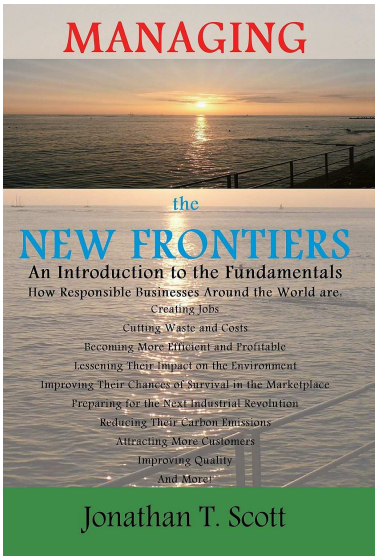
Managing the New Frontiers

An Introduction to the Fundamentals

Jonathan T. Scott



This book is also available as a soft cover paperback from
www.lulu.com

MANAGEMENT
EDUCATION SERVICES®

International Praise for

The Concise Handbook of Management

By Jonathan T. Scott (Haworth Press, New York, 2005)

'**If your aim is to be a more effective manager you'll have difficulty finding a better text. Few management books come within a mile of this one**.'

Director magazine (UK), March 2006

'**…a common-sense and easy-to-understand approach to management. In simple and straightforward prose, Scott presents a practical and thoughtful look at how to manage a business**.'

BizEd magazine (USA)
(published by **AACSB**: the Assoc. to Advance Collegiate Schools of Business)

'**An extraordinary achievement from a seasoned practitioner who clearly knows what he's talking about**.'

Jordi Diaz Martin, Director of International Programs, EADA (Spain)

'**…engaging and mercifully short and to-the-point. The author's knack for clarity makes learning the fundamentals of management an enjoyable experience**.'

Financial Management magazine (UK)

'**The book I've been searching for all my teaching career. It's perfect for an applications-oriented management course as well as the busy manager**.'

E. Cameron Williams, Assistant Dean, Fl. State University (Panama City, USA)

'**The most engaging, easy-to-read, and informative management book I've ever read. It should be the first book every student reads before undertaking a business course**.'

Beat Reber, University of Nottingham (UK)

'**An absolute joy to read. Astonishingly clear, totally relevant, and 100% essential reading**.'

Ivan Hernandez, Director, AACE (Mexico)

'**Hands down the best management book on the market.**'

Daniel C. Kuczaj, Founder, Polish-German Assoc. of Entrepreneurs (Poland)

Managing the New Frontiers

An Introduction to the Fundamentals

Jonathan T. Scott

This book is also available as a soft cover paperback from
www.lulu.com

If you wish to print this document in its PDF format, please set your printer to 'draft' mode, print on recycled paper, and print on both sides of each sheet of paper.

Published by:
Management Education Services
P. O. Box 27928, Panama City, Florida, 32411 (USA)
e-mail: managementeducationservices@gmail.com

Cover design: ***Sunrise*** by Joanna Matuszyk and Joanna Wierusz-Walknowska

Library of Congress Cataloging-in-Publication Data

Scott, Jonathan (Jonathan T.)
Managing the New Frontiers: An Introduction to the Fundamentals / Jonathan T. Scott
Includes bibliographical references and index
ISBN: 978-0-9818-2600-4

1. Management – Handbooks, manuals, etc. 2. Efficiency, sustainability, and waste reduction – Handbooks, manuals, etc.
3. Business – Handbooks, manuals etc. I. Title

Note from the Author and Publisher:

Few would dispute that because of today's 24-hour media and marketing blitzes the world is constantly bombarded with what draws its attention rather than what deserves it. Sensing this, the following organizations and research centers are distributing this book free of charge from their websites. The aim is to inform others that waste is a real and growing danger and to provide practical solutions for eliminating it. The leadership these institutes show and the commitment they're making to improve global business communities *and* the economic strength of their regions is both unprecedented and exemplary. Please visit the Internet to learn more about them.

KOZMINSKI UNIVERSITY

Warsaw, Poland
www.wspiz.edu.pl/index.php/en/

UNIVERSITY OF SURREY

Centre for Environmental Strategy
Guildford, UK
www.ces-surrey.org.uk

BIMTECH BIRLA INSTITUTE OF MANAGEMENT TECHNOLOGY GREATER NOIDA

Greater Noida/New Delhi, India
www.bimtech.ac.in

THE PRODUCT-LIFE INSTITUTE 1982 · Geneva

Product-Life Institute
Geneva, Switzerland
www.product-life.org

EFMD Global Focus

The EFMD Business Magazine
Brussels, Belgium
www.efmd.org/publications

When downloading, please set your printer to 'draft' mode, use non-toxic ink, print on recycled paper, and print on both sides of the paper.

Readers are asked to share downloads with colleagues, students, and friends. Businesses are encouraged to share with their employees.

Dedication

Alexander Von Humboldt, the famous 19th century naturalist and explorer, once said that there are three stages in the discovery process. First, people deny that what has been discovered is true. Second, they deny that it's important. And third, they credit the wrong person.

With these words in mind, this book is dedicated to the all-too-few business realists, environmentalists, naturalists, and conservationists who, over the decades, have tirelessly championed a better way to live, work, and prosper. Ironically, after ignoring their message for so long, it is they to whom many of us are now turning to ensure our economic, as well as physical, survival.

About the Author

Jonathan T. Scott is a lecturer, manager, and business owner with over 25 years of work experience in seven different countries. As a business leader he was recognized for tripling productivity, reducing costs by up to 40%, and increasing net profits by over 55% at the companies where he worked. In the process he conducted three separate SME turn-arounds (the first occurred in a war zone; the second was described as 'the best of it kind in the country') and pioneered multi-million dollar projects in parts of the world where they previously did not exist.

Currently, Scott serves as a faculty member at three business schools: *Kozminski University* (Warsaw, Poland), the *Audencia Nantes School of Management* (Nantes, France) and *Bradford University*, (Bradford, UK). His specialty subjects are management and entrepreneurship as well as efficiency, sustainability, and waste reduction.

Born in Trenton, New Jersey, Jonathan Scott attended *Brevard College* (Brevard, North Carolina) before graduating with a Bachelor of Science degree from *Florida State University* (Tallahassee). He has since attended the *Universite de Bourgogne* (Dijon, France), earned an MBA (in management) from *Western International University* (at its former London, UK campus), obtained a teaching certification from *Oxford Brookes University* (Oxford, UK), and acquired an MA (in management) from the *Leon Kozminski Academy of Entrepreneurship and Management* (Warsaw, Poland) where he is currently completing a PhD in entrepreneurship. His business books include ***Fundamentals of Leisure Business Success*** (1998), the highly praised ***The Concise Handbook of Management*** (2005), and ***The Entrepreneur's Guide to Building a Successful Business*** (2009). He is also the author of the critically acclaimed action/adventure novel ***On Wings*** (2007).

For more information about the author and his work please visit:

www.jonathantscott.com

TABLE of CONTENTS

Part I: Building the Foundation

Introduction

In 2005, I began searching for a way to conclude a book that I'd been working on for four years. Titled *The Entrepreneur's Guide to Building a Successful Business* (Scott, 2008), the purpose of the book was to explore various success and failure factors associated with small businesses and explain the fundamentals behind them. Material for this project was gathered from hundreds of small businesses in 12 different countries and a good way to tie up all the loose ends, I thought, was to include a chapter on a major challenge that every small business might face in the future. Wherever there's a problem there's an opportunity, states an old adage, so the idea was to uncover a growing problem and explore ways to prepare for it.

Somewhere along the way it seemed that the worsening state of the Earth's environment might fit the bill. To this day, however, I'm not sure what prompted me to look in that direction. Perhaps global warming was becoming more of a mainstream topic. Or maybe it was because my childhood asthma had reappeared with a vengeance and seemed to worsen with every passing season (due, in part, to an increase in pollution levels). Whatever the reason, I did a bit of digging, became surprised at what I found, and started working on a concluding chapter that described how the environment was tied in with business.

The first group to hear about what I was doing (in a lecture format) was a gathering of MBA students in Warsaw, Poland. Naturally, I was apprehensive regarding how two subjects as seemingly diverse as the environment and business would be received by a group of hard-nosed executives (an incredibly naïve supposition seeing as every business resource comes from the Earth), however, during the lecture they all leaned forward in their chairs and sat wide-eyed in rapt attention. Afterwards, when I dismissed them, rather than make their way to the door (which is what they usually did), they mobbed me like a rock star - a reaction that repeated itself in several other classes where I introduced the same material. Obviously I was on to something and as time went by that something began to articulate itself. The undergraduates seemed to feel that 'going green' was the calling of their generation. The post-graduate students were overjoyed to discover a useful topic on which they could write a thesis that both interested

them *and* was relevant to business. And the executives appeared eager to apply the cost-effective concepts introduced in class at their places of work (they were also adamant that they wanted to learn more about anything that could improve their children's future).

Some time afterward, when I mentioned to several of my colleagues the impact this subject was having on my students, murmurs of disapproval arose. This is not surprising in an industry (and make no mistake about it, education is an industry) that is notoriously loath to consider anything that it feels is new or vocational. For example, in the Business Education section of the *Financial Times* dated May 14, 2007, the lead story ('Schools Get a Lesson in Listening to Their Clients' by Della Bradshaw) revealed how companies are becoming increasingly vociferous with their complaints about irrelevant business school curriculums. Solipsistic academic theories based on limited sets of empirical experiences were also mentioned as a turn-off. One corporation that regularly spends a small fortune educating its executives put it this way, 'Business schools should spend more time listening to clients and developing course design in accordance with our requirements, not theirs'.

As if on cue, one of my postgraduate students, a hard-working French woman, approached me for help in putting together a thesis proposal. Her idea was to study the packaging used in a *Fortune 500* company, follow its manufacturing process (including the harvesting of its raw materials), and discover ways to minimize both its cost and environmental impact. The *Fortune 500* company had given its blessing and everything was set to go when the thesis committee turned her proposal down flat. When asked why, one of the professors, after searching the room with his eyes as though he wasn't quite sure, waved his hand dismissively and explained that the idea was 'not international enough'. In another incident, an academic actually forbid me from mentioning waste reduction in a management course I was teaching for him in another country. This behavior puzzled me and for a time I shrugged it off as just another example of business scholars refusing to consider topics that focus on practical application. Then I spoke to Walter R. Stahel (see Chapters 13 and 14), the man who is credited with co-founding the concept of sustainability (he also coined the term 'cradle to cradle' to define it) and one of the first scholars to realize that the world's industries cannot continue on their present path without repercussions. 'The reason so many academics don't see the logic behind closed-loop practices,'

he told me, 'is because they're economists – and economists are usually trained to think in only two dimensions. What they don't understand is that efficiency, waste reduction, and sustainability are three-dimensional issues.'

He's right, of course. Most business researchers will only think in terms of a graph with an X and Y-axis, but that explanation didn't help when several months later a few of the post-graduate students began resisting. As one of them put it, there was no proof that climate change - or any other environmental problem, for that matter - was happening so there was no need to discuss the issue. When I tried to explain that the solutions to environmental problems drastically lower business costs *and* increase profits, he remained unmoved. Yet another student wrote a full-page letter to my program director insisting that sustainability was nothing more than 'propaganda'. Later, a small group of students sat in stony silence with their arms folded across their chests as I discussed waste reduction concepts. 'This will never be allowed,' one of them finally said. 'What won't be allowed?' I replied. He gesticulated wildly. 'This… this saving of resources and saving all this money,' he answered. 'It'll effect national economies, cause financial disruption… that sort of thing. Governments and industries won't allow it. Besides,' he added, 'there's no proof that the environment is in trouble.' I stared at the floor. Although he had a point about governments and industries, the word 'environment' seemed to be turning too many people off. I decided from then on to begin my lectures by focusing on 'efficiency' - although even *that* word caused the eyes of my colleagues to roll. My intent was to discuss how efficiency cuts costs, increases revenues, and can increase employment while reducing waste and pollutants (rather than the other way around). The problem with this approach, however, was finding a point from which to begin. As a business subject efficiency is very broad and presenting it in a logical and coherent fashion is challenging to say the least. In the end, desperate to provide a framework from which to begin, I formed a crude alliteration and created the following 'whole-system' 7-P teaching model:

The Seven P's of Business Efficiency

Part I: Building the Application Foundation

- **Preparation** (creating awareness and examining needs)
- **People** (getting employees involved and keeping them motivated)

- **Processes** (efficiency-related work philosophies and cultures)
- **Preservation** (measuring progress, staying on track, and going further)

Part II: Taking Action (Practical Application Suggestions)

- **Place** (improving the buildings in which business is conducted)
- **Product** (increasing the efficiency of goods and services)
- **Production** (cutting waste and costs in manufacturing processes)

What started as a chapter in a book slowly grew to a three-hour lecture and then to 20 and 30-hour courses titled ***Management and the New Frontiers***. A year or so later I decided to once again use environmental issues to start the first part of the program. For better or worse, I've learned that environmental facts tend to grab an audience by the throat, which is exactly what most university courses need at their onset. Also, today, many students and business practitioners are more accepting of this information than they were a few years ago so less of my time is spent countering resistance. To be sure, efficiency, the environment, and financial profit may not yet be seen as synonymous, but one day they will be – the facts speak for themselves and the payoff is simply too good to ignore.

After priming a class with the worsening state of our environment, I then launch into the rather eclectic subjects that make up efficiency using the 7P model. In the classroom this model proved to be quite helpful in allowing students to understand and digest the many diverse facets of efficiency, but being a former business practitioner I wanted to make sure that it worked outside the walls of academia as well. To that end, 26 businesses[*] in six countries (Austria, the Czech Republic, France, Poland, Portugal, and Slovenia) were introduced to the model in early 2007 in the form of an efficiency evaluation. An additional 31 businesses were evaluated a year later solely to improve their energy efficiency.

[*] The companies included: a restaurant, an IT business, a tobacco company, a university, a restaurant equipment importer, a clothing supplier, a travel company, a business that makes automobile tire balancing machines, a food market, a cleaning service, a steel manufacturer, a consulting business, a wood-products manufacturer, a fitness club, a meat processing plant, a cement company, a business that makes fuel pellets from waste, a plastics manufacturer, a truck building plant, a plastic bag manufacturer, a publishing house, an IT security firm, a courier service, a packaging producer, and a company that sells healthcare products.

Afterward, the people within these businesses (as well as the questioners) were asked what they had learned. Case studies, e-mails, and consultations with environmental institutes and seasoned efficiency practitioners were later used to confirm what was revealed. The result became this book. When the business publishers I began approaching insisted that efficiency is an environmental issue and therefore couldn't be published under a business imprint, I came up with the idea of placing the book on the Internet where it could be downloaded from the websites of recognized business schools. The purpose of this is: (1) to show that efficiency, sustainability, and waste reduction *are* business issues, (2) to promote business as a whole, and, (3) to help stop environmental degradation (which is worsening faster - and causing more financial damage - than most people think). Incredibly, even the idea of giving the book away for free proved difficult. 'What's in it for us?' asked the director of corporate responsibility at a major academic institute after I explained that the material would provide a free resource for students and SME's that can't afford to attend multi-thousand dollar seminars and workshops. 'We don't give away free books,' stated another. Some months later an American university claimed that it was interested in being a distributor until its legal team said the school might be sued – although for what and by whom was never made clear. Such is what happens when people feel it's all in a day's work to find ways of saying no rather than yes.

Please note that ***Managing the New Frontiers*** is not meant to be prescriptive or seminal nor is it an academic tome. Although it's often ignored, the material within these pages may be familiar to those who keep abreast of management topics and current events. Simply put, I have no desire to re-label the fundamentals of management or the work of others and pretend that something new has been discovered. Rather, my research and efforts have been directed toward compiling and presenting efficiency, sustainability, and waste reduction in a basic, structured, and teachable way to the *many* businesspeople and students out there who aren't yet aware of their wide scope, their cost-effectiveness, and their profit potential. Put another way, this book is a stepping-stone to further study on the part of the reader. It is *not* a definitive guide.

Keep in mind that many of the practices behind the 'new frontier' concepts and solutions mentioned herein began in the 1970's and caught the attention of very few people. Empirical evidence is therefore lacking in some

cases (although that's changing by the week), which is why indicative material, anecdotes, and estimates (which vary from application to application), have been used throughout the text. In other words, if you don't believe the examples that highlight the subjects, or if you think the evidence behind climate change and environmental degradation is exaggerated (the repercussions of which you're paying for now in terms of higher insurance premiums, higher food prices, and higher energy costs), at least try to acknowledge that waste reduction, efficiency, and 'going green' have been estimated as a $572 billion a year market (and as Richard Lofthouse, editor of *CNBC European Business* magazine [February 2007] puts it, '(whereas) history shows us that political will, voluntary restraint, and idealism cannot be relied upon (to provide change), human greed usually can.') From a business practitioner's view, it would therefore be unwise to ignore the advantages that efficiency, sustainability*, and waste reduction produce. To remain competitive and relevant businesses are obliged to cut waste and costs. Fortunately, most businesses seem to want to do just that once the fundamentals of efficiency have been explained to them (interestingly, several of the students who years ago insisted that my efficiency lectures were groundless, now send me e-mails asking how they can incorporate it into their places of work). Regardless of their enthusiasm, however, many beginners find that anxiety sets in at some point. The good news is that with a little encouragement, most people increase their confidence as they go, quickly learning the ropes and rapidly ascertaining the difference between what they can do themselves and where they might need help. At this point it's important to understand that the majority of employees I've spoken with who've saved their companies a fortune by making them less wasteful started with *no formal training* (the same holds true in most of the case studies I've examined). With some efficiency consultants charging as much as $1,000 per hour, that's welcomes news.

The only caveat is that efficiency, sustainability*, and waste reduction must be on-going, whole system, all-or-nothing endeavors. No business can be a little bit efficient or somewhat efficient; it either is or it isn't (which means that all the **7** P's of Business Efficiency must be embraced). Just as important, there is

*In 1983, the *Brundtland Commission*, created by the UN for the environment and development, defined the word *sustainability* as 'the present generation satisfying its needs without inhibiting future generations from satisfying their needs'.

no finish line. Improvements are *always* possible even after it seems that no further progress can be made (that's when outside expertise should be brought in). The most difficult part is getting started – or, as my old track coach used to say when he talked about jogging, 'The hardest step to take is usually the first one out the door.'

Please note that although efficiency, sustainability, and waste reduction practices are producing eye-opening results in businesses around the world, they do not present a cure-all nor are they an end in themselves. Whether you're a practitioner or a teacher looking to enhance your curriculum, I encourage you to delve deeper into the subjects mentioned in this book. Keep up with new research and chart your own course. Feel free to combine different sections of the 'Seven Requirements of Business Efficiency' (the 7-P's), move topics from one segment to another, merge what you feel are related subject areas, or add your own thoughts to what I've presented. For example, you may feel that recycling and remanufacturing belong with *Production* topics. If so, then put them there. Or perhaps you believe that conflict issues are better suited under the *People* category (rather than *Processes*) -- or that 'Reducing Waste in the Office' belongs in the *Place* section, not *Production*. Everything within these pages is inter-related so moving subjects around doesn't really matter. This is your book now. Do whatever works best for you and those you work with as you venture into the new frontiers. The point is to believe in yourself and your abilities, say yes rather than no, take that first step, and launch an attack on *every* front.

I wish you all the best on your journey.

Acknowledgements

Special thanks are owed to the following people for reviewing chapters, allowing me to use case studies and materials from their organizations (or publications), and/or for pointing me in the right direction when I had questions: **Cameron Burns**, staff editor at the *Rocky Mountain Institute*; **Cheri Chastain**, sustainability coordinator at the *Sierra Nevada Brewing Company*; **Paul Hawken**, founder and director of the *Natural Capital Institute* and co-author of the book *Natural Capitalism*; **J. Andrew Hoerner**, Director of Research at *Redefining Progress*; **Ragini Kapadia** who was director of the *Apollo Alliance* when I contacted him, but is now with *Energy Action*; **L. Hunter Lovins** founder and director of *Natural Capitalism Solutions*, **Cory Lowe** of the *Rocky Mountain Institute*; **Rachel Regan** and **Chet Marchwinski** of the *Lean Enterprise Institute*; **Dorle Riechert** of the *Wuppertal Institute*; **Marlene Roy** of the *International Institute for Sustainable Development*; **Bob Simmons**, founder and principal of the *Continued Success Foundation*; **Walter Stahel** founder and director of the *Product Life Institute*; **Thomas Sterr**, Managing Director of *IUWA Gmbh* and Senior Research Associate (Chair of Business Administration) *University of Heidelberg*; **Ken Tannenbaum** of *Dow Chemical*; **Maria T. Vargas** of *Energy Star*; and **Pete Zelinski** of *Modern Machine Shop Magazine*.

Thank you also to **Alex Chukhlov** for formatting and looking over the completed text prior to publishing - and the students of ***The Leon Kozminski Academy of Entrepreneurship and Management*** in Warsaw, Poland for their help in testing the model on which this book is based. Special mention should also be made of the over four dozen businesses that graciously opened their doors to us. .

Part I

Building the Efficiency Foundation

PREPARATION

Preparation is the act of making ready (i.e.: putting or setting in order in advance of an act or purpose). Before beginning the process of becoming more efficient and reducing waste it's important to: (1) learn what efficiency entails, (2) articulate why the pursuit of it is important, and, (3) set the groundwork that will instill both managers and non-management employees with the reasons, enthusiasm, and support necessary to initiate efficiency improvements on their own. Without establishing this foundation, most attempts at improvement will be prone to confusion, suspicion, disorganization, and dwindling motivation, as well as wasted time and efforts.

Chapter 1

The Power of Efficiency

For the most part, the profound reductions in costs, the dramatic increases in quality and productivity, and the impressive gains in profits, employment, and growth now being enjoyed by a number of astute companies around the world began years ago at the back-end of business operations rather than the top or front-end where most people assume they should have occurred. To be fair, the foundation for these improvements was laid much earlier, but the lion's share of what was built upon this foundation kicked into gear during the early 1970's, while the *Clean Air Act* was becoming law in the United States. Back then it was quite fashionable in most business communities for managers and industry analysts to state with utter assuredness that pollution control legislation would cost American companies millions of dollars worth of hard-earned revenues every year (a debate that still rages today). Imagine the surprise then when, in 1975, the *Minnesota Mining and Manufacturing Company* - a technology based consumer and industrial products provider commonly referred to as *3M* - announced that it wanted to voluntarily reduce the amount of pollutants it created. Eyebrows were further raised when the company, spurred on by a Chinese immigrant named Joseph Ling, added that it would rely on two pioneering methods to achieve this goal. First, rather than collect and treat waste *after* it was created (as the law stated), *3M* declared that it would prevent waste at its source *before* it became a problem. Second, the company insisted that its front-line employees would play an integral role in obtaining this objective (the usual method at the time was to employ pollution control engineers and consultants). Dubbed '*Pollution Prevention Pays*' (3P), *3M*'s groundbreaking program began by asking employees to simply stop being wasteful. Eventually, as workers began looking deeper into eliminating waste and wasteful practices, their efforts picked up steam and became more diverse. Leaks, spills, and other waste byproducts were reduced or eliminated; waste and scrap material was recycled back into production processes; products were reformulated using less toxic and

more sustainable substances; and equipment and manufacturing processes were redesigned so that they required fewer raw materials and less energy to produce.

Fifteen years and hundreds of improvements later, *3M* discovered that its new program had lowered overall waste and emissions by 50-percent and had resulted in the company saving over $500 million. Indeed, the program was so successful that the company launched an improved version of it in 1990 with the intent of reducing remaining waste and emissions by a further 90-percent in ten years time (Ahuja, 1996). Dozens more efficiency projects were launched and millions more dollars were saved before employees and managers figuratively stepped back and wiped their brows, firmly believing that there were no cost-effective projects left to pursue. Unbeknownst to them, however, an independent *3M* plant in Midland, Michigan thought differently. Entrenched in the belief that the pursuit of efficiency, like any philosophy, is an unending process, company administrators set two new objectives designed to push themselves and their employees even further. The first objective was to cut waste and emissions an additional 35-percent. The second was to integrate local health and environmental experts into the program – a move that introduced *3M* workers to different perspectives and provided them with new ways of thinking. Working with the community in which the plant was located – as well as with outside environmental activists and pollution control specialists - employees were able to initiate 17 more projects that saved an additional $5.4 million (IOM, 2001). Not long afterward, in 2005, *3M*'s 'Pollution Prevention Pays' program celebrated its 30th anniversary with enough accumulated data to reveal that it had saved the company over $1 billion in costs.

Not to be outdone, corporate giant *DuPont* decided that it too wanted to cut costs and increase profits by reducing waste – and it didn't take long before the Delaware-based company discovered what *3M* had already learned; that waste in any form is wasted money. During the first four years of its waste reduction efforts, *DuPont* cut production costs by $45 million – an amount that continues to grow as the company strives to become ever more efficient. Currently, *DuPont* is on track to add over $3 billion dollars to its net earnings through the implementation of efficiency practices.

Recently, food giant *General Mills* also took steps toward waste reduction by decreasing the size of its cereal boxes and re-engineering the

noodles in its *Hamburger Helper* meals – changes that reduce packaging material by 11-percent, save the company 400 metric tons of paper every year, and cut transportation costs by 500 truckloads annually (Kolesnikov-Jessop, 2008).

Further north, the *Hudson's Bay Company* (HBC), Canada's fifth largest employer, is undertaking its own unique waste-cutting pledge, which began back in 2002. Because *HBC* is a retailer and not a manufacturer, its emphasis was placed almost solely on eliminating wasted energy. By refitting its stores and offices with more efficient lighting, lowering thermostats, and adjusting its operating schedules around the efficient use of electricity, the company shaved $12 million off its energy bills over a six-year period (BC Hydro, 2007).

It's Not Just Big Businesses

With a handful of major corporations saving huge amounts of money and greatly increasing their profit margins in the process, it would be easy to surmise that efficiency and waste reduction practices only work in big companies. Fortunately, that's not true. In 1993, for example, a 29,000 square foot (2,694 sq. meter) grocery store in Sacramento, California (*Vic's Market*) installed energy-saving light bulbs in all its light sockets, replaced its coolers and refrigerators with less expensive energy-saving models, and covered its open-faced, multi-deck freezers with glass doors. As a result, the company slashed $48,000 from its yearly energy bills (Energy Star, 2007). Across the country in Alburg, Vermont, the 4,200 square foot (390 square meter) *Thomas Mott Homestead Bed & Breakfast* cut its annual fuel bill by $10,000 in an efficiency drive that included switching to a continuous-flow hot water system, a state-of-the-art boiler, and the installation of super insulated windows. High up in the Rocky Mountains, the 20,000 square foot (1,860 sq. meter) *Boulder Book Store* in Colorado reduced its energy costs by around $5,000 per year after it replaced its old lighting system with efficient bulbs and replaced its windows with super insulted, double-paned alternatives. The 35,000 square foot (3,250 sq. meter) *A.O.K Auto Body Shop* in Philadelphia, Pennsylvania, as well as the 8,500 square foot (790 sq. meter) *Subway Sandwich* shop in Norma, Oklahoma (which cut its annual energy bills by $20,000), have enjoyed similar efficiency success stories (Energy Star, 2007).

Slowly, it seems, at organizations both big and small (including schools and universities), waste and wasteful practices are being recognized for what they

are – lost profits. As one astute businesswoman put it, 'the more an organization wastes the more it has to purchase'. Just as important, a decrease in the amount of energy and materials that are all-too-often wasted in business is being accomplished without any reduction in quality or service. On the contrary, most employees quickly discover that overall quality and work environments greatly improve when waste, wasteful habits, and pollutants fall by the wayside. Just ask the *Kraft* food company. It recently redesigned its salad dressing bottles, which reduced packaging material by 19-percent, increased shipping efficiency 18-percent, and saves the business 1,360 tons of plastic per year. Further south, Brazilian water company *Lindoya Vida* enjoys 40-percent reductions in material and energy costs after it converted its packaging from a rigid plastic bottle to a recyclable bag in a box (Kolesnikov-Jessop, 2008).

Waste in Any Form is Wasted Money

If waste is defined as *money spent in which no value or only partial value is received from what is purchased* then the cost of waste is truly staggering. Examples of waste in a business setting include: excess packaging, skips laden with garbage and unreclaimed materials, leaks and spills, lighting that generates more heat than light, furnace walls or machines that are hot to the touch, lights and electrical equipment left on when not needed, discharge from smokestacks, chemicals seeping from production systems, tap water used in industrial processes, products laden with toxins, energy-hungry equipment, people not being used to their full potential, wasted resources, wasted revenues, wasted electricity, wasted time, wasted production processes… and countless other preventable scenarios that end up costing companies – and the societies in which they operate – hundreds of billions of dollars annually. In the United States alone it has been estimated that annual waste expenses amount to over $2 trillion.

Lost Revenues

How much *physical* waste comprises $2 trillion? In the USA over 50 trillion pounds (23 trillion kilograms) of physical waste is created every year. This amounts to about one million pounds (453,600 kilograms) of materials per person annually, or about 20 times the body weight of every American *per day*

(see Chapter 28). Included is the over 1,500 pounds (680 kilos) of water most Americans use in a 24 hour period, which is so contaminated afterward that it cannot be re-introduced into the environment without treatment. With approximately 491 people born in the United States every hour, it's not difficult to conclude that the sheer volume of waste being created within the country's borders is increasing at an alarming rate.

In a typical year, because of inefficient extraction, production, transmission, and use, Americans and their businesses waste up to and over 50-percent of their energy. In addition they throw away over 920 million square yards (841 million sq. meters) of carpet, 19 billion pounds (8.6 billion kilograms) of polystyrene packaging material, 360 billion pounds (163 billion kilograms) of manufacturing chemicals, 710 billion pounds (322 kilograms) of household chemicals and toxins, almost four trillion tons of construction debris (Hawken, et al, 1999) and 96 billion tons of food. Keep in mind that when these items are thrown away *all the raw materials, all the labor, and all the energy that went into making them is also tossed away* as if none of it has, had, or ever will have, any value (see Chapters 28-31).

Ironically, although most of the materials, labor, and energy that go into discarded products can, in many cases, be used again, less than two-percent of it ever is. Indeed, on average, only one to six-percent of all materials mobilized to serve the United States is still in use six months after it's been sold. The rest is wasted. This problem is so endemic in American business culture that in some companies it's actually considered acceptable to create more waste than product. The majority of America's power stations, for example, use one-third (or less) of the fuel they consume to create electricity; the rest escapes up chimneys or through poorly insulated furnace walls in the form of lost heat. Yet despite what many people seem to want to believe, the astonishing amount of waste that people and their businesses create on a daily basis is not a sign of progress or wealth. Rather, it's the result of apathy, irresponsibility, and managerial incompetence. Equally as disturbing is that the cost of waste compounds. For example, waste heat emitted by machinery, manufacturing processes, and office equipment is combated by turning up air-conditioners. Cool air that seeps unchecked from coolers and refrigerators (or under doors or through window frames) is offset by turning up thermostats. And countless products (and their

packaging) are not treated as assets in transition, but rather are dumped into landfill sites never to be seen (or used) again. Enough aluminum is thrown away in the USA every three months, for example, to rebuild the country's entire commercial airline fleet – despite the fact that recycling aluminum from scrap requires up to 95-percent less energy (Hawken, et al, 1999).

Putting Physical Waste into Perspective

The *Fresh Kills* landfill site on Staten Island is the former dumping ground for New York City ('kills' means river in Dutch). Opened in 1948, *Fresh Kills* was more or less closed in the late 1990's because local residents claimed enough was enough. The site itself contains four giant mounds of garbage ranging in height from 90 to 225 feet (making it the highest point on America's northeast coastal plain). These mounds sprawl across 2,220 acres; the equivalent of 2.5 *Central Park*s. Literally, *Fresh Kills* is the largest manmade structure on earth. Laden with 50 years worth of cans, bottles, paper, packaging, furniture, rotting food, chemicals and other debris that arrived en mass at the rate of 11,000 – 22,000 tons per day, *Fresh Kills* is actually taller than the Statue of Liberty (Brockes, 2002) and just under half the height of the Great Pyramid. When one takes into account that New York isn't even in the top 12 when it comes to the planet's most populated cities, such waste statistics becomes even more sobering.

Across the Atlantic, the 385-acre *Packington* landfill site outside Birmingham, England receives upwards of 900 truckloads of garbage a day. Included in these shipments is rubbish as seemingly insignificant as chewing gum. As a waste product, gum may seem irrelevant, yet it's a good way to show how the cost of even small amounts of waste add up. Three billion packets of gum are bought in the UK every year, and although some of this gum makes its way to landfill sites (where it takes three to five years to decompose), much of it is stuck under tables, spat onto carpets or sidewalks, or pressed between bus seats. Deposited in this way, a five-cent stick of gum can end up costing anywhere from 40-cents to $3 to remove (Mass Transit Mag, 2007). Today, gum waste is so problematic that the cost of cleaning up chewed gum in an average-sized city often amounts to over half a million dollars per year.

Additional examples of the cost of waste are even more disconcerting. In the United States, over 175 million mobile phones are thrown away every year -

contributing to the over 550 million discarded phones across America that are still awaiting proper disposal. Most of these phones contain lead, beryllium, arsenic, mercury, antimony, and cadmium – toxic substances that can easily be reused, but which will probably end up working their way into the environment in a condensed form. Today we pollute our planet with 300 times more lead, 23 times more zinc, and 38 times more antimony (a metallic element used in alloys) than can naturally dissipate (Ayres, 1992). Other toxins such as trichloroethylene (a substance used to remove grease from metal) are accumulating almost everywhere because they're used in abundance and never decompose. The American *Environmental Protection Agency* (EPA), for example, estimates that it will take $1 trillion just to clean up the country's trichloroethylene residues before they become even more harmful - a sobering prediction that highlights yet another facet of the waste equation: health care expenses resulting from pollution and environmental degradation. For example, approximately $100 billion is spent annually in the USA just on medical expenses related to polluted air alone.

Hitting Two (or More) Birds with One Stone

Those who have successfully reduced waste in a business know that two of the greatest difficulties encountered involve convincing others that the measures which will eliminate waste don't involve sacrifice and aren't expensive. On the contrary, reducing waste is usually quite simple and the savings derived from it tend to spread out and multiply. Equally as true is that many of the common sense waste reduction measures that save companies millions and billions of dollars in expenses every year not only cost less than the processes that create them they also reduce carbon emissions and other pollutants. For example, during *3M*'s *Pollution Prevention Pays* program, as the company cut a billion dollars in waste costs, it also lowered its CO2 emissions by more than 2.5 billion pounds (just over 1 billion kilograms). Likewise, the *Hudson's Bay Company* discovered that it reduced its greenhouse gas emissions by 50 megatons during the electricity-reducing drive that cut its energy costs by $12 million. *DuPont* famously reduced its CO2 emissions by 72-percent between 1990 and 2003, quickly determining that for every $6 it saves in waste reduction one ton of the company's carbon emissions is also eliminated (during this period, the company's stock value increased 340-percent). And combined, the $88,500 in yearly energy

savings made by the small businesses mentioned on page five lowered their annual carbon emissions by one million pounds (over half a million kilos).

There are a number of lessons to be learned from these (and other) examples and each one is supported by an increasing amount of empirical evidence. The first lesson is that pollution, garbage, and excess energy use are all signs of waste - and waste is *always* a sign of wasted money. Second, efforts to eliminate waste, lower energy requirements, and reduce toxins and emissions often pay for themselves rather quickly, thereby allowing the savings they produce to fund further efficiency improvements. Third, businesses that create the most waste and pollutants stand the most to gain by reducing them (Ahuja, 1996). Fourth, many companies that save money by increasing their efficiency tend to greatly improve the quality of their products and their productivity (Lovins, et al, 1996) while bolstering sales as much as 40-percent or more (see Chapter 24). The message could not be clearer: waste reduction (a.k.a. efficiency) not only reduces costs, it also improves quality (including the quality of work environments), sales, revenues, production, and lives.

Defining Waste Reduction in Terms of Efficiency

To be sure, efficiency is not a panacea. Like good health, however, an efficient condition is an excellent state to be in while navigating the ups and downs of market competition and economic cycles. So what exactly is efficiency? In economic terms, efficiency is often explained as the ratio of work done or energy developed in a system compared to the amount of energy supplied to that system. In production terms, efficiency is usually described as measuring and comparing production with costs. Although these definitions are adequate, for the requirements of this text efficiency has been broadened to also include the following:

- achieving optimal outputs with minimal input (i.e.: doing more with less),
- reducing waste (i.e.: obtaining 100-percent value from purchases and investments), and,
- re-using outputs (e.g.: heat, waste, and other discharges – including used products) and inputs (e.g.: raw materials, water, and energy) for as long as possible wherever and whenever appropriate.

Some Background Information

Efficiency is not a new concept. Our ancestors were masters of it. Almost nothing our forbearers raised or made was wasted. Crops, livestock, and tools were used to their utmost potential; food scraps were fed to animals; animal and plant waste was composted and used as fertilizer; clothes were mended, re-worn, and passed down to younger siblings before being torn into rags or woven into potholders; durable products were treated with reverence and kept in good condition; and for the most part, whenever a piece of equipment came to the end of its work-life it was taken apart and used to repair or create something else. Perhaps it's not so surprising then that an endeavor as high-brow as the study of management also first took root in the practice of efficiency.

In the early 1900's, an American researcher named Frederic Taylor decided to devote his life to eliminating wasted time and effort in the workplace. The method he chose to accomplish this goal (which he christened '*Scientific Management*') was to determine the most efficient way to accomplish a task and teach it to others. Eventually, Taylor's beliefs became so popular that in 1908, *Harvard University*, the world's first business school, declared that his work set the standard for modern management. Scientific Management was subsequently adopted as the foundation on which all *Harvard*'s business courses were organized.

Of course, Taylor's thinking wasn't entirely unique. A number of early industrialists had already discovered the benefits of efficiency and had been capitalizing upon them for years. To this day, some of the more famous of these industrialists are still notorious for what is often sneeringly referred to as 'penny pinching'. For example, as legend has it, oil magnate John D. Rockefeller of *Standard Oil* saved his company hundreds of thousands of dollars a year by ordering a one-drop reduction of solder in the sealing of every oil barrel that rolled off his production lines. In Dearborne, Michigan, Henry Ford insisted that his employees reuse scrap metal, wood packing crates, wood pallets, and other materials. And both the *Tomen Corporation* (a large Japanese general trading company) and the *Toyota Motor Corporation* were created with the profits provided by innovative power-driven weaving looms devised by Sakichi Toyoda in 1897, which shut down when a thread broke thereby preventing the making of defective cloth and the wasting of good thread (Hoover's, 2000). Somewhere

along the way, however, the practice of saving money (and making money) by being less wasteful declined - lost, perhaps, in the rather bizarre notion that the more successful a business becomes, the more it can ignore the cost of waste. Today, with corporations saving more than $1 billion through efficient practices - and countless smaller businesses adding tens of thousand of dollars a year (or more) to their bottom lines by doing the same - one would think that companies around the world would be rushing to become more efficient. Unfortunately, the opposite appears to be true – and apart from a number of inflexible academics, business practitioners, and publishers who mistakenly believe that saving billions of dollars and making millions of dollars through efficient practices is solely an environmental issue, the following reasons appear to be why this is so.

Twelve Major Efficiency Obstacles

- *Lack of Awareness:* Without question, ignorance is efficiency's greatest enemy. Of the hundreds of international students and business people I teach every year, roughly 90-percent of them have never heard a word about efficiency, the cost of waste, the money that can be saved by reducing waste, the numerous negative environmental situations that can be alleviated by eliminating waste, and the myriad applicable solutions that turn waste into money. Of the people that do hear or read about these practices, the conclusion that many naively come to is that the benefits of efficiency are either not important or are overblown. It really is as simple as that.
- *Acceptance:* Some people believe that waste is a natural and acceptable part of business. A common variation of this theme is defeatism (e.g.: saying it can't be done) and/or the conviction that waste-reduction 'doesn't apply in (our) part of the company or in (our) industry'. What the folks that make this claim don't seem to acknowledge is that although waste or the *cost* of waste seemingly diminishes with mass production (or outsourcing), business-as-usual practices do not decrease waste, the long-term costs of waste, or its cascading effects as it spreads to other areas (see 'The Dimes not Dollars Argument' below). As harsh as it sounds, the more short-term one's thinking is, the more likely it is that waste is accepted – and as the old adage says, the short term has no future.
- *The Cost Myth:* 'How much is this going to cost me?' is the first question managers usually ask when the rudimentaries of efficiency are explained

– and the question is often put forth in a pessimistic tone implying that the cost will be too high. Unfortunately, it misses the point. It's not the costs, but the *savings* and potential *profits* that should be considered first. Yes, in many cases some capital is required to start the efficiency process, but efficiency often pays for itself in no time – with the added benefit of additional savings year after year, which can be used to fund further improvements. Energy efficient light bulbs provide a good example. Efficient bulbs can cost anywhere from $6 to $20 (or more) per unit whereas regular light bulbs cost around 75-cents (or more) per unit. Most folks assume that 75-cent bulbs are the less expensive option, yet if one takes into account that energy efficient bulbs last ten to 13 years longer and can save $30 - $60 in electricity costs over the life of the bulb, the 'cheaper' bulb becomes the more expensive alternative. Unfortunately, too many people don't think in the long-term and end up choosing the more expensive option. This is especially true with businesses that have invested millions (or billions) of dollars in inefficient equipment and machinery and refuse to make changes.

- *The Dimes-not-Dollars Argument:* Those who have looked into efficiency sometimes find it difficult to become enthusiastic because they assume it only leads to small-time savings. Half of the businesses studied for this book, for example, initially scoffed at the notion that they could save money by implementing basic efficiency procedures – until estimates showed that many of them could save thousand of dollars per year just by changing their light bulbs and turning their computers off when not in use. That was just the beginning. In several cases we revealed that annual savings of up to and over half-a-million dollars could be obtained quite easily by incorporating a few more inexpensive (and risk-free) solutions. Once again, the moral of the story is that the savings from efficiency don't add up – they tend to multiply. For example, to continue with the light bulb example above, the overall savings from installing energy-efficient light bulbs includes: (1) reduced electricity costs (efficient bulbs consume less electricity), (2) reduced replacement bulb costs (efficient bulbs last longer), (3) lower cooling costs (heat from inefficient light bulbs often increases a building's heat load by 30-percent), (4) a reduction in air-conditioning needs (with heat levels cut by 30-percent, a smaller, less expensive air-conditioning system can be installed), (5) reduced HVAC energy requirements (smaller air-conditioning systems require less electricity), and so on. This cumulative effect

(see Chapter 24) is how the *Hudson's Bay Company* was able to save over $12 million by, in part, changing its light bulbs.

- *The Hassle Factor:* Most people don't want to add more work to their day no matter how much time or money they can save. The result is that efficiency is placed at the bottom of a long list of priorities even if it does carry enormous potential. The message to remember here is that efficiency is not about sacrifice. It's about eliminating wasteful practices and replacing them with simpler, more cost-effective alternatives that make work easier, more enjoyable, and less expensive.

- *Skepticism and/or Obstinacy:* In a world where prices are regularly taken into account, but long-term value rarely is, efficiency is a difficult concept for many people to accept. Skeptics, for example, often think that the amount of cost-savings their businesses can achieve by changing wasteful habits are impossible to prove (especially if no measurement is taking place). Estimations therefore become easy to dismiss with an unmovable conviction that the amount of time, energy, and money invested in efficient practices will be far less than what is received. Stated differently, since much of efficiency falls into the realm of prevention, and the predicted savings from most preventative measures can't be proven until *after* an efficiency program or practice has been implemented, studies and predictions are easy to ignore.

- *Social Loafing:* Almost every business or industry has within its ranks those who reduce their efforts when they see that others are more than pulling their own weight. This practice is called social loafing and it's anathema to efficiency – particularly when the lowered input of one or two lazy individuals has the ability to reduce the work or aspirations of an entire operation (or industry). Social loafing tends to be pervasive in under-regulated industries and/or in companies that have untrained or unsupervised employees. As a result, since employees feel that the company (or industry) that employs them doesn't care about waste – why should they?

- *'Let's Wait and See':* Businesses (or managers) that wait to see how other companies react first before they themselves take action probably suffer from a lack of education, direction, and training. Ironically, because of the virtually risk-free nature of efficiency and the rapid financial improvements it brings about,

when a decision to become more efficient is finally made those that sat on the sidelines may discover that their competitors have already passed them.

- *The Solutions are Too Simple:* As one of my students put it, 'How can I look the CEO of a manufacturing company in the eye and tell him that all he has to do to *begin* saving lots of money is to realign his production systems and purchase more efficient machinery? He'll laugh me out of his office.' A British efficiency consultant in France relayed the same concern to me, stating that almost every manager he spoke with rolled his or her eyes when the first suggestion he made was to turn off unneeded lights (this practice alone saved one factory $30,000 a year). Although there is no data to suggest that complexity legitimizes business solutions, many people apparently seem to need the false reassurance that they feel complexity provides - and because most efficiency solutions are simple and low-tech, they're therefore rejected out of hand.

- *'We're Already Efficient':* These self-deceiving words are usually uttered by managers and employees who: (1) mistakenly believe that they've already done as much as they can, or, (2) wish to avoid additional work, or, (3) are placating customers, their shareholders, and/or the media with false information. According to the *Scottish Environmental Protection Agency*, **the true cost of a business's waste is often five to 20 times more than what the business assumes**. Think about that for a moment. In one of the 26 companies studied for this book, for example, an office manager stated that it was highly doubtful that three of my students could find more than $300 in efficiency savings ('We're already efficient,' she said). The students found over six times that amount in two hours. Another group of students found over $4,000 in savings in a restaurant that claimed beforehand that it too was already as efficient as it could be thanks to the policies set by its head office. Managers and employees take note: proclaiming that your business is already efficient is tantamount to claiming that it has no further need of new thinking, training, input, or ideas.

- *Group Think* or a *'Committee Mentality'* results when laziness or the smug air of superiority creeps into a business and it refuses to consider what it feels are strange or different viewpoints from others (see Chapter 17). For example, students I have sent out to conduct efficiency evaluations have been called 'tree-huggers', 'crackpots', and a host of other names when they mention that efficiency and waste reduction also help the environment by dramatically

lowering carbon emissions. This type of behavior is mostly a hangover from the 1970's when businesses and environmentalists clashed (sometimes physically) on a regular basis. Fortunately, times are changing and the two are being increasingly seen as both symbiotic and inseparable.

- *Additional Obstacles* (all of which will be addressed in later chapters) include: stranded capital, fear of change, lack of leadership, an inability to accept criticism, poor management, and poor decision making.

Removing the Obstacles that Stand in the Way of Efficiency

Business practitioners who successfully reduce waste at their place of work often claim that the main reason they achieve success is because they approached the efficiency process by articulating its importance and conveying its implementation both simply and in an enthusiastic manner to *everyone* in the organization. Employees were not issued with edicts, but were treated like adults. No one was overlooked and no one was considered too busy to help. In other words, education and collaboration are key – as is a fervent insistence that waste will no longer be tolerated. The aim, according to one successful practitioner, is not to form a committee or to setup a short-lived project, but to get the entire organization to: (1) accept and apply basic math, (2) think in the long-term, and, (3) acknowledge that waste reduction is an opportunity rather than an expense. Only then is it possible to eliminate the stigma of sacrifice, overcome the aforementioned waste-reduction obstacles, and launch an attack on all fronts.

The Job Loss Argument

Mention efficiency or waste reduction to employees, particularly employees who have been lied to or mistreated in the past, and at some point the job loss argument may emerge. The crux of this argument is that efficiency will result in massive layoffs because the more efficient a business becomes the less it needs employees. The oil and coal industries, for example, have been espousing one form or another of this argument for decades in a bid to promote their product, rake in subsidies, and frighten consumers away from alternative fuel sources. The facts, however, speak otherwise.

Few dispute the notion that cleaner, more efficient energy alternatives will result in job displacement. A similar shift occurred when the automobile wiped out the horse and buggy industry and the jet engine sounded the death knell for ocean liners. Unfortunately, what usually gets lost in the heat of argument is that at its core, efficiency *is not about eliminating people*. Efficiency is about *reducing waste* - including the wasting of people – and according to the *University of Michigan*, efficient business practices create jobs in four ways:

1. Companies that use efficient processes (or that manufacture goods that are environmentally benign) create jobs outright.
2. Efficient and sustainable practices reduce material and energy consumption, which result in cost savings that make companies more financially secure and lead to an investment in job creating activities.
3. Efficient, sustainable business practices improve worker health, productivity, and security - which leads to greater employee comfort, increased productivity, and decreased sick time.
4. Efficient practices increase competitiveness and job growth (Claxton, 2005).

The University of Michigan is not alone in its research. Many of the managers I speak with say that on a local level employees who help their companies become more efficient are more likely to keep their jobs, not lose them. Equally as compelling is the notion that on a broader scale when the door to one industry closes another one usually opens in a replacement industry. The *Apollo Alliance* (a coalition of labor, environmental, civil rights, farm, religious, and business groups), for instance, has estimated that for every $100,000 spent on clean (efficient) energy practices approximately one job is created. That may not seem like much, but when one considers that efficient acts such as turning down thermostats one or two degrees could save American families $200 billion a year, that amount of money could, in theory, equate to two million jobs. The state of Massachusetts, for example, discovered that its new energy efficiency and renewable energy sectors created over 10,000 jobs. One $183 million efficiency program in particular generated 1,841 jobs – ten jobs for every million dollars saved. Jobs opened up in service sectors, in the retail trade, in manufacturing, in construction, in wholesale trade, and in other industries thanks to the knock-on

effect industries have on one another. An additional 431 jobs were created when the state reinvested the savings it made from energy efficiencies (MTC, 2005).

Furthermore, 'With the continued rise in energy costs, the payback period for efficiency projects is going down,' says Dave Led, energy engineer at the *Stora Enso* papermaking company in Biron, Wisconsin. 'It therefore makes sense for (companies like ours) to continue to reduce our energy consumption because it keeps us competitive and keeps jobs in Wisconsin.' (GreenBiz, 2005)

(See the report titled *Green Jobs: Towards Decent Work in a Low Carbon World*, World Watch Institute, 2008, which is available on the internet)

With statements like that being made it should come as no surprise that a number of far-sighted thinkers firmly believe that - with the advent of efficient practices - the world could be on the verge of a new industrial revolution (Gunther, 2007). In municipalities across the USA, for example, hundreds of thousands of jobs are being created (some estimates claim that the total number is over one million) in reuse, recycling, and remanufacturing programs (see Chapters 30 and 31). Within these regions whole communities are being encouraged to take a first step toward waste reduction by segregating disposed items into color-coded containers (e.g.: paper, plastic, aluminum, food waste, etc.). In other parts of the country, for every ten jobs lost in waste haulage and disposal, and every three jobs lost in timber harvesting, 100 more jobs are being created in recycling or remanufacturing. Keep in mind that these jobs are not about picking through garbage, but rather involve the reclamation of raw materials and components. In North Carolina, reuse and remanufacturing activities employ over 8,700 people. A survey of ten northeastern states discovered that end-of-use manufacturing employs 103,413 people and a 1992 study found that the state of Washington created 2,050 similar jobs over a three-year period. In California it has been estimated that 45,000 jobs will need to be filled to meet the state's 50-percent recycling goal and end-of-use remanufacturing processes in Iowa sustain over 23,000 jobs and generate $3.3 billion in industrial output - with the average managerial job paying a salary of $47,700 per year (ILSR, 2007). Meanwhile, in the private sector, it's been noted that manufacturers who recycle waste materials for computer reuse, textile reclamation, wood pallet repair, miscellaneous durable goods repair, paper

milling, glass production, plastics reprocessing, and material recovery employ 60 times more workers on a per ton basis than landfill sites.

So again, why do some industries lobby against efficient alternatives under the pretext that change will cause massive unemployment? Let's take a look at big coal, a heavily subsidized industry that champions - in what it says is a bid to protect mining jobs - the traditional use of its products rather than investing in cleaner, less wasteful alternatives. According to the *U.S. Bureau of the Census*, 55-percent of coal mining jobs were eliminated by coal companies between 1980 and 1994 despite the fact that coal output rose 25-percent during this same period. Put another way, long before newer, cleaner energy practices could be held to blame, coal companies were responsible for more job losses in the coal industry than any other factor (DeCanio, 1997). Depending on who is behind the capital, it appears that efficiency can be used to either hire people or fire them. Only recently has big coal seemed to acknowledge that its product can be used less wastefully as an energy source in fuel cells and other new technologies, yet time will tell how many more jobs the industry will lose because it's been fighting the wrong battles for years.

Subsidies

Sadly, stubbornness, corporate apathy, and lobbyists that don't think in the long-term aren't the only obstacles that stand in the way of efficiency, for if misguided corporate practices obscure the benefits of efficiency, sustainability, and waste reduction then government policy positively undermines it. In nearly every country on Earth, tax laws penalize what we want more of – jobs and income – while subsidizing what we want less of – resource depletion and pollution (see Chapter 20). Utility companies, for example, are regularly rewarded for selling more energy, more water, and more resources while being penalized for selling less, even if increased production costs more than improved customer efficiency. Equally as unsettling is that too many governments and businesses behave as if people are scarce and resources are abundant (the conditions that spurred the first industrial revolution) when a check of the world's disappearing fish stocks, forests, water supplies, and topsoil - not to mention our increasingly unstable climate - attest that conditions have changed dramatically over the past 200 years (Lovins, et al, 1999).

The Payoff

The bottom line is that *results in efficiency enjoyed by scores of companies around the world have led many researchers and practitioners to believe that it is highly probable for businesses in most nations to achieve up to 90 to 95-percent reductions in material and energy use* - with job creation - *without diminishing either the quantity or quality of the products and services that customers want to buy* (Hawken, et al, 1999).

This is not a new argument. At the turn of the last century, Henry Towne (President of the *American Society of Mechanical Engineers*) wrote in the foreword of *Shop Management* (a book written in 1911 by management pioneer Frederick Taylor), 'We are justifiably proud of the high wage rates which prevail throughout our country, and are jealous of any interference with them by the products of cheaper labor of other countries. To maintain this condition, to strengthen our control of home markets, and, above all, to broaden our opportunities in foreign markets where we must compete with the products of other industrial nations, we should welcome and encourage every influence tending to increase the efficiency of our productive processes.'

Apparently, Towne's words fell on deaf ears. Today, with our increasing technologies and ability to make vast improvements in speed and quantity, we seem to have created a rather arrogant age in which we feel we have nothing to learn from the past. For a species that continuously relives its mistakes, this is a disturbing trend. It's even more disconcerting when one takes into account that there's an increasing amount of evidence, which shows that efficiency goes far beyond the mere strengthening of business. Indeed, efficient measures may be just as crucial in protecting the safety and well-being of the foundation on which all business is based – the environment. Note that this does not mean that the Earth is about to collapse or that life as we know it may soon be wavering on the brink of extinction (although these scenarios certainly do have their proponents). More likely it means that unless action is soon taken, maintaining the current wasteful practices inherent in so many businesses is going to become very, *very* expensive.

Chapter 2

The Environmental Elephant in the Room

In the previous chapter the argument was made that efficiency and waste reduction are business issues that not only save money and make money, they also carry the potential to help reduce many of the world's current environmental problems. Unfortunately, few subjects, it seems, are as polarizing or provocative as those that attempt to explain the condition of the Earth's present situation. To some people our planet appears to be undergoing drastic changes. To others this is either not true or no big deal. Regardless of which side you're on, legendary investor Warren Buffet appears to nail the issue on the head when he says, 'Climate change is a problem that once it manifests itself it's a little too late to do something about. You really have to build the ark before the rain comes in this case' (Guerrera, 2007). What Mr. Buffet is referring to is only one aspect of environmental degradation: global warming - the belief that atmospheric temperatures are rising around the world and that, among other things, dire consequences due to shifting weather patterns will be (or are) the result.

To begin with, the Earth's atmosphere contains 40-percent more carbon dioxide today than it did at the start of the industrial age. This is not guesswork. Although carbon dioxide is odorless, tasteless, and invisible (which makes it as invidious as it is easy to ignore), its levels can be accurately measured by examining isotopes trapped in ice deposits that have been forming in the arctic for over 650,000 thousand years. Through the study of these deposits it has been revealed that in as little as 60 years carbon dioxide levels have increased far above that of any other time period. Perhaps more troubling is that temperature increases, which can also be accurately measured from ice deposits, have risen relatively proportionately. Today, over 90-percent of scientists looking into this matter (on an independent basis) agree that the two are related and that human activity is responsible for the current increase of carbon dioxide and other

greenhouse gases. Most of these same scientists also agree that the buildup of carbon dioxide is a result of the following five culprits:

- Electricity production,
- Heating,
- Transportation,
- Agriculture, and,
- Deforestation and Forest Degradation

To put the problem in perspective, keep in mind that only five degrees in average temperatures separates us from the last ice age. A few degrees in the other direction, therefore, may have an equally disastrous effect. No one is certain what that effect will be, but the warning signs have been evident for years. Property damage caused by natural disasters is rising an average of ten-percent per year due to shifts in weather patterns – a fact that underscores a recent report by the *Lloyd's of London* insurance company, which states that unless every insurance company starts to make better use of global warming predictions the entire industry could collapse (Vencat, 2007). In some parts of the world whole regions and lakes are drying up while in other areas catastrophic flooding is increasing. Just as unsettling, areas with once steady climates are experiencing drastic changes in temperature. One of the most in-depth weather studies to date recently revealed that the length of heat waves in Europe has doubled and their frequency has nearly tripled (Begley, 2007). This is not to be taken lightly, especially when one takes into account that heat waves, on average (particularly in developed countries), kill more people than any other form of natural disaster. Unfortunately, since the victims are usually poor and there's no catastrophic property damage for the media to fixate upon, heat waves don't generate the same attention as floods, earthquakes, and storms (Carlson, 2006). Meanwhile, the frequency of Atlantic hurricanes and tornadoes has doubled compared to the last century and snowpack, whose water is crucial to both cities and farms, is diminishing. These changes have already damaged several economies dependent on agriculture and have resulted in higher food prices, higher fuel costs, and higher insurance premiums. Between 1981 and 2002, for example, increasing cereal crop losses resulting from higher temperatures amounted to $5 billion (Walsh, 2007) and in 2007 Canada (the world's second biggest wheat producer)

recorded its smallest harvest ever as a result of drought. Across the Atlantic, European wheat production fell by 40-percent due to flooding rains the same year. Further north, ice caps and glaciers are melting at an unprecedented pace and the oceans appear to be both rising (low-lying islands are now slowly disappearing in the Pacific) and becoming more acidic (due to the absorption of CO2). Equally as worrying, open water was recently discovered at the North Pole for the very first time – a sign that warming trends could discharge tons of carbon and methane gas frozen in northern permafrost regions as well as the freezing sludge at the bottom of both poles (methane is 20 times more potent than carbon dioxide and nearly a third of the world's supply of these gases are trapped in permafrost soil).

Population Increases

After looking into the climate change issue in 2006, the UK government concluded that every ton of carbon dioxide created causes around $120 of economic damage and that the average person produces nine tons of CO2 per year through energy consumption alone. What makes these numbers particularly worrisome is that the world's population is multiplying. In 1950, the number of people on Earth amounted to around two billion. Today the number is six and a half billion. By 2050 this will increase to somewhere between eight and ten billion (currently, 10,000 people are born every hour) – all competing for the world's limited resources. Judging by our previous history, overpopulation will probably lead to more consumption and waste, a further deterioration of the Earth and its resources, and an escalation of toxins poured into the air, ground, and water. Traditionally, people have always been able to move to new habitats when old locations became unsuitable because of waste buildup or resource depletion, however, today there are fewer pristine places to which one can move. People now generate three times more garbage than they did in 1960 and natural resources are becoming scarcer. On average, most people generate 4.4 pounds (2 kilos) of garbage per day, an amount that is projected to rise to 4.8 pounds (2.2 kilos) in the near future (these numbers do not include waste trails explained in Chapter 28 and tabulated on page 6). The number of developing countries that are growing their economies to the same level enjoyed by those in the West (which they have every right to do) makes waste and carbon emissions even more

problematic. China, for example, is planning to open a new coal-fired power plant every week for the next six years and in Beijing 1,375 cars are added to the roads every day (Friedman, 2006). Indeed, according to a statement made by the British government in 2006, if the entire UK were to shut down and cease producing carbon emissions, the Chinese economy would make up the difference within two years. It isn't difficult to deduce that as the economy of China (and India, and a host of other nations) continues to grow, the amount of garbage, waste, and toxins added to the Earth's overloaded environment will soon reach extraordinarily higher levels than what we are seeing today.

Agriculture Woes

Obviously, an increasing human population means that more output is needed in food production. Yet according to agriculture researchers, one-third of the world's croplands are losing topsoil at a rate that nature can't replace (Hawken, et al, 1999). As a result, too much commercial agriculture, heavily dependent on chemicals, fertilizers, and pesticides, is either stagnating or experiencing diminishing returns. More to the point, many farmed areas are steadily requiring more input and effort to maintain their crop yields (see Chapter 39), which means more fertilizers and pesticides are being dumped onto soil that has, in many cases, been burned into a substance that resembles little more than chunks of dust. The chemicals then wash away into nearby streams and rivers. For example, off the Louisiana coast an area 7,000 square miles in diameter (11,265 sq. kilometers) is now completely dead due to the run off of nitrates that seep into the Mississippi River from farmlands. Meanwhile, to offset diminishing returns, more forests are being cleared to create larger crop fields and grazing land (the latter of which already takes up a quarter of the world's land). Add to this the fact that half of the world's range lands have deteriorated into desert, water tables have been falling for years, and the world's 18 major oceanic fisheries have either reached or exceeded maximum sustainable yields (Hart, 2005) and deterioration in food production could become even more problematic.

The livestock industry appears to be doing no better. Consider the 1,000 or more cattle penned in at the average factory farm and note that each beef cow (which requires 100 pounds of feed for every ten pounds [4.5 kilos] of beef it produces) generates the same amount of feces and urine as 16 adult humans. Moreover, animal waste tends to be 25 to 100 times more concentrated than

human waste and is laden with antibiotics to speed the growth of livestock - a practice widely believed to contribute to resistant strains of bacteria. The US *1997 Census of Agriculture* reported that the amount of animal waste produced by hogs, cattle, poultry, and sheep amounts to 220 billion gallons (833 billion liters) per year, enough to fill 330,000 Olympic-sized swimming pools -- too much for farmers to use on their fields as fertilizer without killing their crops (Knoblauch, 2007). Where is the excess waste put? Usually into specially created 'sewage lagoons', which, can be an accident waiting to happen. In 1995, for example, an eight-acre pig-waste lagoon in North Carolina broke its banks and spilled millions of gallons of waste into a nearby river killing ten million fish and closing down more than 300,000 acres of wetlands to shell fishing.

Disease, Toxins, and Health Problems

Recently, the *World Health Organization* concluded that because of our waste-producing lifestyles, our ability to travel, and climate change, infectious diseases are spreading faster than at any other time in history. For example, 39 new diseases (e.g.: SARS, Lyme disease, Ebola virus, Lassa fever, etc), most of which are life-threatening, have emerged onto the world stage since 1967. Furthermore, a 2001 survey of nearly 600 children found that perfluorooctanoic acid – a substance found in food wrap, Teflon, and stain-resistant fabric coatings – is swirling in the blood of 96-percent of the children it sampled (Zandonella, 2005). This substance is one of dozens of toxins now found as a matter of course in most human bodies (Kamrin, 2003). Traces of arsenic, mercury, and benzene also show up regularly alongside heavy metal compounds such as lead, cadmium, zinc, chromium, and copper. In river sediments and estuaries these substances are equally as ubiquitous. Increasing levels of polycyclic aromatic hydrocarbons (PAH's), polychlorinated biphenyls (PCB's), and pesticides merely add to the problem (each of which can take hundreds of years to degrade) (EPA, 2006). Residues from the billions of doses of prescription drugs humans consume are also being found along shorelines and in wetlands. Swallowed to combat cancer, pain, depression, and other ailments, most medications do not disappear into patients or animals where they harmlessly disappear. Instead, they work their way into the environment (Johns Hopkins University, 2002). Researchers in Canada, for example, found a dozen different toxic drugs in water samples taken from the St. Lawrence River in Quebec, while across the border a vast array of

pharmaceuticals (including antibiotics, anti-convulsants, mood stabilizers, and sex hormones) have been found in the drinking water supplies of 41 million Americans (Associated Press, 2008).

Life-threatening health dangers appear to be on the rise for plant and animal life as well. Some scientists believe there may be a link between an upsurge in animal viruses that used to be considered rare (e.g.: bird flu) and changes in global temperatures. Other diseases and parasites are ravaging trout stocks in Europe, decimating shellfish, and killing off plant species (Margolis, 2006). Further studies have revealed that chytridomycosis (a waterborne fungus) is wiping out the world's frog population - a worrying sign that the natural order of the world may be changing – and in North America alone, 25-percent to 35-percent of the continent's honeybees have disappeared (honeybees pollinate 30-percent of America's food crop and account for over $15 billion of its economy). One explanation as to why so many species are suffering or disappearing – apart from the stress induced by chemicals and pollution - is that environmental shifts are causing micro-predators to flourish faster than the species they prey upon can evolve natural defense mechanisms. As one environmentalist told me, 'We seem to forget that our actions, particularly when duplicated hundreds of millions of times, result in big consequences – and these consequences often appear quicker than we anticipate.' A few years ago, for example, it was predicted that one third of the world's population would lack access to clean water by the year 2025. That prediction came true 20 years early.

Economic Troubles

As early as 30 years ago it was deduced that an industrial system with open linear material flows (one that takes in materials and energy, creates products, and then throws most of what it creates away) probably cannot continue indefinitely (Frosch, 1997). Indeed, there is strong evidence to suggest that the $40 trillion world economy, which is based on a linear system, is in trouble (Palley, 2006). One aspect of the problem is that the current job market cannot grow fast enough to provide opportunities for the tens of millions of young people who wish to join the labor force every year – a situation that many believe will continue to contribute to violence and terrorism. In the meantime, the gap between rich and poor is widening at an alarming rate. Since 1960, the world's

wealthiest individuals have increased their control over global production by 15-percent (the rich currently control 85-percent of global GDP) while the poorest have lost more than half of the 2.3-percent share they once had. Today, large multi-national corporations account for a quarter of the world's global economic activity while employing less than one-percent of its labor force. Moreover, most of the world's profits are produced by focusing on only the top third of the global economic pyramid (i.e.: the richest consumers) leaving two-thirds of humanity out of the world's economic loop (Hart, 2005).

The Paid Doubters: A Well-Funded Force

Despite the accumulating evidence behind many of these unpleasant scenarios, a number of businesses, industry representatives, and government officials are determined that the world should carry on in a business-as-usual manner. For example, in August of 2007, *Newsweek* magazine reported that several 'conservative' think tanks sponsored by fossil fuel companies were offering scientists $10,000 to write articles that criticized climate change data and to reposition global warming as theory rather than fact. It was further reported that *ExxonMobil* has given at least $19 million to organizations like the *Competitive Enterprise Institute* to 'produce very questionable data' on climate change. A leaked memo from the *American Petroleum Institute* proposed a $5 million campaign to train up to 20 respected climate scientists for the purpose of 'raising questions about, and undercutting, the prevailing scientific wisdom (as well as) the Kyoto treaty's scientific underpinnings' so that elected officials 'will seek to prevent progress toward implementation'. In another example, the coal industry paid a university researcher $165,000 to produce a newsletter called *The World Climate Report*, a publication designed to cast doubt on mainstream climate science. Other organizations created and funded to protect the interests of polluters (many of which are given names suggesting that they're doing exactly the opposite) include the *Global Climate Coalition,* the *Marshall Institute*, and the *Information Council on the Environment* (Begley, 2007).

How do these folks gain attention against a rising tide of opposing data? For the most part, through 'change should be feared' tactics that use arguments constructed from 'top-down' economic models. In other words, the basis behind

many of the arguments these organizations make is that change is *always* and *only* an expense. In contrast, 'bottom-up' models take into account the added savings (and potential earnings) that competition, new practices, and new technologies can produce. For example, before the passage of the American *Clean Air Act Amendments* of 1990, 'top down' theorists predicted that meeting sulfur emission reduction targets would cost businesses $1,500 (or more) per ton of emissions (DeCanio, 1997). Instead, sulfur allowances traded at less than $100 per ton by 1996 and fell to $66 by 1999. Sulfur emissions subsequently dropped across the USA by 37-percent and electricity rates, which were predicted to rise to astronomical heights (power plants are one of the chief creators of sulfur pollution), *fell* by one-eighth. Ironically, the reason why the worst case scenarios of the top-down theorists never materialized was because by making waste more expensive the onus was put on power companies to become more efficient, more competitive, and more innovative – which they did.

Which Direction Will You Go?

While some people wish to argue or ignore the evidence behind environmental degradation (as well as the world's numerous other solvable problems), some companies are already changing the way they do business to cash in on it. Pharmaceutical companies, for example, are reportedly gearing up to profit from the resulting outbreak of diseases once kept in check by cooler temperatures. Shipping companies are also getting in on the act by exploring new ice-free routes through the arctic while farming interests are shifting north into the once barren areas of Siberia, Canada, and Alaska (Vencat, 2007). However, the recent recalls of cheap food products and toys around the world - many of which were designed to take advantage of short-term gains via cheap labor, cheap materials, and cheap production processes, suggest that long-term, more proactive business strategies might be more appropriate. Sustainable energy companies, for example, are popping up like mushrooms after a spring rain, cosmetics companies are testing new products that look better under energy-efficient CFL lighting, and some corporations have been breaking sales records by making products more efficient and more efficiently (ideally for remanufacturing purposes). Refurbished computers, construction equipment, and MRI scanners (all of which

cost around 60-percent less to remanufacture) are a case in point, but *General Electric*'s (GE) locomotive plant in Erie, Pennsylvania is used as an example here because its advantages seemingly defy conventional wisdom.

Despite the fact that several of *GE*'s best customers come from nations where the price of local locomotives is 30-percent cheaper, *GE* is able to sell its more expensive locomotives in developing countries because its locomotives are of high quality, they're more energy efficient, they emit very low levels of pollutants, and they have an unmatched record of reliability – all of which costs more. But a combination of lower operating costs, reduced energy needs, and extended product life – as well as less waste – means that *GE* locomotives are less expensive to operate in the long run as opposed to cheap, energy-consuming alternatives that have a shorter lifespan and require constant repairs (Friedman, 2007). Businesses that choose not to adapt their products and production processes in similar ways may find themselves facing increasing legislation that forces them to do so. For example, at one end of the scale, Australia has already banned most energy-wasting, incandescent light bulbs by the year 2010 (a move that is designed to save millions of dollars in energy costs and eliminate tons of CO2 emissions) and both Europe and the USA are poised to adopt similar legislation. More robust legislative examples include the European WEEE directive (*Waste Electric and Electronic Equipment*) that took effect on August 2005 (WEEE is designed to mitigate the incineration and dumping of electronic waste) and Europe's RoHS (the *Restriction of Hazardous Substances*), which went into effect in July 2006 (RoHS bans electronic equipment containing certain levels of cadmium, lead, mercury, and other toxic substances). Further European efficiency measures include the EUP directive (*Energy Using Products*) that took effect in August of 2007 (which requires producers to design and track products according to closed-loop waste reduction practices) and the up-and-coming REACH authorization (the directive on *Registration, Evaluation, and Authorization of Chemicals*), which requires manufacturers to publicly display toxicity data and to prove that the chemicals used to make products are safe. Foreign companies that wish to do business with the EU will thus have to change their products and production processes to meet with these directives or they may find themselves unable to penetrate a vast and profitable market (currently, one third of the world's electronics are sold in Europe).

Additional legislative moves, particularly in Germany and Japan, make many manufacturers legally responsible for their products *after* they're sold to promote reuse, recycling, and remanufacturing (see Chapters 30 and 31) and dozens more countries have initiated legislation to reduce, eliminate, or recycle packaging materials (see Chapter 29). Even the United States, which for a long time lagged behind most of the developed world in terms of reducing waste, is taking action at both state and local levels. New York City, for example, has made it mandatory that all taxis be hybrid vehicles by 2012 – a move that should save drivers over $1,000 per month in fuel costs while reducing tons of greenhouse gases – and few doubt that more environmental laws are on the way.

No matter how it's looked at, governments are slowly realizing that producing high levels of costly waste and pollutants does not equate with freedom nor is it a basic human right. For example, the *Securities and Exchange Commission* (SEC) was recently petitioned by representatives of several American states to force companies to reveal the actions they're taking to prepare for climate change (see Chapter 20). The belief is that investors should have the opportunity to avoid investing in companies that are ignoring the spiraling costs of waste and a changing environment.

Although it's true that many environmental laws do not have teeth at the moment, the bite is expected to come. One legislator explained it to me this way, 'Most environmental laws are passed in a weakened stage with the intention of strengthening them in the future. The idea is to get a toe through the door.' It's in this manner that paper, electronics, and other recyclable wastes are slowly being banned from landfill sites. In fact, regulations are tightening to such a degree that crimes against the environment committed by negligent company directors can now result in heavier fines (of over $1million) and jail time of up to ten years. In Europe, these crimes include:

- Discharge, emission, or introduction of a quantity of material, which causes death or serious injury
- Discharge, which causes or is likely to cause death or serious injury to any person or substantial damage to the quality of air, soil, water, animals, or plants

- Treatment, transport, export or import of hazardous waste, which causes or is likely to cause death or serious injury to any person or substantial damage
- Unlawful operation of a plant in which dangerous substances are stored or used, which causes or is likely to cause death or injury to any person or substantial damage to the air, soil, water, animals, and plants.
- Illegal shipment of waste
- Possession, taking, damaging, killing, or trading of protected wild flora and fauna
- Damage to a protected habitat
- Trade in or use of ozone-depleting substances (Harvey & Bounds, 2007)

There is a Better Way

According to Sir Nicholas Stern, former head of the UK government's *Economics Service*, the costs of taking action to combat climate change are much smaller than the costs of business-as-usual by a factor of between five and 20. In other words, companies that don't act now will pay dearly later. The *Intergovernmental Panel on Climate Change* (IPCC), set up under the auspices of the *United Nations*, recently concluded that collectively, the cost of reducing climate change will amount to between **.**12 percent and **.**3 percent of global GDP (IPCC, 2007). The challenge is that *everyone* must get involved. As most managers know, behavioral change on an individual level is difficult enough. On a global scale, change becomes infinitely more demanding. These changes include: (1) having businesses convert to efficient, sustainable, less wasteful practices, and, (2) reducing the ever-widening distance between industry and humanity (the wasting of people) by bringing into the fold the over four billion people on earth whose needs are currently not being met. Simply put, too many people don't know the value of the ecosystems and biodiversity that are being destroyed on our planet because it's virtually impossible to measure what these systems are worth. And that which is not easily measured is extremely difficult to manage effectively.

The good news (apart from the fact that the solutions to these challenges already exist), is that myriad opportunities, substantial cost savings, and greater

profits lie in wait for companies willing and able to embrace efficiency changes. It is therefore not difficult to deduce that developing countries, the entrepreneurial-minded, and those who understand the true purpose of management have an advantage in securing the benefits of efficiency because it's far better to become less wasteful now than to go the more costly route and have to re-design, re-tool, and re-think later *after* change becomes more expensive. Put another way, in all probability, businesses that heed the signs and adopt efficiency as their modus operandi stand a better chance of survival than those that do not.

Chapter 3

Back to Basics:
The Purpose of Management

Drawing on a study based upon 30 years of research and the input of millions of employees, author David Sirota (et al) explains in his book, *The Enthusiastic Employee*, that most employees, when they're hired, are excited, hopeful, ready to work, and eager to contribute to the business that has just hired them. Unfortunately, all too often something goes horribly wrong after work begins – and that something is usually management. According to the American *Bureau of Labor Statistics*, 74-percent of employees say that their boss treats them disrespectfully. Over half state that at one time or another their manager has publicly humiliated them. Added to this are the more than one million acts of workplace violence reported each year (Lorenz, 2005). Is it any wonder so many businesses fail to reach their full potential?

What is Management?

Since most employees will never work at a higher standard than that which is exhibited by their manager, perhaps the best way to present a rich and accurate concept of what management is (or should be) about is to look at what good managers do – or are *supposed* to do – in the course of a typical working day. Competent managers keep their organizations on track by ensuring that *everything* that's being done at work is ethically geared towards providing what customers want. In this regard, a good manager is responsible for reducing ambiguity, keeping costs down, eliminating waste, using resources wisely, and motivating employees to do the same. In the same vein, competent managers constantly streamline their organizations toward making a sale and take educated risks in doing so. These risks include trying new approaches, successfully adapting to change, developing subordinates, and improving their own managerial skills – each of which is crucial to the implementation of efficiency, sustainability, and waste reduction.

Since most managers are responsible for more work than one person can reasonably be expected to perform, a good manager must also delegate and integrate his or her work (and the work of others) by, in part, acting as a clear channel of communication within the business that he or she serves. Good management is about rising above the often monotonous grind of a working day and injecting motivation, creativity, discipline, and enthusiasm into areas where they either don't exist or they're not wanted. Management also entails doing difficult and time-consuming tasks most people don't want to do in order to get the results the company wants to achieve. And while all this is occurring, the ups and downs of life have to be dealt with. Again, I'm talking about good managers. These are the men and women who face their insecurities and problems, put in long hours, set a good example, and have an inherent knack to create something from nothing. In addition, good managers work well with others (including those they don't like) and they can be counted on to be honest and upstanding. Good managers concentrate on goals and results rather than showing who's boss because the creed they live by is *integrity, responsibility,* and *maturity*. That's not to say that good managers always score; they most certainly do not. However, when good managers don't succeed the first time, they pick themselves up, brush themselves off, learn from what happened, and then score. Put another way, good managers create value. They don't make excuses or blame others, they produce results.

Sound like a tall order? Well, it's not so high that it can't be reached. There are tens of thousands of good managers in this world quietly going about their work and performing admirably. The fact that most of these folks don't attract attention to themselves shows, in part, their acumen and the dedication they have for their craft. Good managers understand that their title isn't a rank it's a responsibility - and they more often than not let their work, and the work of others, speak for itself. Good managers don't need to be charlatans or showmen. Yes, a little bit of flashiness sometimes goes a long way in business; nevertheless prioritizing showmanship is not the hallmark of a competent manager.

So what constitutes bad management? According to too many downtrodden employees, bad managers are loud, insecure, overbearing bosses who spend obscene amounts of time reminding everyone that the boss is in charge, manage to instill fear instead of respect, disappear when the going gets

tough, and maintain the status quo when opportunities abound. At an administrative level, incompetent managers tend to see their profession as a game of acquisitions and mergers or act as though their task involves only numbers. Metaphorically speaking, being called a manager doesn't make someone a manager in the same manner that cooking dinner doesn't make someone a chef, penning a letter doesn't turn a writer into an author and going jogging doesn't make a person an athlete. On the whole, management is not a glamorous profession and placing the word 'manager' on a door or a business card isn't an invitation to a gold-encrusted club and a bottomless expense account. Most management positions, particularly those in small to mid-sized businesses, don't come with perks. A business's resources are best spent serving customers – not managers – and this involves rolling up one's sleeves and working with *everyone* in an organization to serve the needs of customers (see Chapter 7). Put more succinctly, management is not about the person carrying the title – it's about achieving results.

As a former manager, I often tell anyone who'll listen that although managing a business isn't the easiest thing to do in the world, many teachers and students try to make it as difficult as brain surgery. Certainly management, like many academic subjects, can be made as complicated as you wish, but the truth of the matter is that management needn't be complex, nor is it dry and boring. In most cases it's fascinating – or at least it should be. It's based on *doing* something – and who among us isn't intrigued by the tools, outcomes, implications, and emotions that are involved in being productive? Suffice it to say that management is a tough, relentless and time-consuming job that demands regular assessment, constant improvement and the ability to give more than is taken. And that, in essence, is what makes management so difficult to define – let alone do. The simple truth, says Don Simmons (a former pollution prevention who helped set policy for the EPA's *Pollution Prevention Office*), is that if you want your business to be less wasteful, you're going to need competent management.

Managerial Competencies

By most accounts, competency in management requires two sets of distinct, yet general skills often classified as:

General Management Skills, which include:

- *Conceptual Skills* - the ability to comprehend complex situations.
- *Interpersonal Skills* - the ability to work with, understand, and motivate other people.
- *Political Skills* - the ability to network as well as gain allies and gather power.
- *Technical Skills* - the ability to understand and apply specialized knowledge or expertise.

and *Specific Management Skills*, which involve:

- *Exercising Good Judgment* - the ability to plan and prepare for the future, respond to change, be held accountable, and stay focused on objectives.
- *Organizing and Coordinating* - the ability to organize tasks and interdependent relationships.
- *Handling Information* - using and communicating information.
- *Fostering Personal Growth and Development* – in terms of both the manager and his or her employees.
- *Handling Conflict* - understanding the importance of conflict (Katz, 1974).

Take a look at these two lists again. Note that the emphasis of being a competent manager is placed on what a manager can *do* rather than what a manager knows. Yes, having a particular expertise or skill is a precious commodity in most organizations, but good managers don't need to have a higher grade point average or more industrial experience than their subordinates. The ability to serve others, produce results, and get employees to do the same is what matters most. This is important to remember when introducing efficiency, sustainability, and waste reduction (or any other new practice for that matter) into a business because for many managers new practices are uncharted territory.

The 'Two Choices of Management' Theory

A common complaint voiced by managers who want to introduce efficiency into their workplaces is that the people who must either implement it or approve it are either apathetic or obstructive. The major obstacles to efficiency were discussed in Chapter 1 (see also *Pitching a Proposal*, page 115), however, a more fundamental issue may be the way management views its role in the efficiency process. In any business, most managerial decisions boil down to one of two choices. The first choice is to serve the business's customers. The second is to serve management. The *Two Choices of Management* can be illustrated as follows (see FIGURE 3-1):

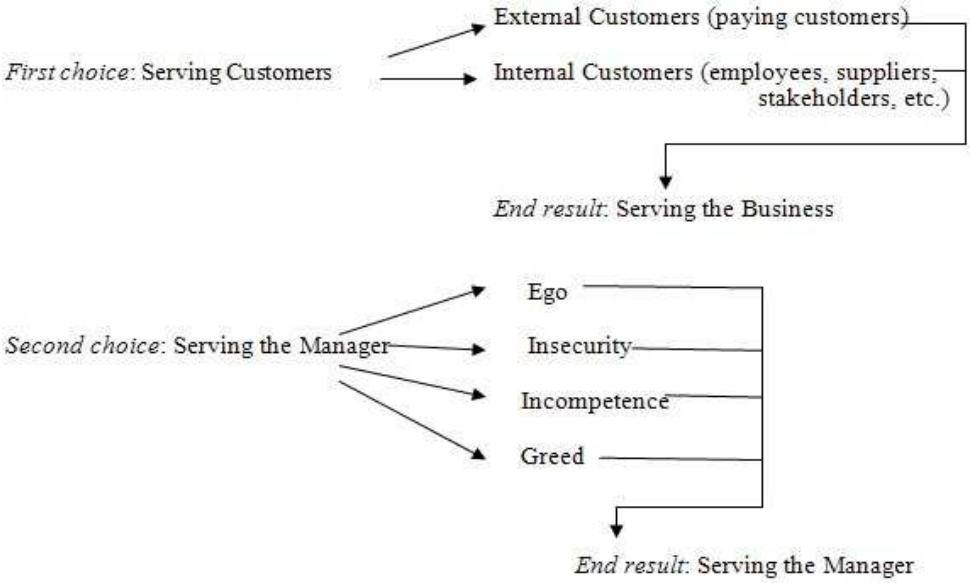


FIGURE 3-1. Scott's *Two Choices of Management* Theory

Serving *external* customers involves finding out what paying customers want (as well as how, when, and where they want it) and then moving heaven and earth to provide it (for a look at what most internal customers want, see Chapter 6). Serving *internal* customers (employees, suppliers, contractors, and other stakeholders) includes finding good people, educating (training) them, and giving them what they need so that they know the requirements of the business, the business knows their requirements, and the two can serve each other. Any other

decision on management's part merely serves managers (to discover what external customers want, see Chapter 7). For example, if an employee approaches a manager with a good waste reduction idea and the manager immediately says 'no', the manager may be serving his or her ego (few words show that one person has superiority over another more than the word 'no'). If the manager says 'no' because he or she is not sure if the idea will work, insecurity is probably to blame (a major part of a manager's job is to find out how or if new ideas *will* work). If the manager says 'no' because implementing the idea will involve additional work (as new practices often do in their initial stages), the manager is probably serving his or her incompetence. Lastly, if the manager says 'no' because the idea will allow someone else to shine, the manager's greed (or selfishness) is being served.

The Two Choices of Management: A Case Study

In the summer of 2005, a woman who had recently been named as the director of a large charity for children invited me to a dinner party at her home. Seated at the table was a long-time friend of hers, a man from a prominent family who owned a successful marketing firm. During the meal the man mentioned that he loved making donations. 'Whatever you need I'll be happy to provide it for free,' he said to the hostess. 'I love doing pro bono work for worthy causes.'

'No thank you,' the hostess replied, 'that's not the way we do things where I work.'

A moment of stunned silence followed. Here was a charity being offered tens of thousands of dollars worth of marketing expertise (possibly more) by a respected businessman, with no strings attached, yet the director of the charity was turning the offer down flat. Obviously, she was not serving the world's starving children (her customers) by refusing a major contribution of this kind. Make no mistake, she is a lovely person, highly intelligent, university educated, a joy to be around, and honest to a fault. Similarly, the donation she was offered was genuine and sincere. So why did she let her business and her customers down and what part of herself was she serving by doing so (greed, ego, insecurity, or incompetence)?

Knowing the hostess fairly well, it's safe to say that she is not a greedy person. Greed can therefore be eliminated as a motive. If she had said yes in

order to conduct an act of embezzlement or to seek unwarranted attention, than she would certainly be guilty of greed. Likewise, if she had said no to prevent someone else from taking credit for an idea, then her action could be interpreted as a greedy one, but this was not the case.

Was her ego responsible? Possibly. When making a decision, few words show power and authority faster than the word 'no'. Saying no immediately shows who is in charge, which, all-too-often is a quick and easy way to feed a hungry ego.

Is she incompetent? Many managers, when they don't know how to handle a situation, think that saying no eliminates the risk of making mistakes. The problem with this line of thinking, however, is that a manager's job is to learn how to do old things in new ways as well as to keep up with new technologies and explore new ways to serve customers better. So yes, incompetence may be part of the problem here.

Was my hostess insecure? She admitted during dinner that she was new to her job and she was having difficulty learning her new responsibilities. It's therefore a good guess that insecurity had something to do with her behavior. Insecure managers often say 'no' to untried suggestions because they're unsure of the outcome if they say yes. Saying no to a good idea also prevents having to do more work, which new ideas and suggestions almost always initiate.

Think about these choices in regards to the subject matter of this book. Because the breadth and depth of efficiency make it virtually impossible for one manager (or even a handful of managers) to conduct on their own, getting employees involved is not only crucial, it's often the difference between success or failure. More to the point, employees won't get fully involved if management has a history of serving itself.

Management's Greatest Nemesis: Ego

In his book, *How to Succeed in Business by Breaking All the Rules*, author Dan Kennedy tells an interesting story that describes just how dangerous and self-destructive self-serving managers can be. According to Kennedy, several years ago a *Fortune 500* corporation bought a profitable business and hired a consultant to investigate how the business could make even more money. The consultant duly finished his study and reported back to the corporation,

describing how disorganized, inefficient, and undisciplined he thought this highly successful company was. In particular, he described how the company's top salesman showed up some days at seven o'clock in the morning and other days at ten o'clock. This same man drank coffee after every call, wasted incredible amounts of time wandering around, and took long lunch breaks. What the consultant did not mention was that this employee was the highest producer in the business. He rarely lost a sale and his monthly sales average beat that of every other employee by four to one. Unfortunately, rather than investigate further, the *Fortune 500* administrators dutifully dispatched one of their top managers, a former military officer, to whip this man – and the entire successful company - into shape by barking orders, laying down the law, giving everyone strict new schedules to adhere to, and so on. As a result, the top salesperson left. Ninety days later, sales dropped by over one third. Shortly thereafter, the corporation was forced to sell its new acquisition for less than half of its original cost.

This story has two morals. The first is that by adhering to a traditional (misplaced) managerial style and focusing on exerting its will (i.e.: serving its ego) rather than producing results (i.e.: serving customers), management (and everyone else, for that matter) lost. The second moral is that new ideas, new policies, and new programs cannot be implemented until the people who must work with them *will* work with them. In other words, when management decides to begin a new program by reciting the old parental mantra 'Because I said so!' the result is usually the same as it is with children – resentment, foot-dragging, and defiance. As one well-seasoned manager told me, 95-percent of the time when an employee doesn't produce results the fault lies with management for: (1) hiring the wrong person, (2) not providing appropriate training, or, (3) not replacing the employee with a more competent individual when previous warning signs were evident.

Management Styles

For many managers, authority and power is wielded through trial and error. What worked well enough in the past is then used again. And again. The number of management styles that can produce results are probably too numerous to list, however, in 1993 acclaimed management researcher Charles Handy successfully classified six of the most common ones as follows:

1. *Force* is the crudest method of influencing others. It derives from pure authority and ranges from outright threats to bullying.
2. *Rules and Procedures*. Setting down concrete rules and guidelines is another time-honored way to control others and is often the favored method of bureaucracies.
3. *Exchange*. Bargaining, negotiating, cajoling, and bribery fall under this category. Promotions, pay increases (bonuses), rewards, and recognition are more subtle examples.
4. *Persuasion* is usually the first method of choice used by managers. In practice, however, it's usually contaminated by one of the other five methods.
5. *Ecology* is the use of environmental surroundings to exercise influence (see Chapter 18). This includes wielding power during troubled times. For example, the three most common ecological moments in business are widely thought to be: 1) when negotiating a contract, 2) during the first six months of employment, and, 3) during any moment of crisis.
6. *Magnetism* is achieved through personal charisma and involves cultivating followers. It is sometimes witnessed in its abuse stages by sales people, faith healers, and religious fundamentalists. .

So Which Style is Best… and When?

One of the biggest dilemmas managers face after deciding to become more efficient is when to use these styles (or a variant thereof) to produce results. Unfortunately, one size does not fit all. Successful solutions are relative to the people involved and the situation encountered. What works for one manager may or may not work for another. Equally, what works one day may not work the next. For example:

- Using *force or fear* may achieve immediate results, but the results could be short-lived or lead to high employee turnover (or even sabotage).
- *Rules and procedures* can effectively control behavior, but often drain a workplace of creativity, spontaneity, and morale.

- The *exchange* method can prove to be a good motivator, but what happens when everyone expects some type of reward in exchange for doing a task? The result can be expensive, time consuming, and produce a lack of respect for management.
- With excessive use of the *ecology* method, managers might be seen as opportunistic or conniving.
- As for *magnetism*, well, what a manager sees in the mirror and how others see him or her can often be quite different – and as the expression says, 'you can fool some of the people some of the time …but not all of the people all of the time.'

Good Management Brings Out, and Compliments, the Abilities of Others

Management theories tend to ebb and flow like tides, but one that I and many of the successful managers interviewed for this book have used to great effective is known by the acronym **MBWA** (**M**anagement **B**y **W**alking **A**round). The idea behind MBWA is simple: to reduce the distance between management and employees and strengthen relationships (and understanding) between the two. Just as the name suggests, MBWA demands that a manager gets out of his or her office to walk around the shop floor. As author Richard Pascale explains, the point is not to interfere with employees, but to draw management into reality (or, as Pascal puts it, *get grounded*). Too often management lives and operates within its own perceptions of what is right or wrong, rather than in what is real. The result manifests itself into various forms of misunderstanding, miscommunication, anger, and resentment. Yet when contact between a manager and an employee is strengthened, communication often improves. The result for the manager is a clearer understanding of what best motivates the employee. Conversely, the employee more clearly understands the motives behind the manager. MBWA also tends to reduce managerial arrogance while generating experience in influencing others. Additionally, it allows managers to see what's going on in their business without having it filtered by someone else – and if what is seen by management is far enough out of line with what was previously

believed, then managers will be forced to update their thinking. That's when progress is made. MBWA is not designed as a means of constantly looking over the shoulders of employees. The idea is to facilitate understanding, cohesiveness, communication, cooperation, and improvement – while gaining a better picture of the internal workings, character, and politics of the organization.

For example, the American retail giant *JCPenney*'s started an 'energy captain' program, which involved assigning a few employees to spend one or two hours a week finding ways to reduce electricity consumption in the stores where they worked. The program was kicked off by putting up notices and sending out e-mails asking for volunteers. One employee found a light switch hidden behind some shelves in a massive stockroom and simply switched it off at night – thereby slashing the store's energy consumption by 25-percent.

Meanwhile, at the *PepsiCo* research and development facility in Valhalla, NY requests for volunteers went largely unanswered until managers realized that e-mails and bulletin board notices weren't working. A more personal approach, however, involving face-to-face meetings that reflected management's enthusiasm for reducing energy use resulted in 5-percent of the workforce becoming interested and signing on (Nemes, 2008). Ultimately, a better understanding of workplace characteristics was the key to success.

Once Last Time: Management is about Service

Good managers produce results by focusing on two over-riding factors: (1) providing for the needs and wants of paying customers in terms of quality, costs, and service, and, (2) getting the most from employees. Management is not about showing everyone who is the boss, maintaining the status quo, or covering up (or ignoring) wasteful habits. Managers exist to ethically serve the needs of their customers[*], to motivate others, to reduce waste and costs, and to streamline their businesses toward making a sale. If these are not established as top priorities – and put into action - the desired benefits of efficiency and waste reduction will remain elusive. .

[*] To discover how servicing customers can directly benefit a manager by winning others over to the efficiency cause, see Chapter 11 and the section titled, 'Selling Efficiency, Sustainability, and Waste Reduction to Others'.

Chapter 4
Getting Started: Establishing Efficiency as an Objective

A common refrain heard from employees and managers in many organizations around the world is that they don't know the aims of the company in which they work and they have never been taught their employer's basic values and priorities - a situation that usually boils down to a lack of communication. Poor communication often results in employees not performing to the utmost of their ability and not pulling in the same direction.

According to successful waste reduction managers interviewed for this book, the first step in achieving the benefits of efficiency is to establish its concepts as objectives - with the help of employees - and to effectively communicate them to all concerned.

Goal Setting

The practice of setting objectives *and* communicating them has its roots firmly entrenched in *Goal-Setting*, a theory formulated in 1968. Goal-setting forms the basis of many modern management techniques by making three important claims:

1) specific goals increase performance more than ambiguous goals,
2) difficult goals, when accepted, result in a higher performance level than easy goals, and,
3) providing good feedback produces more results than not saying anything (Locke, 1968).

Over the years a number of intellectuals have taken this tried-and-tested concept (Peter Drucker being among the most notable), added to it, and re-named it *Management by Objectives* (MBO). The basic idea, however, remains the same: people work better: (1) when they know *exactly* what it is they're supposed to be doing, (2) when they've been told (and have accepted) what is expected of

them, and, (3) they're provided with regular real-time feedback. In this respect, management by objectives helps provide a guiding star for employees to follow while at the same time conveying guidelines that help explain how the company's objectives are to be achieved. In addition, by building in real-time feedback, employees can determine exactly where they are in relation to these goals as well as how much time has been allocated to achieve them.

Ensuring that Proper Goals and Objectives are Established

Before establishing a set of objectives, every business must first size up its people. *Dow Chemical*, for example, when establishing its efficiency objectives, could boast support from the company's CEO as well as shop floor workers, clients, suppliers and, in some cases, community activists. Excluding input from any one of these groups was seen as asking for trouble – something the *Monsanto* corporation discovered only too well several years ago.

During the 1990's, the *Monsanto* corporation (which many people credit with inventing 'Agent Orange' and PCB's) developed a bold new vision of providing sustainable agricultural products that could resist pests and diseases without the use of chemicals. The company's objective was to aid the environment and provide a level playing field for poor farmers around the world who could not afford high-end technology as well as the latest fertilizers and pesticides. This seemed to be an admirable and reasonable objective from the viewpoint of the business's administrators, however, the company began developing genetically modified seeds to achieve its aims without first asking its customers what they thought about this practice. The resulting violent reaction against *Monsanto* and its genetically modified products shook the GM industry to the core, caused the company's stock price to collapse, forced its CEO to step down, and ended with the company being merged with another. In other words, by giving its customers what it *thought* they wanted instead of asking what they actually wanted, *Monsanto* set off in the wrong direction and suffered for it (Economist, 2002 & Bohan, 1999).

Four Steps to Achieving Workable Objectives

Before objectives can be put into practice be prepared to do some writing. Writing down objectives achieves four important aims. (1) It conveys and

explains relevant information. (2) It helps the organization clarify what is being written about. (3) It reflects seriousness on the part of the organization, and, (4) it holds people accountable. When a business cuts corners by not bothering to discuss and write down its objectives, it makes it that much easier for employees (and management) to ignore or dismiss what the company hopes to achieve.

Step 1: Create a Vision

In business terms, the word vision is usually so clouded in hyperbole that it's often misinterpreted as being synonymous with predicting the future. A good business vision, however, has nothing to do with a crystal ball. Rather, a vision is a simple, articulate, and highly motivating means of uniting employees with purpose and direction by describing how the future *should* be. This does not pertain to pie-in-the-sky dreams or financial goals ('*We will lower costs 14% by next quarter*' – or – '*Our aim is to increase sales by 8%*'). Instead, visions tend to move hearts and minds. For example, Dr. Martin Luther King, one of the world's greatest speakers and humanitarians, once said, 'I have a dream that my four children will one day live in a nation where they will not be judged by the color of their skin, but by the content of their character.' Note that he did *not* say, 'I would like to see a future in which 32-percent of our nation's representatives are people of color'. Instead, Dr. King relayed how he thought the future *should* be in a way that most people could understand - through the love they have for their children. That's vision.

Today, a growing number of companies are establishing their own vision in terms of efficiency and a reduction in environmental degradation. In London, England, for example, *HSBC Holdings PLC* decided to motivate its customers by becoming a carbon neutral business. *Reckitt Benckiser*, a British manufacturer of household goods has developed similar plans. And in the USA, the *Bradley Corporation*, a manufacturer of commercial washroom fixtures, proclaimed a more efficient production vision years ago, which led to its products becoming 'environmental solutions instead of environmental problems'. Organizations like these believe that a commitment to efficiency not only reduces waste, pollutants, and costs, it also promotes responsibility and respect - attributes that attract paying customers and help create an inspiring vision for employees to fulfill.

Step 2: Decide on a Mission

After a clear vision has been formulated, the next step is to articulate it with a concise 'mission statement' that employees and customers can identify and rally behind. A mission statement individualizes a business by declaring its purpose and uniqueness. Most mission statements share four common traits:

1. they set tough, but obtainable, standards,
2. they relay basic beliefs, values, and priorities,
3. they are measurable, and,
4. they clearly explain what business the company is in.

A mission statement can be as long as a page or two in length or as short as a single sentence proclaiming that a main competitor will be surpassed in two years. Either way, mission statements should avoid generic blurbs (e.g.: '*we will be even less wasteful*' or '*our mission is to reduce waste…*'). In place of these uninspiring ambiguities, a sharp and clear message should be adopted. *Ben & Jerry's Ice Cream*, for example, announces in its mission statement that it's dedicated 'to make, distribute, and sell the finest all-natural ice cream… with a continued commitment to incorporate wholesome, natural ingredients and promote business practices that respect the Earth and its environment.' The statement goes on to recognize that 'by definition the manufacturing of products creates waste' -- an acknowledgement that helps to further draw out and articulate the character and direction of the business:

- '(Our company's goal is) to sustain financial and profitable growth (while) increasing value for stakeholders and expanding opportunities for employee development and career growth, (in addition, we intend…)
- to strive toward minimizing our negative impact on the environment, and,
- to support sustainable and safe methods of food production that reduce environmental degradation, maintain the productivity of the land over time, and support the economic viability of farms and rural communities.'

Step 3: Break the Mission Statement Down into *Achievable* Objectives

Objectives are blueprints for achieving a mission. They incorporate concepts of time and measurement (i.e.: we will reduce production waste by 60-

percent within nine months and energy consumption by 25-percent in six months…), address financial and non-financial issues, and are more concrete and action-oriented. If, for example, a business wants to incorporate this book's definition of efficiency as part of its mission…

(a) doing more with less,
(b) reducing waste (obtaining 100% of purchases and investments), and,
(c) re-using outputs.

…the business may discover that to achieve these goals it must provide additional training for its employees, replace its current raw materials with recyclable materials, ask its suppliers to utilize sustainable methods in their production processes, recycle waste sent to landfill, invest in clean energy, replace old, inefficient equipment and machinery, redesign products so they can be easily taken apart and remanufactured, and so on. By encouraging the input of every department and employee, the options open to the business will become more apparent. This is why mission statements and objectives often take weeks (or months) to devise.

Step 4: Formulate Strategies to Achieve Objectives

Once a firm set of objectives has been decided upon, the next step is to identify short-term goals for unit, departmental, or individual use. Keep in mind that all goals must contain a timeline to avoid procrastination. Some form of measurement to ensure that progress is being made must also be determined. Practical solutions for achieving goals can be as diverse as redesigning work processes, replacing toxins with less hazardous alternatives, investing in new equipment, hiring an expert, forming specialized teams whose job is to formulate suggestions, establishing new reward incentives… or a host of other *workable* suggestions. Again, tapping into the workforce to obtain its input is crucial because the involvement of others builds motivation and commitment and often yields more ideas and solutions. For example, in one of the businesses surveyed for this book, a factory worker was approached and asked if he had any ideas that would improve the efficiency of his workplace. The worker immediately suggested moving two machines closer together so that one person could operate them both, thereby freeing up a second worker to focus on other tasks. Hearing

this, the shop foreman expressed surprise that the worker hadn't spoken up earlier. 'No one asked me earlier,' the worker replied.

The MBO Process (Simplified)

Once again, the main point of MBO is to eliminate ambiguity. Only when clarity and direction have been established can employees understand what they are expected to do. Essentially, the entire MBO process can be condensed as follows:

- Identify and discuss the organization's goals and direction. (i.e.: vision and mission)
- Break the organization down into units or departments. What is it that everyone in these units is supposed to be doing in relation to the company's goals?
- Together with employees, establish *specific* goals for each unit and person - including quantity and quality expectations for every task. Remember, goals must be challenging, but achievable.
- Prioritize the goals. Employees may need help placing them in the company's preferential order.
- Clearly state a realistic deadline for goal completion. Like the old saying says, without a time line, goals are nothing more than dreams.
- Build in feedback mechanisms so employees know exactly how they are doing.
- Ensure an appropriate reward system is linked to results (Robbins & Hunsacker, 1996).

Is It Really as Simple as That?

Well, no, obviously there is a bit more to it than that, but when one considers that too many organizations, (1) place a wall between management, non-management, and customers, (2) don't take the time to *fully* train employees, (3) don't do much of anything in regards to educating employees in a company's overall goals, (4) are satisfied when employees simply maintain the status quo, and, (5) provide little or no feedback during an employee's workday – the value of managing by objectives becomes more apparent.

Warning! Panaceas Don't Exist

Although many managers swear by the effectiveness of managing by objectives, like most business theories, MBO does have its drawbacks. For example, goals that are set without customer input can start a company off in the wrong direction (as the *Monsanto* case study showed). In addition, goals can sometimes be seen as a ceiling rather than a floor (i.e.: once targets have been met employees may stop performing). Just as important, setting objectives that are too demanding can encourage employees to cheat.

But perhaps the greatest weakness in management by objectives is that an emphasis can be all-to-easily placed on quantity rather than quality. For these reasons, Peter Drucker, one of MBO's main proponents, considered managing by objectives to be more of a philosophy rather than a rigid system of rules and procedures. According to Drucker, remaining flexible and keeping communication pathways open with customers, employees, suppliers, and other stakeholders is the best way to avoid ineffective or problematic goals and objectives.

Chapter 5

Mapping the Efficiency Process

Trying to eliminate waste in an organization without first conducting some form of reconnaissance is comparable to hacking one's way through a jungle without a map. Put another way (as one efficiency practitioner explained it), without in-depth knowledge of what you're looking at and what you want to do, trying to find wasteful practices is akin to wandering around in circles pointing out superficialities. For this reason, many efficiency experts advocate creating a *process map* (also known as a *process flow chart*) to help lay the application foundation. Process maps have been around for a long time. Although ancient Egyptians are credited with developing the first ones, efficiency pioneer Frank Gilbreth presented a more modern version in 1921 during a talk given to the *American Society of Mechanical Engineers* (Lee, 2007).

A process map is a step-by-step analysis – much like a storyboard - that graphically describes and illustrates all the inter-linking tasks, inputs, efforts, and outputs involved in creating a product or service. A good process map also displays the amount of time required to complete each task. Almost any production setup or work process in any organizational setting can benefit from being mapped and examined including factory assembly lines, farm work, offices, schools, and food production. When done correctly, a process map usually reveals astonishing facts and figures about consumption and waste. Following are typical subject areas a process map can document:

- *Raw materials* (including the amounts of whatever is needed to harvest, process, and ship these materials)
- *Manufacturing processes* (including manpower needs, material use, energy use, and waste creation)
- *Time factors* (the amount of time it takes to conduct tasks)
- *Packaging requirements* (the amount of paper, plastic, styrofoam, and other materials being consumed)

- *Transport needs* (the amount of energy used to shift materials from one place to another)
- *Maintenance* (the chemicals, energy, and water needed to use, maintain, and/or clean whatever it is that is being produced)
- *Use and Disposal methods* (a description of how the product is thrown away as well as the costs involved) (ESSP CLP, 2007).

Because gathering and mapping an organization's production activities requires much effort and is usually more far-reaching than originally envisioned, obtaining the input and opinions of the many different people who perform the activities being mapped is a good idea (see Chapter 10: *Managing Teams*). Schedule several weeks to ensure that a thorough job is done. Henri Miller, a famous American painter and novelist, once said that *in this age, which believes that there is a shortcut to everything, the greatest lesson to be learned is that the most difficult way is, in the long run, usually the easiest*. Keep Miller's words in mind when mapping a production process. For example, not long ago the *Nestle* corporation launched a massive initiative called GLOBE (**Glo**bal **B**usiness **E**xcellence) to help reveal and share its best practices among different branches as well as to standardize data and create a shared IT platform. 'Process mapping was vital to the program's success,' a *Nestle* employee told me, 'because we needed to identify the most productive processes from different areas and distribute them across the company.' After several weeks of concerted effort, *Nestle* discovered over 1,000 efficient practices, which were subsequently used to reduce data errors by 60-percent. $20 million in extraneous costs were cut in the process, which helped streamline work activities and boosted market share in some regions by as much as five-percent. Meanwhile, *ST Microelectronics* pledged to be carbon neutral by 2010 and, in a mapping drive to figure out how, went from being the 12th largest microchip manufacturer in the world to the 6th.

Laying the Groundwork

Don't worry if you or your employees have no experience putting together a process map. Practice makes perfect. Experienced practitioners suggest using post-it notes to start the process. Displaying work processes on post-it notes make it easy to move around and add new information. Again,

remember to obtain input from as many people as possible. You're bound to miss something if you go it alone. Figure 5.1 (below) shows how the mapping process can start with a rudimentary overview of a seven-stage manufacturing process:

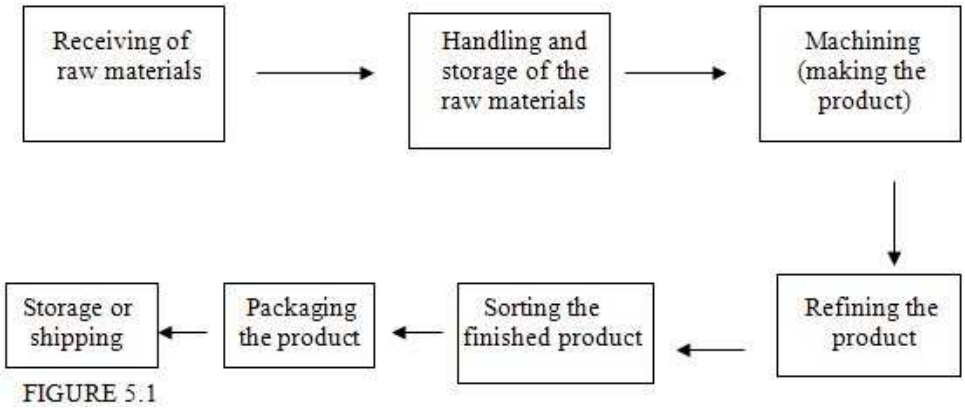


FIGURE 5.1

Analyzing Every Stage of Production

Once every major stage of production has been laid out, break the stages down into subtasks for further analysis. List and describe every activity undertaken in the order that it occurs along with the time it takes to perform each activity. Examine how these activities impact one another and measure and record the amount and costs of *every* input and output (see Figure 5.2). When finished, everything should be questioned in a bid to reduce waste. Nothing should be seen as trivial. For example, one of my undergraduate students visited a packaging company to conduct his waste reduction research and discovered that the company used mobile phones to communicate with employees in different parts of the plant. A quick search on the Internet revealed that the company's mobile phones could easily be replaced with cheaper walkie-talkies, which would drastically cut the business's internal phone bills. 'Everyone stopped laughing at my waste reduction suggestions after that,' the student told me.

Accurately measuring and recording all inputs and outputs is essential (see Chapter 19). Accurate measurement includes weighing or counting (in terms of units or financial amounts) how much is consumed as well as how much is produced and wasted. Without this type of measurement it's impossible to determine if progress is being made or if cost savings have been achieved.

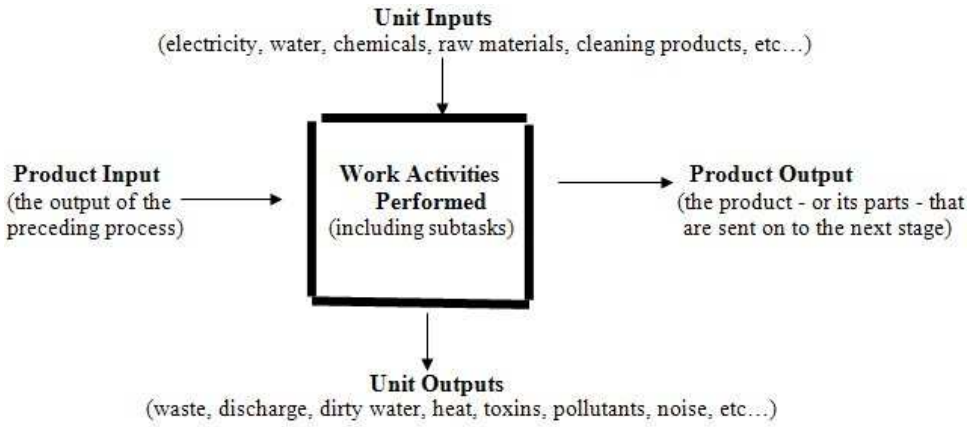


FIGURE 5.2

Examples of waste measurement devices include: utility and fuel bills, the number of trash bags the business fills daily (placing similar items of garbage into separate containers makes this process easier), water consumption figures, raw material use, and so on.

One of the most effective ways to measure (and appreciate) the amount of physical waste a department or business disposes is to 'dumpster dive' (i.e.: collect and examine what is being thrown away). 'Once you've seen your garbage up close its hard to ignore it,' says Shira Norman, a research consultant with *YRG Sustainability*. The *Bentley Prince Street* carpet company agrees. For over 12 years BPS managers have forced employees to record what they toss in the trash by sifting through company rubbish (a different department is selected every month). Doing so makes it easy to determine what can be changed, reused, re-incorporated back into production processes, or sold to a recycler. For example, the company now only orders snacks from vending machine suppliers that take back their packaging (Nemes, 2009). Every little bit helps.

Keep It Simple

Ironically, the term 'process mapping' is not normally used by waste reduction practitioners when they describe the activity of investigating and recording inputs and outputs of work processes – and perhaps a quick examination of the reams of information on process maps is enough to explain why. In the hands of academics and consultants process mapping can become

extremely complex, the results of which often look foreign to the uninitiated. 'We just study our utility bills and look in our garbage bins to see the amounts of waste being produced,' a sustainability practitioner explained to me, 'then we make a note where it comes from. We don't make maps.' When I suggested that collecting waste data, determining its origins, and recording it (to make improvements) is indeed a form of process mapping, he (and several others) conceded. The message? Don't overload your waste-reduction process map with symbols, technical jargon, or other markings that render it incomprehensible. Keep it simple. No business will profit from a map that only a handful of employees understand.

Time Analysis

As stated previously, process maps can also be used to identify wasted time. For maximum results, time should be classified into two categories: *lead time* and *processing time*. *Processing time* is the amount of time it takes for employees to perform an assigned task within each process unit before repeating it. *Lead time*, which is defined as the amount of time required for a product (or its material) to move through each unit or task from start to finish, is measured from the end of one unit or task process to the end of the next and includes queues, waiting periods, *and* processing time. By making a distinction between lead time and processing time it's easier to determine units of time that are under an employee's control and those that are not (see Chapter 12).

Calculating Carbon Footprints

Calculating a 'carbon footprint' (i.e.: the amount of carbon dioxide a process creates) or an 'environmental footprint' (which includes measuring every negative environmental outcome produced by a business) is a trendy way to measure the amount of waste a business produces. Here's how to begin. On average, one kilowatt-hour of electricity produces approximately 15 ounces (422 grams) of carbon dioxide into the atmosphere while one kilowatt-hour of natural gas releases seven ounces (194 grams) of CO2. Find out how much energy the electrical equipment in your business consumes (read the label on the back of each item), or look over your utility bills, and use the numbers to estimate the

amount of carbon dioxide being produced. Employees often enjoy seeing how their efforts help the environment so displaying carbon emission measurements as they drop can create a strong sense of achievement. For more information about carbon footprints and their calculation start by using the following free carbon calculators at these websites (for maximum results use a combination of different sites and different measurements methods):

www.carbonneutral.com
http://actonco2.direct.gov.uk
www.puretrust.org.uk/Business/Calculator.aspx

Using the Map to Make Improvements

After your process map has been completed, study it and determine where and how to eliminate, simplify, or reduce inefficient activities and waste. Don't lose sight of the fact that if one department, one operation, or one task remains inefficient then the entire business is compromised. Once again, it must be stressed that whenever possible the input of every employee should be actively sought and considered. I was once employed by an organization that made a very costly mistake because the owner didn't tell his employees about a major purchasing decision he had made. Only after it was too late did he discover that one part-time employee (the cleaner), who held years of experience in a crucial area, could have saved the business lots of money (not to mention months of unnecessary construction work) if he had just been asked. Don't make the same mistake. Use the following five efficiency fundamentals (and their accompanying sample questions) to help challenge your employees:

1. *In every work system, the whole system, along with each and every process that makes up that system, must be analyzed, questioned, and streamlined in terms of waste and cost reduction*. The biggest mistake businesses make is in assuming that current processes, production setups, and equipment is operating at 100-percent efficiency when nothing could be further from the truth. Just because something works doesn't mean it's efficient. Questions that need to be answered include, but are not limited to:

   - Is every activity necessary?

  - Can certain systems or steps be reduced or combined?
  - What steps or activities can be eliminated?
- Where does the electricity we use come from? Is there an alternative?
- What is the most efficient mode of transporting our people, products, and raw materials?
- Is there another supplier that is cleaner and/or geographically closer to us?
- Can shipment numbers be reduced? (bulk transport)
- Can the amount of packaging we use be reduced?

2. *In every work process the right steps should be taken at the right time and in the right order*. Look at the way information, people, and materials flow through the business. Does every stage follow a logical order?

   - Are some units producing too much or too little, thereby creating waiting periods and bottlenecks?
   - Are tools, people, and materials criss-crossing the shop floor in a time-consuming manner?
   - Are machines placed in the right order to minimize material-carrying distances and processes?

3. *Whenever possible (and appropriate), low-energy, non-toxic, recyclable, and/or biodegradable materials and or equipment should be used in place of toxic, virgin, and/or non-degradable materials or equipment*. Doing so opens the door to reuse, recycling, and/or remanufacturing, which reduces raw material needs, cuts waste, and increases product life. Keep in mind that using natural materials is not as straightforward as it may seem (see Chapter 28). For instance, switching from petroleum-based raw materials to agricultural-based materials may sound like a good idea, but is it really? The cotton for a single pair of denim jeans, for example, requires three-quarters of a pound (one-third of a kilogram) of fertilizers and pesticides and over three tons of water to produce. Likewise, replacing incandescent light bulbs with energy efficient alternatives saves money, but most energy efficient bulbs also contain mercury, which means they can't be thrown in the trash once they reach the end of their product life (reduced-mercury bulbs should

therefore be sought). With these complexities in mind, the following questions can help clarify and improve upon the negative impact of your products:

- How are the raw materials we use extracted, grown, processed, and shipped?
- What systems or materials can we change in order to reduce waste?
- Can another business's outputs be used in place of the raw materials we use?
- How much are the toxic chemicals and process we use really costing us?
- Can our chemicals and solvents be replaced with cleaner and safer alternatives?
- For our transportation and delivery needs can we use 'greener' vehicles?

4. *All inputs and outputs should be measured in terms of long-term gains rather than short-term savings*. The refusal or inability to think ahead greatly contributes to inefficiency. Many real-life examples can be used to illustrate this point, but my favorite concerns a time analysis that was performed at a laundry service in the UK. Research revealed that a defective laundry chute caused employees to repeatedly pick up clothing that landed on the floor. This took six to ten seconds to perform and was done over 30 times per day, which meant that over 50 hours a year were being wasted – all because no one wanted to take the time to reposition the laundry chute. Questions that can help root out similar insane practices include:

- How can our systems and practices be modified and streamlined?
- How much water, electricity, chemicals, etc is required to run our machinery?
- Are more efficient machines available that will reduce our energy and material *inputs*?
- Are efficient machines available that will reduce wasted *outputs*?
- Can our product(s) be redesigned to eliminate one or more stages of production?
- Can our tools and equipment be used in a way that makes them last longer?
- Can we save by using higher quality, longer-lasting equipment?
- Can our products be made more modular or multi-functional?
- Can the components or sub-components of our products be standardized?

- Can the components of our products be designed for reuse in other products or systems?

5. *Efficiency is an unending process*. After every system has been improved it's time to start over again. Waste and inefficiencies *will* be found that were missed the first time around. A deeper understanding of your supply chain will be obtained. There is no finish line. Questions to ponder include:

   - How can we motivate employees so they'll continue to make improvements?
   - What policies, strategies, and systems do we have in place regarding the environment and sustainability?
   - What incentives will get customers to return products s after they have been used so we can cannibalize them for future production purposes?
   - How can our initial improvements be improved upon?
   - Who has the expertise to help us go further?

The Long Road

By now the size, scope, and scale of the work needed to obtain long-term gains in efficiency should be apparent. Niccolo Machiavelli, an Italian renaissance figure best known for his treatise *The Prince*, once wrote, 'there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success than to take the lead in the introduction of a new order of things'. Seen in this context, the successful implementation of efficiency requires welcoming – and adapting to – change, getting the most from employees, understanding the importance of customers, and creating productive teams. Put another way, no business can become efficient if its people aren't fully behind its efforts.

Chapter 6

Leadership: the Often Missing Ingredient

A recent survey of over 1,000 employees in the UK public and private business sectors revealed that despite a clear understanding of the steps needed to adopt more environmentally friendly practices (which lead to greater efficiency), most business leaders were not providing the leadership necessary to put such practices into action. 52-percent of employees said that they could be encouraged to reduce waste at work if their employer 'led by example'. 62-percent said their employer offered no incentives whatsoever for them to change inefficient work habits. 49-percent believed that the organizations they worked for wasted too much electricity; 45-percent believed that some sort of program should be put into place to save resources and materials; and 37-percent stated that they would like more training on how to be more environmentally friendly. Most astonishing, 94-percent of those surveyed admitted that at home they performed basic efficiency measures while at work they did not (Logicalis, 2007). Employees, it seems, are crying out for leadership.

Leadership vs. Management

Leadership is a notoriously difficult concept to grasp, although this is probably not due to a lack of information on the subject. Most bookshops are literally bursting with material on what it takes to be a leader. What makes this subject difficult to pin down is that virtually everyone has an opinion about what constitutes *effectiveness* - and ultimately, being effective is what makes a leader. Add to this the too many people out there who seem to find no shame in calling themselves leaders and the concept becomes even more difficult to define.

For the most part, leading appears to involve motivating people as well as building commitment toward a set goal. How does that compare with management? Management, it can be said, is about coping with complexity, bringing about order, being consistent, and rendering a profit by drawing up and

successfully implementing plans and structures – then measuring them. Leadership, on the other hand, is about coping with change, establishing a vision, effectively communicating it, and inspiring others to work toward it. Put more succinctly, *things* are managed – *people* are led. Indeed, one of the more important aspects of leadership is that it doesn't occur unless others are willing to follow.

Much evidence suggests that most business leaders generally fall into two categories: those that place an emphasis on a *concern for task* (getting a job done by strictly meeting work objectives), or those that focus on a *concern for people* (getting things done via relationships and the consideration of others). Which is the most effective? In practice, good leaders probably combine both categories – using whichever method appears most suitable and constructive in the situation encountered at the time (more about this later).

Leadership: Abilities and Actions

Beauty is in the eye of the beholder, suggests an old saying – and the same, it seems, can be said about leadership. Indeed, one of the greatest determinants of leadership appears to be hindsight. For example, American presidents Abraham Lincoln and Harry Truman are often recognized as effective leaders, yet in their time they were widely derided. Conversely, the administration of George W. Bush and Dick Cheney, which is now almost universally regarded as being grossly incompetent and self-serving, was once seen by many Americans as beyond reproach. Clearly, a rush to judgment, emotion, politics, public relations (spin), and a disregard of common sense often factor heavily when awarding leadership status. The attributes below however, are somewhat more substantive when determining the characteristics of a leader:

Abilities (traits that lay the foundation for successful leadership)

- *Above average drive* – having initiative, high energy and a strong appetite for achievement.
- *Motivation* – a desire to lead and influence others.
- *Integrity* – honesty in dealing with others and consistency with words and deeds.

- *Self-confidence* – being naturally decisive and confident with personal abilities.
- *Intelligence* – able to gather, integrate, and interpret complex information.
- *Vision* – a clear understanding of current situations and how the future should be.
- *Flexibility* – being willing and able to adapt to changes (Kirkpatrick & Locke, 1991).

Actions (results-producing leadership methods that speak volumes)

- *Excellent communication abilities* – the ability to convey clear, short, understandable messages.
- *A willingness to make sacrifices and/or display personal risk* – being in the midst of the everyday realities faced by others.
- *The exhibiting of extraordinary behavior* - for example, being quiet while others shout or shouting while others are quiet, or similarly, doing the right thing when everyone else is doing the wrong thing.
- *Instigating change* – being seen to lead change rather than have change lead you.
- *Showing sensitivity* – displaying an awareness of the needs and wants of others.
- *A willingness to be reliable and responsible 24/7* - remaining on-call and responsible at all times.
- *Handling adversity with grace* – remaining calm, professional, and polite under pressure.

Are You a Leader?

Some managers believe that being placed in a decision-making role automatically makes them a great leader. Here is an exercise I give my students to counter that belief. It never fails to make an impact.

A few years ago, a female physician (Dr. Jerri Nielsen) volunteered to be the medical officer for a research facility in the Antarctic. This facility is situated in an extremely remote area that only accommodates a few dozen scientists at a

time. Because of the extreme cold (which has been deemed 'searing') there are only a handful of weeks out of the year when a plane can land, pick-up, or unload passengers and deliver supplies. At all other times of the year aircraft fuel becomes gelatinous because of the cold. In other words, once someone commits to this project they're stuck there for a full year.

Shortly after winter set in, Dr. Nielsen discovered that she had a virulent form of breast cancer. Taking into account her surrounding resources, she sat down with her colleagues and discussed the tasks each would have to perform in order for her to survive. One person would have to perform the surgery (incredibly, during the operation Dr. Nielsen remained awake and told this person what to do *while it was being done*). Another person who knew how to work with chemicals had to learn to administer chemotherapy. Still others came up with a means to transmit pictures of blood and tissue samples to outside medical experts via a jury-rigged digital camera, a mobile phone, and a satellite hook-up.

Thankfully, the story has a happy ending. Dr. Nielsen survived her ordeal and was eventually airlifted out in an heroic rescue attempt weeks later. Needless to say, she learned many important lessons along the way. Here's the leadership decision I ask my students to make: Place the following list of people in the order of their importance to an Antarctic research station.

- Manager (the person responsible for instilling a purpose, motivation, teamwork, and cooperation)
- Chemist (the person who understands how chemicals work)
- Doctor (the person entrusted with saving lives)
- Researcher (the individuals who look into and dissect problems)
- Scientist (the person who conducts experiments and gathers data)
- Mechanic (the person who fixes equipment)

Most people choose the doctor or manager as being the most important employee in this exercise, but from her experiences, Dr. Nielsen identified the mechanic as the most essential person in the lot. Why? In the Antarctic, a good leader knows that the environment is the greatest enemy. And although each person in a scientific team is fully expected to pull his or her own weight, if something were to happen to the electrical generators *or* the community's heating

system *everyone* would be dead in less than 48 hours unless a mechanic was available to fix the problem.

Dr. Nielsen went on to explain in her book (*Icebound: A Doctor's Incredible Battle for Survival at the South Pole*), that she also came to appreciate the sometimes conflicting inter-relation between type 'A' personalities (bold, energetic, up-front, risk-taking, decision-making types) who turned into caged tigers during the Antarctic's dark months – and the quiet, type 'B' personalities who exhibit patience, silence, caring, and pragmatism. Although the former are often heralded, it's the latter who take the time to sit with others, listen to their needs, and patiently provide training during the periods when it's needed most.

Coming to Grips with Leadership Theory

Among the dozens of tomes that try to explain leadership (one or two actually suggest that the loss of a parent is contributory), several come to similar conclusions. Note that most of these theories have their roots firmly entrenched in the 'concern for task' versus 'concern for people' categories mentioned previously.

- *Fiedler's Contingency Model* states that good leadership depends on matching or changing appropriate leadership styles (*concern for task* or *concern for relationships*) with the proper situation or best 'fit' ('best fit' being a situation that requires the attributes of the most appropriate leadership style).
- The *Hersey-Blanchard Situational Theory* suggests that successful leaders should adjust their styles (delegatory, participatory, persuasive, or forceful) depending on how ready and willing others are prepared to follow as well as what they respond to best.
- *House's Path-Goal Theory* says that an effective leader is one who allows people to achieve their own task-related and/or personal goals (i.e.: the leader helps set goals, removes the barriers to these goals, allows people to get on with achieving the goals, and then provides rewards).
- *Blake's Leadership Grid* splits leadership into a grid with the axis marked 'concern for people' and 'concern for production'. Leadership styles are then

drawn accordingly with leaders who show a very high regard for both people *and* production (task) being the most effective.

- The *Vroom-Jago Leader Participation Theory* is designed to help leaders choose a decision-making method for solving problems. For example, with an *authority decision*, the leader makes the decision. With a *consultative decision*, the leader consults others and then decides. With a *group decision*, both the leader and his or her followers participate and decide.

Drucker's Three Essentials of Leadership

Over the decades, one of the more down to earth management writers has been Peter Drucker. Here is what Drucker (1988) said constitutes leadership:

1. *Defining, communicating and establishing a sense of mission in a way that's understandable to others.* This involves clearly establishing an organization's direction, priorities, and standards and then simply and effectively communicating them. Put differently, a leader is someone who, in the midst of chaos or the mundane, is a trumpet that sounds a clear note.

2. *Treating leadership as a responsibility rather than a rank.* Good leaders accept their weaknesses and surround themselves with talented people. They aren't afraid to develop strong and capable subordinates and they don't blame others when things go wrong. Curiously, although effective leaders don't normally treat people similarly (they tend to have 'favorites'), they do not appear unfair when doing so.

3. *Earning and maintaining the trust of others.* Effective leaders display above-average levels of integrity and perseverance and often put aside their own interests to help enable others. For example, former Chairman of the American Joint Chiefs of Staff, General Colin Powel, once said, the day soldiers stop bringing you their problems is the day you've stopped leading them. This is a sobering realization when one considers that leadership is also about what happens in a business when a leader is away or otherwise not available (see Chapter 22).

The conclusion? Few, if any, leadership discourses mention winning-at-all-costs, dishonesty, or ruthlessness as a measure of leadership. Rather, in a statement that suggests most organizations are over managed, under led, and too public-relations oriented, Drucker suggests that effective leadership is based on being ethical and consistent in word and deed. Other experts say that good leaders do no pretend to be someone else. Instead, they're amplified versions of themselves. They know their weaknesses and strengths and have learned how to apply them appropriately (i.e.: *concern for task* versus *concern for people*). For example, a type-A leader might find that leading a waste reduction program by issuing directives may not suit the leadership needs of competent employees who want to chart their own course. Therefore, with competent employees, it may be best to exhibit more B-type characteristics. Again, the idea is to match the attributes of the leader with the needs of employees.

Leadership, Hype and the Human Element

Without doubt, most great leaders have a dark side. Equally as true is that how someone thinks he or she leads can be very different from how others see that person leading. Therefore, both the strengths and shortcomings of a person must be taken into consideration before he or she is tapped for a leadership position. Just because someone has succeeded in one leadership role it doesn't mean they'll succeed in another. Consider the following two examples:

1. Legendary manager Soichiro Honda, apart from reportedly liking a drink or two (or three), had a reputation for losing his temper over shoddy workmanship and hitting the responsible employee over the head with the nearest tool he could find. Yet he was also renowned for allowing workers to speak their minds (even if what they had to say was unpleasant) and for listening to what they said.
2. Winston Churchill was notorious for making big mistakes early in his career (his involvement in the WWI Gallipoli massacre being just one). He was also renowned for being sour and cruel to his subordinates and he had a remarkable propensity to burst into tears. Despite his notoriety, however, he was one of the few people in his day who understood that winning a war involves fighting and suffering losses. Ironically, just

> about everyone who put up with his surliness professed a love for the man (probably because he instilled them with a sense of genuine purpose). Nevertheless, immediately after he led the saving of the free world, voters threw him out of office -- not because they were ungrateful, but because they felt he wasn't sensitive enough to their needs after they had made so many sacrifices.

It can't be overstated: good business leaders fully understand *concern for task* versus *concern for people* situations and learn to apply their leadership qualities accordingly. Put another way, a good business leader is someone who knows what motivates his or her employees (a carrot or a stick) and who uses that knowledge to take all employees further than they would ever go on their own. More recent research data suggests that in addition to the aforementioned attributes and skills listed on pages 61 and 62, most good business leaders possess above-average amounts of:

- *Self-awareness*: good leaders know (and admit to) their strengths, weaknesses, goals, and aspirations.
- *Personal conviction*: an unwavering commitment to beliefs, ethical behavior, and values.
- *Courage*: the ability to act on beliefs – especially when those beliefs are questioned.
- *Creativity*: the ability to think out of the box and on one's feet.
- *Curiosity*: a desire to regularly ask questions and try new things.
- *The ability to inspire*: the patience and dedication to earn the trust and commitment of others.
- *The ability to listen*: understanding and acting upon what others say.
- *The ability to innovate*: knowing the difference between maintaining the status quo and change.
- *An eagerness to experience new situations and reflect on what has been learned*: not always racing forward, but taking the time to pause and think about what is happening (Bisoux, 2005 citing Pearce, 2003).

So, After All is Said and Done, What Exactly is Leadership?

Being the head of a business or project does not automatically make one a leader. Leadership involves movement; both mental and physical, which consists of going beyond babysitting (i.e.: keeping things as they are), doing good deeds, doing what's best for all concerned, thinking in the long-term, admitting mistakes, and being both human and larger-then-life at the same time. More specifically, it requires a deep dislike of the status quo. 'True leaders are teachable,' says billionaire entrepreneur Jon Huntsman, who goes on to explain that great leaders carry a continuous desire to listen and learn (Bisoux, 2005).

With such a heady mixture of conflicting traits and styles – not to mention the polarized interpretations of followers – perhaps it's not so surprising that the concept of leadership continues to baffle many. 'I may not know how to define it,' an American Supreme Court Justice reportedly once said, when grappling with a difficult subject, 'but I know it when I see it.'

Bibliography

Ahuja, Gautam, 'Does It Pay To Be Green? An Empirical Examination of the Relationship Between Pollution Prevention and Firm Performance,' (appearing in) *Business Strategy and the Environment*, John Wiley & Sons, Volume 5, Issue 1, March 1996, pp. 30-37.

Associated Press and CBS News, 'Probe: Pharmaceuticals in Drinking Water', www.cbsnews.com, March 10, 2008.

Ayres, R. U., 'Toxic Heavy Metals: Materials Cycle Optimization', *Proc. National Academy of Science*, vol. 89, pp. 815-820, February 1992.

BC Hydro, 'Power Smart Success Stories', www.bchydro.com/business/success/story, 2007.

Begley, Sharon, 'Global Warming Deniers: A Well-Funded Machine', *Newsweek*, August 13, 2007.

Bisoux, Tricia, 'What Makes Leaders Great?', *BizEd* magazine, pp. 40-45, September/October 2005.

Blake, Robert, & McCanse, Anne, *Leadership Dilemmas – Grid Solutions*, Gulf Publishing, Houston, 1991.

Bohan, Peter, 'EU Biotech Storm Plants Few Seeds', Reuters News Service (Chicago), April 22, 1999.

Brocks, Emma, 'What a Dump', *The Guardian*, Tuesday May 21, 2002.

Carlson, Ann, 'Heat Waves, Global Warming & Mitigation', *Issues in Legal Scholarship*, May 2006.

Claxton, Gregory, 'Sustainable Strategies for Economic Development', *Urban & Regional Planning Economic Development Handbook* (University of Michigan – Taubman College of Architecture and Urban Planning, www.umich.edu/~econdev/susdev , March 22, 2005.

Cushman, J.H., 'Industries Plan for Credits in Emissions Pact', *New York Times*, 1:1, Jan. 3, 1999.

DeCanio, Stephan, J., 'The Economics of Climate Change', published by *Redefining Progress*, San Francisco, Cal, 1997 (data taken from the U.S. Bureau of the Census, 1997, table 654).

Drucker, Peter, 'Leadership: More Doing than Dash', *The Wall Street Journal*, January 6, 1988, p. 16.

The Economist, 'Genetically Modified Company', August 15, 2002. (Posted on Ag Bio View: www.biotech-info.net/GMO_company.html)

Energy Star, www.energystar.gov, 'Success Stories', accessed April 2007.

EPA (Environmental Protection Agency), *Volunteer Estuary Monitoring: A Methods manual* (2nd Edition), Chapter 12, EPA-842-B-06-003, March 2006.

ESSP CLP, 'Product Stewardship Through Life-Cycle Analysis', *Introduction to Sustainable Development for Engineering and Built Environments*, www.naturaledgeproject.net/ESSPCLP-Intro, 2007.

Fiedler, F. E., 'Time Based Measures of Leadership Experience and Organizational Performance', *Leadership Quarterly, Spring*, 1992, pp.5-10.

Friedman, Thomas L., *The World is Flat*, Penguin Books Ltd., London, 2006.

Frosch, Robert, 'Closing the Loop on Waste Materials', *The Industrial Green Game*, National Academy Press, 1997, pp. 37-47.

GreenBiz, 'Stora Enso, Biron Facility: Energy Efficiency', www.greenbizleaders.com, 2005.

Guerrera, Francesco, 'Warren Buffeted by His Critics, but Wins the Day,' *Financial Times*, Section B, pg. 19, May 7, 2007.

Gunther, Marc, 'The End of Garbage,' www.cnnmoney.com , March 14 , 2007.

Handy, Charles, *Understanding the Organization*, Penguin Books Ltd., London, 1993.

Hart, Stuart, *Capitalism at the Crossroads*, Wharton School Publishing, 2005.

Harvey, Fiona & Bounds, Andrew, 'Regulatory Regime Put to the Test at Borders', *Financial Times*, Section A, pg. 3, Feb. 7, 2007.

Hawken, Paul & Lovins, Amory & Lovins, Hunter, *Natural Capital*, Little Brown and Company, Boston, 1999.

Hersey. P, & Blanchard, K. H., *Management of Organizational Behavior*, Prentice-Hall, Englewood Cliffs, NJ, 1988.

Hoover's Handbook of World Business, Hoover's Business Press, Austin (Texas & Oxford (England), 2000.

House, R., (Goal Path Theory): see Huber, G.P., 'A Theory of Effects of Advanced Information Technologies on Organizational Design, Intelligence, and Decision Making', *Academy of Management Review*, vol. 15, 1990, pp.67-73.

IOM (Institute of Medicine), 'Sustainable Business, Economy, and Health – A Case Study', *Rebuilding the Unity of Health and the Environment: A New Vision of Environmental Health for the 21st Century*, The National Academies Press, Washington, DC, 2001.

IPCC, Fourth Assessment Report (AR4), May 2007.

Johns Hopkins University, 'Prescription Drug Pollution May Harm Humans, Aquatic Life', *Science Daily*, www.sciencedaily.com, April 11, 2002.

Kamrin, Michael, *Traces of Environmental Chemicals in the Human Body*, (prepared for) The American Council on Science and Health, May 2003.

Katz, R. L., 'Skills of an Effective Administrator', *Harvard Business Review*, September-October 1974, pp. 90-102.

Kennedy, Dan, *How to Succeed in Business by Breaking All the Rules*, Dutton Publishing, New York, 1997.

Kirkpatrick, Shirley, & Locke, Edwin, 'Leadership: Do Traits Matter?', *Academy of Management Executive*, vol. 5, May 1991, pp. 48-60.

Knobluach, Jessica, '*Have It Your (the Sustainable) Way*', EJ Magazine (University of Michigan), pp. 28-30, Spring 2007.

Kolesnikov-Jessop, Sonia, 'Companies Save Money through Waste Reduction', *International Herald Tribune*, Wednesday, June 4 2008, www.iht.com.

Lee, Quarterman, *Value Stream and Process Mapping*, Enna Inc., New York, 2007.

Locke, E. A., 'Toward a Theory of Task Motivation and Incentives', *Organizational Behavior and Human Performance*, May 1968, pp. 157-89.

Locke, E. A. & Shaw, K. N. & Saari, L. M. & Latham, G. P., 'Goal Setting and Task performance', *Psychological Bulletin*, January 1981, pp. 125-152.

Logicalis, 'Lack of Incentives Prevent Employees Going Green at Work', *News_Greenatwork*, www.logicalis.com , January 15, 2007.

Lorenz, Kate, 'Desperate Co-Workers; True Tales of Office Animosity', www.careerbuilder.com/Custom/MSN/CareerAdvice, 21 March 2005.

Lovins, Amory & Lovins, L. Hunter & Hawken, Paul, 'A Road Map for Natural Capitalism,' *Harvard Business Review*, May-June 1999, pp. 145-158.

Lovins, L. Hunter & Lovins, Amory, *How Not to Parachute Cats*, Rocky Mountain Institute, 1996.

Margolis, Mac, 'Why the Frogs are Dying', *Newsweek International*, www.msnbc.com, Oct. 16, 2006.

Mass Transit Mag, 'Recycle Media Solves Sticky Problem of Chewing Gum Litter with 5-Year Deal Worth $26.6 Million', www.masstransitmag.com (online article page), April 2007.

MTC (Massachusetts Technology Collaborative), 'Energy Efficiency, Renewable Energy, and Jobs in Massachusetts', The Renewable Energy Trust, November 2005.

Mulisch, Hans-Martin, *Municipal Environmental management: A Guideline for Decision-Makers in Municipalities*, Heinrich-Boll-Stiftung, Potsdam, pg. 9, 2005.

Nemes, Judith, 'Leading from the Middle: The Power of the Green Champion', www.greenbiz.com, October 13, 2008.

Nemes, Judith, 'Dumpster Diving: From Garbage to Gold', www.greenbiz.com, January 12, 2009.

Nielsen, J., and Vollers, M., *Icebound: A Doctor's Incredible Battle for Survival at the South Pole*, Hyperion, NY, 2001.

OECD, (The Organization for Economic Cooperation and Development), Paris, France, 2005.

Palley, Thomas, 'A New Development Paradigm: Domestic Demand-Led Growth', *Foreign Policy in Focus*, www.fpif.org/papers, September 2006.

Pascale, Richard T., *Managing on the Edge*, Penguin Books, New York, 1991.

Pearce, Terry, *Leading Out Loud*, Jossey-Bass, San Francisco, 2003.

Robbins, S. P., & Hunsacker, P., L., *Training in Interpersonal Skills* (2nd Edition), Prentice Hall, Upper Saddle River, New Jersey, 1996.

Scott, Jonathan T., *The Concise Handbook of Management*, Haworth Press, New York, 2005.

Sirota, David & Mischkind, Louise A. & Meltzer, Irwin, *The Enthusiastic Employee: How Companies Profit by Giving Workers What They Want*, Wharton School Publishing (Pearson Education, NJ), 2005.

Stern, Nicholas, *The Stern Review on the Economics of Climate Change*, (Working paper 12741), December 2006.

Vencat, Emily, 'Climate Change and the Economy', *Newsweek International*, www.msnbc.msn.com, April 16, 2007.

Vromm, V.H., & Jago, A. G., *The New Leadership*, Prentice-Hall, Englewood Cliffs, NJ, 1988.

Walsh, Bryan, 'Global Warming's Next Victim: Wheat', *Time Magazine* (online edition), www.time.com/time/printout/0,8816,1656570,00html, August 27, 2007.

Wolfe, Martin, 'In Spite of Economic Skeptics, It is Worth Reducing Climate Risk', *Financial Times*, Section A, pg. 13, Feb. 7, 2007.

Zandonella, Catherine, 'Airborne Toxins', *National Geographic* (*The Green Guide 109*), www.thegreenguide.com/doc/109/toxin, July/August 2005.

PEOPLE

Efficiency is not a technological issue. At its core, it's a behavioral issue and as such it is dependent upon teamwork, cooperation, and motivation to instill. For waste reduction practices to take root and produce results, every employee (whether he or she is a cleaner, a production line worker, or an administrator) must contribute to the efficiency process. No matter what level or experience employees have, each has the potential to discover something that no one else can spot. Just as important, every employee has the ability to add that final jolt of effort that brings about success. Actively including every employee in all phases of the efficiency process is therefore necessary to ensure that a thorough and combined attack on all fronts is made because employees are a business's ultimate competitive advantage.

Chapter 7
Understanding the Importance of Customers

To understand how important customers are in regards to efficiency, it's first necessary to define the word 'customer'. According to Oakland (1993), a customer *is everyone that an organization serves*. Look carefully at this definition because it includes everyone involved in the running of a business - not just the people whose money is taken in exchange for a product or service, but also the people who serve these folks. Equally as important is that all customer transactions are a two-way exchange. For example, every paying customer wants something from the business that he or she frequents (e.g.: a product or service) and every business wants something from paying customers in return (e.g.: money). Similarly, every employee wants something from the business he or she serves (e.g.: wages, training, respect) and every business wants something back from its employees (e.g.: skill, labor, loyalty, etc). This two-way, give-and-take service scenario allows the word 'customer' to be classified into two categories:

- *External Customers*: the people that exchange money for a product or service, and,
- *Internal Customers*: the individuals that are employed by, that use, or who rely on the work of others within an organization to perform their responsibilities (including employees, suppliers, contractors, shareholders, the community where the business is located, and other stakeholders).

Business 101

Lesson #1: The reason why *external customers* are important is because the money they exchange for goods and services pays all the business's expenses (rent, salaries, insurance, equipment, supplies, taxes, bills, pensions, medical plans, and so on).

Lesson #2: The reason why *internal customers* are important is because without them business cannot take place. Equally as significant, how internal customers are treated has a direct bearing on the way external customers are treated. Simply put, the ultimate responsibility of every person in a business is to serve everyone else. No one is too busy to help and no one should be left out of the loop.

Lip Service vs. Customer Service

As important as external and internal customers are to every business, the irony is that it doesn't take fancy schemes or expenses to win them over. Usually what external and internal customers crave most is the human element – acknowledgement, respect, a smile, a listening ear, politeness, and honesty. Gimmicks, slogans, or the latest trendy business theory rarely amount to much when attracting or retaining customers. Think of your own experiences as either an internal or external customer. How many times have you been subjected to rudeness, glued-on grins, unhappy repetitive responses, lies, or a general uncaring, lackluster, or patronizing attitude?

What is it that causes so many otherwise intelligent people to lose sight of the fact that to make money and survive a business must focus on the needs, wants, and desires of its customers? Perhaps this rather astonishing oversight can be attributed to *sensory adaptation* -- the human body's inclination to eventually ignore the constant stimulus of clothes, eyeglasses, wristwatches, contact lenses, smells, and the so many other things we get used to and forget are there - until they're gone.

What is Good Customer Service?

Customer service begins with good ethics and includes common etiquette, always telling the truth, sincere attempts at quality, and *giving immediate attention*. Put another way, good customer service starts before a customer steps foot in your business and it continues long afterwards. No customer, internal or external, should be abandoned, or be made to feel abandoned before, during, or after a business encounter. Managers and employees that don't memorize and practice this simple truth need to do so until

it becomes second nature because cultivating, delighting, and retaining customers (both internal and external) is as crucial to success as it is never-ending (Scott, 2005). Statistics show that it can take five to seven years to establish an external customer base. Finding and educating good internal customers (employees) can be equally as difficult and time consuming (not to mention expensive if employees keep being lured away by companies that treat them better). Clearly, in any business, winning over customers (both internal and external) is not only a necessity, it's an on-going process that requires constant fine-tuning and attention.

Back to Basics: The Ten Commandments of Business Success

One of the better ways to understand the importance of customers is the '10 Customer Commandments'. The origins of this list can be traced back to Mahatma Gandhi who reportedly taught them to his law clerks. Think of each in relation to internal and external customers:

1. Customers are the most important people in our business
2. Customers are not dependent on us – we are dependent on them
3. Customers are not to argue or match wits with
4. Customers brings us their needs – it is our job to fill those needs
5. Customers are not an interruption of work – they are the purpose of it
6. Customers do us a favor when they call – we do not do them a favor by serving them
7. Customers are part of our business – they are not outsiders
8. Customers deserve the most courteous and attentive treatment we can give them
9. Customers are the individuals who make it possible to pay our wages
10. Customers are the lifeblood of this and every other business

Efficiency, Going Green, and External Customers

To some customers, the word 'green' translates into greater expenses, questionable quality, and out-of-the-mainstream thinking ('green' or 'going green' is defined as *moves or measures that reduce or eliminate negative impacts on the environment*). To a growing crowd of business people, however, 'green'

means geo-strategic, geo-economic, being capitalistic, and patriotic (Friedman, 2007). Small wonder then that with the value of green markets estimated to be worth around $600 billion (CNBC, 2007), more businesses (and governments) are awakening to the power of green. *Wal-Mart*, for example, recently introduced green versions of several of its products across the USA to gauge customer reaction. The conclusion? Consumers are indeed 'embracing products that help the environment' (Wal-Mart, 2007). Such findings should not come as a surprise. The food industry has known about this trend for years and has predicted 20-percent increases in organic food sales well into the future. The *National Association of Home Builders* is also aware of what's going on and is expecting green building construction to grow from $7.4 billion to $38 billion by 2010 (Beck, 2006). Obviously, this is good news for businesses seeking to become more efficient. The crux of a manager's job is therefore to find out exactly what external customers want in terms of 'green' and to learn how these wants can be capitalized upon. Just as importantly, careful attention should be paid to every aspect of the manufacturing, distribution, and promotion of green products because going green is not a guaranteed ride to success. Indeed, early findings suggest that the following issues (from *GreenBiz.com*) should be thoroughly researched when a business decides to become greener:

- *Keep prices down*. Does going green automatically translate into higher costs? Unfortunately, there's no definitive answer to that question. Some people think the answer is yes, however, many of the extra costs associated with going green (if there are any) can be offset by making production processes more efficient (see Chapters 28-31 and 33-39). Going green can also reduce the specialized expenses associated with toxic or hazardous production processes such as specialized transport requirements, health and safety costs, specialized equipment needs, and expensive waste disposal bills.
- *Focus on quality*. Many successful green business practitioners suggest that the overall quality of a green product should be improved before announcing its virtues. In other words, improve the reasons why customers purchase the product rather than hoping that 'greening' it will make it more appealing.
- *Incorporate new green products into a traditional product line*. By adding a green alternative alongside traditional product lines it becomes easier to enter

the green market, learn the needs of consumers, overcome mistakes, and gather information and ideas for further improvements.

- *Make small changes first*. Many consumers still believe that environmentally safe products don't work as well as conventional products. This is largely a legacy of the 1970's when such charges were usually true. To offset this hangover, some organizations advocate being modest when announcing greenness and to refrain from announcing any green intentions until after an improvement in quality has been detected by consumers.
- *Be upbeat*. Avoid doom-and-gloom messages in green product advertising. Most consumers are turned off by negative messages and, as rule, respond better to positive messages.
- *Seek out a green accreditation*. More and more government agencies, consumer organizations, and environmental groups are issuing certifications to bolster the credentials of products that claim to be green. Examples include *Energy Star* (which rates the energy efficiency of electrical appliances and equipment), the *Leadership in Energy and Environmental Design* (LEED) ranking system (which evaluates efficiency in terms of building performance), and other valid certifications that denote the use of non-toxic raw materials and production methods for maximum recyclability. Beware, however! Some accreditations are nothing more than smokescreens or marketing gimmicks so be certain the one you choose is valid.
- *Green the place where your product is sold*. Remember the California store mentioned in Chapter 1? *Vic's Market* cut its annual energy bills by $48,000 after adopting several basic efficiency practices. An added bonus, however, was an increase in sales due to brighter, energy efficient lighting and the covering of food freezers with glass doors, which made interior temperatures more comfortable. As a result, customers shopped longer. Elsewhere, retail giant *Wal-Mart* fitted half of one of its stores in Lawrence, Kansas with energy efficient skylights and the other half with fluorescent lights – then watched with astonishment as sales rose substantially on the naturally lit side (Romm & Browning, 1994). The moral of the story is that efficiency not only reduces costs, it can also lead to increased sales. See Chapters 23-26 for further details on how an efficient workplace or sales center can increase productivity and profits.

Finding Customers Where Others Fear to Tread (or, How Not to Waste People)

Eliminating the wastage of people is as much a part of efficiency as a reduction of physical waste. Consider then, that the world's largest consumer markets - upwards of two-thirds of humanity - are comprised of poor people that are either ignored or forgotten by most businesses because of tradition, ignorance, or prejudice. Much to their credit, however, an increasing number of companies are waking up to the fact that poor people, if given a chance, are an economic force unto themselves. For example, in 1998 a cement manufacturing company in Mexico (*Cemex*) sent a team of managers into one of the poorest areas of the country to conduct a six-month study on how to increase sales. People with limited incomes accounted for around 40-percent of *Cemex*'s cement sales so the company wanted to learn how best to serve what they suspected was a virtually untapped market. After living amongst this customer base and learning its needs, the *Cemex* team discovered how poor people used cement, how they could pay for it, and a host of other profitable facts, which they then used to make their products more accessible. Company sales subsequently grew 250-percent - and have continued to grow every year since the project began (Hart, 2005).

Cemex's story is not unique. Thanks to extensive media coverage, most people are aware that the 2006 Nobel Peace Prize was awarded to Mohammad Yunus, a former economics professor from Bangladesh who invented the concept of micro-finance (giving small loans to poor people so they can start their own businesses). Although Yunus was repeatedly told by the establishment that poor people could not be trusted with money, his research (and his conscience) suggested otherwise. Yunus's solution was to help people help themselves by creating a new financial institution called the *Grameen Bank* (grameen means *village*). Currently, the *Grameen Bank* provides over $445 million in small loans each year ($10 to $50 at a time) to those who need it most. In a nice twist, the bank operates by visiting its customers rather than having them come to the bank. Far from being unable or unwilling to pay back their loans, those that borrow money from the *Grameen Bank* pay back their borrowings at a higher rate than any other group in the world. (For similar information on how supposedly 'uneducated' and 'unmotivated' poor people beat the odds, check out the *Honeybee Network*, a self-help organization created by Anil K. Gupta.)

Realizing that he was on to a good thing with the *Grameen Bank* (which now has branches in the USA to help alleviate poverty there), Yunus next established a telecom company called *GrameenPhone*, which adapted the selling of mobile phones to fit yet another wasted market. Basically, *GrameenPhone* sells cellular phones to villages rather than individuals. Selling phones to villages helps spread out the cost of the phones, thereby enabling more people to receive information about crop prices, market conditions, and other vital statistics without wasting days walking back and forth to major communication hubs. The result? Profits from the *GrameenPhone* project are expected to rise to over $100 million. Interestingly, both *Grameen Bank* and *GrameenPhone* operate in a region of the world where the average yearly wage is only $286. In other words, by refusing to turn his back on traditionally neglected customers, Mohammad Yunus not only built two profitable businesses, he's also lifting countless millions out of poverty at the same time.

Efficiency, Going Green, and Internal Customers

External customers aren't the only people that businesses fail to use to their utmost ability. The basic wants and needs of internal customers are also ignored on an astonishingly regular basis. For example, over the past 10,000 years or so, sunlight, fresh air, and natural settings have greatly influenced human evolution. It's hardly surprising then that artificial light and settings - combined with industrial noise - have repeatedly shown to adversely affect human productivity and performance. Studies from Russia and the Czech Republic, for instance, show that workers laboring in windowless factories experience more headaches, faintness, and sickness compared with workers who labor under natural light. Additional studies have revealed that prolonged exposure to artificial light decreases white cell (antibody) activity, increases infections and colds, and results in depression (Edwards & Torcellini, 2002). Creating workplaces that reduce such impediments is therefore crucial to achieving maximum efficiency. For example:

- *Lockheed Martin* reported saving half a million dollars on its energy bills *and* then enjoyed a 15-percent reduction in absenteeism after moving its offices to a building lit by natural light. Apart from saving hundreds of thousand of

dollars every year on energy costs, *Lockheed* also discovered that for every two-percent increase in productivity the company achieves, up to $3 million extra is made per annum.

- In another example, the *Boeing* aircraft company and *Prince Street Technologies* (PST) introduced natural light into their workplaces and watched as their quality control systems improved. Specifically, tool measurements could be read easier, previously unseen cracks in fuselages were detected, and subtle shades of color were better differentiated. At PST, the introduction of natural light was so successful it actually reduced worker compensation cases by 90-percent (Edwards & Torcellini, 2002).
- The *Diagnostics Products Corporation* in Flanders, New Jersey saw employee productivity increase 19-percent after the installation of an efficient climate control system and the addition of skylights that 'let in lots of (free) natural light.' (Manufacturing News, 2002)
- By installing skylights and additional insulation to improve lighting and temperature control, *Verifone*'s credit card verification facility in Costa Mesa, California, decreased its energy consumption 59-percent, reduced absenteeism by 47-percent, and boosted productivity five to seven-percent (NRDC, 2007).
- At the headquarters of the *West Bend Mutual Insurance Company* in West Bend, Wisconsin, efficient workstation controls, which allow employees to alter temperature, airflow, lighting, and noise based on their personal preferences, contributed to a 15-percent increase in claims processing *per employee* (NRDC, 2007).

(For additional information on how efficient work places contribute to healthier, motivated employees and increases in productivity, see Chapters 23-26.)

The Final Word on Customers

Nothing is more crucial to a business than customers. Without exception, the role of every business is to serve customers what they want, where they want it, and the way they want it in the most efficient manner possible. The good news is that many of the cost effective techniques and solutions that reduce waste and

increase efficiency not only increase productivity and sales, they're also good for the environment. No business should ever lose sight of the fact that every decision it makes and every action it takes must be customer oriented. Anything else is a complete and utter waste of time, money, and resources. Period.

Chapter 8
Managing Change

Change is never easy. Just ask Amy Spatrisano, principle and cofounder of *Meeting Strategies Worldwide* (an international meeting and event organizer). Some time ago, Amy took a look at the number of everyday items used during a typical five-day conference and found that 2,500 attendees used and discarded over 62,500 plates, 85,000 napkins, 75,000 cups and glasses, and 90,000 cans and bottles. Determined to eliminate this (and other) waste, Amy did some research and discovered that using online registration could eliminate paper, printing, and postage costs, thereby saving $3,900. Not providing conference bags could save $11,700. Avoiding presentation handouts saves $1,950 in printing and paper. Providing water in pitchers instead of plastic bottles saves $12,187. Serving condiments in bulk rather than in individual packages and eliminating the need for buses by choosing hotels close to the convention center provided additional savings, all of which amounted to more than $60,000. Unfortunately, as Amy later lamented, many of the meeting planners, hotels, caterers, and other businesses she works with remain unimpressed by these figures. 'Even if you show them they'll save money and even if you make it easy,' she says, 'it doesn't mean they'll do it.' (Makower, 2005)

This story is not uncommon. Many people and their organizations actively resist change even if the desired change guarantees the making of money and/or the providing of additional job security. *Species that survive*, said Charles Darwin, *are usually not the smartest or the strongest, but the ones most responsive to change*. All-too-often, however, many businesses don't consider change until they're knee deep in trouble. The result is an organization susceptible to losing out on a sale or being overtaken by rivals. To avoid this situation, most change advocates recommend introducing change as a *proactive* process that focuses on the needs of customers (both internal and external) rather than a reactive defensive measure. The most common of these include:

- cutting waste and costs,
- reducing customer waiting time,

- increasing product or service quality,
- eliminating unnecessary paperwork,
- updating systems and procedures, and,
- generally streamlining operations to serve customers better.

Improving (i.e.: Changing) Your Business

In his book *Management: Theory and Practice*, author Gerald Cole sums up the change process well. To change something, he says, implies altering it, varying it, or modifying it in some way. Some businesses change mainly in response to external circumstances (reactive change); others change principally because they have decided to change (proactive change). Some are conservative in outlook, seeking little in the way of change; others are entrepreneurial in outlook, ever-seeking new opportunities and new challenges. Some organizations are constructed so that change and/or adaptation is a slow and difficult process. Others are designed with built-in flexibility, which enables adaptation to take place relatively easily. There is not much point in change for change's sake and most people need to be persuaded of the need for change. The reality is that every group has forces within it that keep it together and provide it with stability and others that provide it with reasons to change and adapt.

Preparing for Change

For any type of change to take hold within a business (particularly efficiency) *breadth* and *depth* is required. *Breadth* means that the change must take place across the entire organization (i.e.: every department and/or person must be made aware of the need for change). *Depth* means that everyone becomes involved with, and brings their skills to, the change process. Having employees become part owners in the change process by asking for their input is a powerful way to win them over. Involving employees also taps into a wider knowledge base, initiates motivation, and reduces the chances of something being overlooked. Just as important, when a change process is shared the words, 'that's not my job' are heard less often. In 2003, for example, *Dow Chemical* achieved hundreds of millions of dollars in cost savings thanks to the pursuit of employee-

led efficiency practices at its facilities in Texas and Louisiana. As part of the change process, employees worked alongside managers from the highest levels of the company. The solutions they came up with – on their own - included identifying and fixing steam leaks, reducing electricity consumption, super-insulating industrial furnaces, and introducing real-time monitoring (i.e.: receiving *immediate* feedback from mechanical processes). By involving as many employees as possible from a wide range of departments, *Dow*'s on-going efficiency drives ensure that: (1) breadth and depth is achieved, (2) there are fewer chances that something is missed and, (3) problems are attacked from every angle (U.S. Department of Energy).

Probably the Most Important Management Theory Ever Developed

An adage often attributed to Albert Einstein states that 'insanity is the constant repetition of a behavior with the expectation of a different result'. With this definition in mind, consider the following model developed by Kurt Lewin in 1951 (see FIGURE 7.1). Lewin's 'Force-Field Theory' states that two forces come into play whenever change is introduced into a work setting. The first force derives from those trying to instigate change (driving forces). The second force is a result of those who try to resist change (restraining forces).

Lewin's belief is that most managers use force to bring about change by exerting pressure on those who oppose them. In practice, however, the more management pushes, the more the other side pushes back. The result is that both sides get locked in an I'm-going-to-win-this power struggle hidden behind a thin veil of civility. And the way most employees push back is not with violence or anger, but through inactivity, excuses, and other forms of procrastination.

The better way of overcoming resistance, says Lewin, is to get off the power struggle merry-go-round and to focus instead on why the opposition is resisting change. Almost always, the reason why people resist change is because they're afraid of something. Thus, the question management should be asking isn't, 'How can we persuade these people of our arguments for change?' (i.e.: 'How can we force change upon them?') But rather, 'What are their fears and objections and how can we remove these fears?'

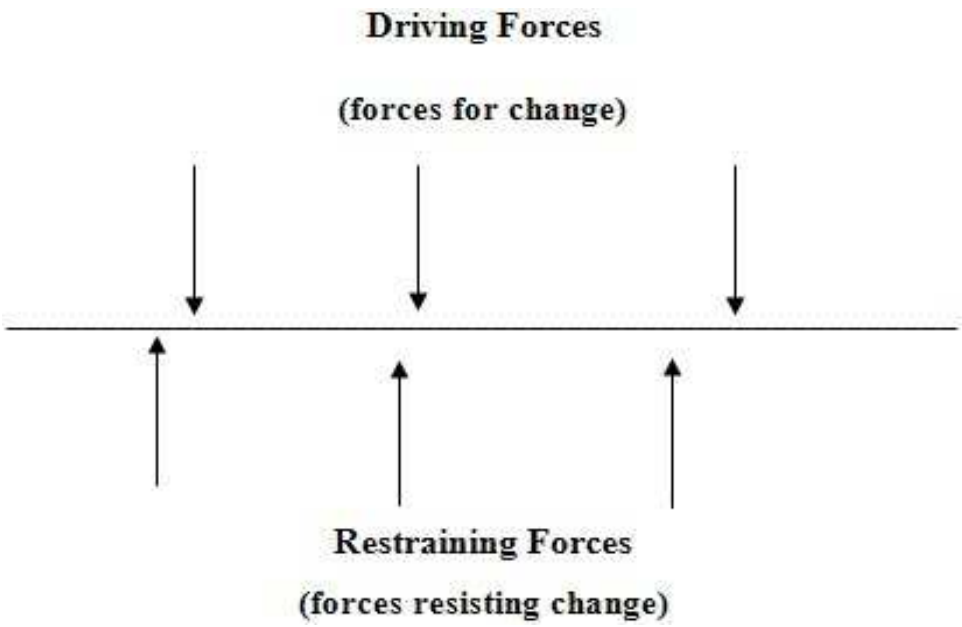


FIGURE 7.1 Lewin's Force Field Theory

Why Employees Fear Change

Initiating change in a business can be a gut-wrenching experience. This is because in many instances change removes comfortable old habits and protective barriers and leaves people feeling stranded and defensive. The following text, adapted from *Creating Value for Customers* by William Band, describes the typical concerns associated with workplace change.

Job loss	Mention 'efficiency' or 'change' in a workplace and many employees immediately assume that jobs are on the line. That's why many change initiatives begin with the promise that no job losses will occur.
Fear of loss of control	Feeling that things are being done *to* employees rather than *by* them

Too much uncertainty	The future is not obvious and everyday feels like the beginning of the end. This can lead to employees wanting excessive details and other procrastination techniques (i.e.: paralysis by analysis)
Too many surprises	People like novelty, but hate surprises. Early warnings are therefore necessary to avoid unwanted shocks.
The changing of habits	Habits are easy and mindless. Change is uncomfortable.
Need for familiarity	Everybody likes what is familiar. Most people feel comfortable going to places and doing things they know are risk free.
New things mean more work	This is true, especially at the beginning of change. But the initial workload often subsides and new tasks become easier (usually the reason for change).
Concern for competence	Whenever something new is introduced, people will question their ability to master new skills, particularly if training and ongoing support are not provided.
No time to adjust	Saying, 'let's do things differently' is not enough. It takes time for new skills to develop. Rushing through the change process can lead to disruption, sabotage, foot-dragging, and/or poor performance.

Change from Another Angle

Kurt Lewin later developed his Force Field Theory further (with the input of from Edgar Schein) by introducing a 'Three Stage Approach to Change Behavior'. Since good habits are recognized as being just as difficult to break as bad habits, the analogy the two men make is to unfreeze bad habits and freeze improved habits once they've been established. Here's how it works:

1. *Unfreeze existing behaviors*. Gain acceptance for change by *getting employees to admit that a change is needed*. This doesn't mean that a decision must be made or a solution must be found just yet. At this stage, only a general consensus is required in which everyone agrees that something new has to be done. Examples of how some businesses get their employees to admit that waste reduction and efficiency practices are needed is to involve them in estimating the amount (and cost) of the waste their business produces, analyzing energy and fuel consumption, presenting carbon emission estimates, and/or pointing out how much garbage the business produces. Studying the cost savings achieved by other businesses (particularly competitors) is another tactic that has produced results.
2. *Change existing behaviors*. Get employees involved in the change process by asking for their advice and input (breadth and depth). This can be accomplished by putting together a team (or teams) whose job is to collect ideas. Once again, the more employees that contribute the more likely change will be accepted because, in effect, change will be seen as the employees' idea rather than management's.
3. *Freeze new behaviors*. Reinforce new work practices with rewards (see Chapter 9). If this isn't done, people will stop making progress and will revert to the safety of their old habits.

Building the Commitment for Change (A Summation)

George Bernard Shaw once said that *to learn something at first feels like losing something*. To eliminate the feeling of loss (and the sense of fear that loss creates), many change experts suggest the following:

- Involve as many people as possible. Participation leads to ownership, enthusiasm, and motivation.
- Emphasize that job loss is not part of the change process. Explain *and show* that every redundant employee will be reassigned and retrained.
- Communicate clearly and often. Make the change message unmistakable (see *Changing an Organization's Culture*, pages 225-226) and provide as much information as possible about every change.
- Divide changes into manageable, comprehensive steps. Make these steps as familiar as possible and make them small and easy. Ensure each step is deemed a success before moving on to the next one.
- Never surprise anyone with change.
- Let commitment grow. Don't ask for allegiance to new and untried ways (you won't get it).
- Make clear what will be expected of people during and after changes are made. Communicate these standards and requirements often (i.e.: provide feedback).
- Provide as much continuous training as needed.
- Bear in mind that new work habits often require three to four weeks (or longer) to make or break.

Learn as You Go

Lack of experience in any change situation is not an excuse for inactivity. Indeed, most successful efficiency initiatives begin with a handful of individuals stepping into the unknown with little more than common sense, a healthy understanding of their business (and its customers), and an overwhelming desire to succeed. Ken Tannenbaum, a technology associate at *Dow Chemical* who has successfully led several efficiency projects, explained this concept to me in an e-mail as follows:

'*Most of the work on efficiency* (at Dow Chemical) *is done by Dow employees. We have utilized consultants from time to time to validate our assumptions or to give us an opportunity to ensure we did not miss anything, but in most of our plants, (because) the processes are very specific, external experts cannot bring much additional help.*'

Ken went on to say that the same techniques used everyday to change, improve, and maintain *Dow Chemical*'s numerous plants are the same techniques *Dow* uses to increase efficiency because when it comes to change there is no sense re-inventing the wheel every time.

Just Do It

In some businesses employees will refuse to undertake new tasks and responsibilities no matter what is tried. Managing change in the face of strong opposition may therefore require stern procedures that include disciplinary action or perhaps even termination. Most practitioners agree, however, that managers should first try to stimulate change by encouraging employees to lead their own way through the process. To be sure, stepping into the unknown is intimidating and frightening to many people, but as with so many situations in life, sometimes one just has to do it afraid. The alternative is that if you continue to do what you've always done, you're likely to get what you always got.

Chapter 9

Motivating Employees

Last year, over 1,000 employees in businesses across the UK were asked how they would feel if their employer set some form of environmental policy. Eighty-percent said they would feel good about it because they wanted their workplace to be less wasteful, more engaged in solid environmental practices, and more environmentally friendly (Logicalis, 2007).

Paradoxically, another survey conducted at the same time asked managers from over 20 companies – mostly large firms spanning a range of different sectors – what happened when their companies tried to introduce environmental policies into the workplace. The response revealed that most businesses are singularly frustrated with their lack of success in raising employee consciousness about green issues (GreenBiz, 2007). More precisely, maintaining employee motivational levels was mentioned as being particularly difficult. Since efficiency is an on-going process, the obvious questions this finding raises are: (1) how can an organization's people be encouraged to take action, and, (2) how does one keep them going?

Basic Thoughts and Theories Behind Employee Motivation

In 1974, the *Academy of Management Journal* conducted a survey that sought to determine the most influential motivation theories in management (Matteson, 1974). Among the top candidates was Abraham Maslow's 'Hierarchy of Needs' pyramid (see Figure 9.1) – a ubiquitous piece of work that graces the pages of almost every management textbook. Maslow's ground-breaking pyramid is based on two underlying principles. When seeking motivation: (1) everyone starts at the bottom and attempts to move up when they see that the need immediately above is not being fulfilled, and, (2) a need can not be activated until the one below it has been met.

As with many new and profound ideas, Maslow's theory continues to be debated to this day. Here, however, it's not important to either agree or disagree with it. The idea is that all people have needs and seek to fill those needs – and smart managers, when searching for ways to motivate their staff, need to find out what those needs are as well as what must be done to keep people moving forward if their needs change (note that the top four motivators in Maslow's pyramid do not involve money).

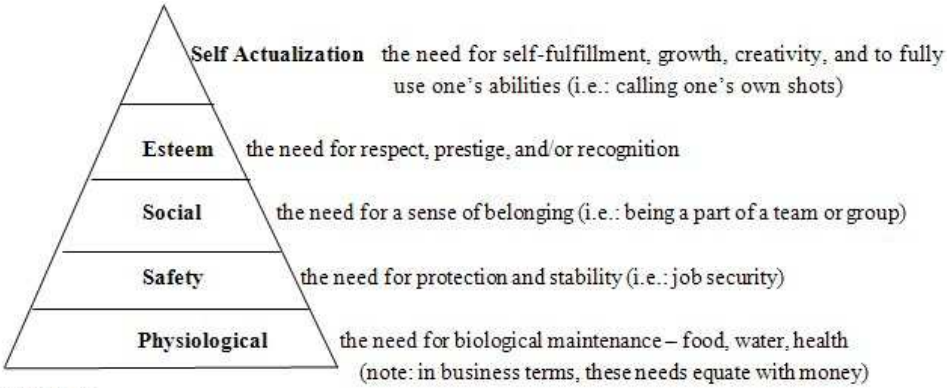


FIGURE 9.1

McClelland's Three Essential Human Motivation Needs

Some time later, psychologist David McClelland more or less continued in the same vein as Maslow by determining that employees are motivated via three essential needs:

1. *The Need for Achievement*: the desire to do better, solve problems, and master complexity.
2. *The Need for Power*: the desire to control other people and influence their behavior.
3. *The Need for Affiliation:* the desire to have friendly relations with people (McClelland, 1961).

McClelland argued that people, over time, acquire or develop different stages of needs as a result of their experiences and that each stage involves a distinct set of work environments. To ensure optimum performance, it's therefore a manager's duty to recognize the needs of employees and create appropriate work settings to satisfy them. For example, delegation might satisfy a person's need for achievement or power. Conversely, being involved in a team project might satisfy affiliation needs.

Herzberg's Two-Factor Theory

In 1967, Frederick Herzberg devised a two-factor motivation theory based on a broad study of people at work. Herzberg concluded that there are two categories directly relating to job satisfaction:

1. *Work Content*: what people do while at work
2. *Work Setting*: the actual environment in which work is done

Herzberg states that work content and work setting issues must be handled separately. Work content involves satisfying an employee's desire to handle additional responsibility, providing employees with a sense of achievement, and allowing for personal growth. Work setting factors (or hygiene factors) deal with an employee's physical environment.

When seeking ways to motivate employees, a manager must determine which of these factors needs attention and to find an appropriate solution. For example, adding natural light, increasing the circulation of fresh air, reducing noise levels, using more efficient tools and machinery, and improving safety (all of which can increase productivity) may be fine for increasing motivation if an employee's physical environment is in need of improvement, but could prove less than satisfactory if the underlying problem involves work content. Likewise, recognizing job performance, handing out awards, providing motivating feedback, asking employees to become part of a team, giving promotions and other forms of recognition may fire up enthusiasm, but may not help with factors relating to environmental work concerns.

Alderfer's Existence-Related-Growth Theory

In 1972, Clayton Alderfer sought to improve on Maslow's hierarchical pyramid by condensing its five categories into three:

1. *Existence Needs:* the desire for physiological and material well-being
2. *Relatedness Needs*: the desire to improve interpersonal relationships
3. *Growth Needs*: the desire to pursue personal growth and fulfillment

Alderfer's theory is meant to be more flexible than Maslow's. Alderfer says that people can move up and down his hierarchy of needs at any given time depending on the circumstances. If, for example, a higher need can't be fulfilled, a lower previously satisfied need can be re-activated in its place.

Which Theory is Best?

Although the similarities and differences between these theories are apparent, success with any given one is dependent upon the employee, the manager, and the situation in which the two find themselves. Most theories suggest that employees are best motivated when they: (a) learn or discover new skills, (b) know that what they're doing is important, and, (c) are told that they're work is appreciated. In other words, when a manager knows the aims of his or her business, is involved in all aspects of the workplace, and appreciates - and recognizes – the input of others, good results usually follow.

Basic Motivation (or, Getting to the Top of the Pyramid)

According to Maslow, the best way to motivate an employee is self-actualization (i.e.: the employee is allowed to do what he or she wants to do in the way that he or she wishes to do it). Unfortunately, employees can't always call their own shots. Previously established methods and decisions must sometimes be followed due to safety and other factors. When this is not the case, a *result* may be more important than the method being employed so perhaps it can be left to employees to decide how to best achieve results. Stated differently, if a work solution is not contingent upon a set process then the talents and abilities of employees should be used to their full potential. This is more than just a

philosophical argument. If the right people are hired, trained, and provided with whatever is necessary to complete their jobs, then managers need to be extracting as much from these people as possible. The word for this is *delegation* (transferring a manager's authority and ability to act to a subordinate).

Delegation

For the most part, delegation involves:

1. choosing the right employees for the right job,
2. informing employees of *exactly* what needs to be done (creating responsibility),
3. providing each employee with relevant information (training),
4. discussing with employees how they are to achieve their objectives (establishing work perimeters),
5. giving employees the tools necessary to accomplish their objectives (handing over authority),
6. reviewing the results (enforcing accountability).

Keep in mind that by definition, delegation involves more than simply assigning someone to do a task. Delegation should also, if possible, allow employees to choose and implement *how* that task will be done. One of the challenges of management lies in understanding that *people are motivated for their own reasons, not a manager's reasons*. Put another way, ideas, rules, and regulations cannot be implemented unless the employees who have to work with them *will* work with them. When performed correctly, delegation therefore lets employees show the world what they are capable of achieving - and if the right people were hired and trained well then that should amount to quite a lot.

Taking the Fear out of Delegation

For most businesses delegation is not a choice. Most managers have more work to do than one person can reasonably be expected to perform. Thus the question is not '*should I delegate*?' but rather '*how*?'. Many years ago I worked with a man who said that his father taught him how to swim by dragging

him to a lake and throwing him in. He ended up thrashing around in the water before he was finally rescued. Ridiculous? Absolutely. Yet for many managers this 'sink or swim' philosophy represents the very essence of how they delegate. The result is that employees aren't used to their full potential. Following are typical arguments insecure managers use to either avoid delegating or to avoid delegating properly:

Myth #1: With delegation, employees will gain experience and skills that can be used against the manager.
The Reality: Managers don't risk losing their jobs when they find and develop good people. Finding and developing employees is a basic managerial requirement – it's what managers are supposed to do.

Myth #2: Because a manager is ultimately responsible for every delegated task, it's easier and safer for a manager to do everything himself or herself.
The Reality: A manager's time is limited. It's usually not possible for a manager to do everything for which he or she is responsible. Certain tasks and responsibilities *must* be handed to others.

Myth #3: Delegation reduces a manager's powerbase thereby decreasing his or her effectiveness and authority.
The Reality: Delegation increases a manager's influence among employees and work situations, which enables managers to widen their span of control and increase their powerbase.

Myth #4: Delegation demoralizes employees because most managers delegate the most boring tasks to their subordinates and leave the best stuff for themselves.
The Reality: Fun tasks are usually the easiest to delegate. Besides, if managers chose to only do the fun stuff, they couldn't perform the tasks for which they alone are responsible (Caudron, 1995).

Making Delegation Work for You

The following twelve steps are designed to help managers eliminate delegation pitfalls:

1. *Don't assign duties because you don't want to perform them***.** This includes managerial functions such as explaining objectives, providing feedback, reprimanding, hiring/firing, training, motivating, handling sensitive issues, team-building and so on.
2. *Clarify the assignment before it's delegated.* Determine what is being delegated, the results expected, and time limitations. Unless specific methods must be adhered to, concentrate on the end results the employee must achieve.
3. *Choose the right person for the right job* and ensure that enough time is available to complete it. Don't use delegation to teach employees a lesson or put them in their place. Know who is ready to handle more responsibility as well as how hard this person can be pushed.
4. *Determine work perimeters.* Let employees know *exactly* what they can and cannot do as well as what will make their job easier and any practices they should avoid.
5. *Make delegation a gradual process by giving employees time to gain confidence.* The key is to provide employees with enough rope to do something constructive without having them hang themselves. Can the task be done in stages? If so, encourage the employee to work in stages.
6. *Discuss the task with the employee.* Allow employees to participate in discussions concerning what they are expected to do, how much authority they have, and the standards by which they will be judged.
7. *Inform others about the delegation.* Failure to inform other employees of an impending delegation increases the likelihood of conflict and decreases the chance that the delegated task will be done efficiently.
8. *Allow the 'delegatee' to make as many decisions as possible.* Unless your decisions are significantly better, let the employee chart his or her own course. Doing so is rewarding and motivating for the employee.

9. *Expect a mistake or two.* Mistakes are a part of every learning process and tend to show that something is being done. Appropriate monitoring should catch mistakes before they grow.
10. *Establish feedback controls.* Regular check-ups enable problems or mistakes to be identified at an early stage. Let the employee know that help is available (the catchy phrase for this is, *delegate don't abdicate*).
11. *When problems arise, insist on solutions.* Along with ensuring that the employee is not abandoned, it's equally important that he/she does not keep running back to you with every problem encountered. Insist that whenever a problem arises, employees come to you with possible solutions rather than just the problem.
12. *Review results and reward good performance.* Let the employee know how he/she is doing. More often than not, people hunger for the chance to show how much they can accomplish. After employees have successfully completed a task, praise any progress and politely address any setbacks so that they'll keep coming back for more (Robbins & Hunsacker, 1996).

Taking the Next Step: Employee Empowerment

Although delegation is an important step in the efficiency process, most organizations, at some stage, want their employees to go further without having to be told. Welcome to the world of *empowerment*. Empowerment is similar to delegation in that it tends to motivate employees by allowing them to develop their own self-worth and, to some degree, operate autonomously. The difference between empowerment and delegation is that empowerment is *on-going* rather than task-specific. This doesn't mean that empowerment allows employees to go off in different directions and do their own thing. When empowering others, strong leadership must be shown to ensure that everyone is marching in the same direction and managers must accept that rewarding others with power does not mean that they lose their own authority. Equally as important, clear goals and guidelines must be established and it must be emphasized that employees will be required to accept the rewards or consequences of the decisions they make (which some employees may never accept).

Empowerment in Action

In 1981, *Dow* empowered 2,400 workers at 20 of its facilities to form competitive teams designed to seek out energy-saving solutions on their own. Specifically, the company was looking for ideas that would generate at least a 50-percent return on investment. In the first year, 27 projects were started that averaged around 173-percent return on investment. During the second year, as employees became more adept at seeking out efficiency improvements, 32 projects were started that averaged a 304-percent ROI. Twelve years and almost 900 projects later, an average 200-percent return on investment was being achieved. In the years that followed, increases in returns and cost savings added over $110 million to *Dow*'s bottom line (Hawken, et al, 1999). Such is the wonder of empowerment. Give a man a fish, states an old proverb and he will have a meal; teach him how to fish and he will feed himself for the rest of his life.

Making Empowerment Work

Obviously, empowering a workforce isn't something that can be achieved overnight. Trusting workers to think up and apply new efficiency solutions that fall in line with company goals and objectives is a lengthy process that demands honesty, cooperation, courage, and a commitment to serve from all involved.

For *non-managers*, this means:

- Learning to take and handle responsibility - and serve others,
- Realizing that constant learning and training are a part of every job,
- Understanding that the ownership of problems and solutions belongs to everyone in the business (i.e.: problem prevention and work ownership),
- Accepting the fact that everyone needs to pull in the same direction,
- Acting on the fact that showing up for work and performing bottom-line duties is not enough – wages are given for *value created*[*], and,

[*] 'Creating value' is a term so overused in business and management literature that it's become a cliché. It derives from the belief that too many people seek congratulations for behavior as basic as showing up for work on time, doing their job, keeping promises, rectifying mishaps, and so on. In these cases, value is not being created. Value is created when a person goes beyond the minimum requirements expected of him or her without being told to do so.

- Displaying caring, integrity and trust,

For *managers*, empowerment involves:

- Viewing workers as assets (not expenditures) and recognizing their value,
- Sharing information and providing good training,
- Listening, asking, valuing, and then acting on other's viewpoints and ideas,
- Creating a motivating environment conducive to creativity, participation, and innovation,
- Working toward preventing problems, not just battling them,
- Rewarding good performance,
- Displaying caring, integrity and trust,
- Prudently choosing the right people for the right jobs, and,
- Ensuring that employees and departments are united and serve each other.

Another Example of Empowerment in Action

Years ago, a large retail operation in the USA watched its sales plummet. Managers blamed the company's failure on the faltering economy, yet in the same areas of the country the retailer's main competitor prospered. Investigations revealed that the first retailer had an employee manual the size and thickness of a phone book. In militant detail, it dictated to employees how to think, dress, behave, and carry out their duties. The competitor used a different approach. Its employee manual is written on a single 5 x 8 inch card that carries the following message (Scott, 2005):

Welcome to Our Company. We're glad to have you with us.

Our number one goal is to *provide outstanding customer service*. Set your personal and professional goals high, we have great confidence in your abilities.

Our Rules:

Rule 1. Use your good judgment in all situations

There will be no additional rules.

(Please feel free to approach the department manager, store manager, or division manager if you have any questions at any time)

If you're still not convinced that empowerment works, ask yourself the following questions: (1) Which of these companies would you rather work for, the first or the second, and (2) Does allowing employees to use their own judgment mean that management has lost control?

Maintaining Momentum

Even when delegation and empowerment are used correctly, employees can still lose enthusiasm. Rather than give up, many efficiency experts suggest re-invigorating momentum with the following:

1. *Re-educate*. People learn in different ways so drive home the efficiency message using a medium that is most effective to *each individual*. According to Elysa Hammond, the staff ecologist of *Clif Bar* (a sports nutrition business based in Berkeley, California), continuous education plays a key role in getting efficiency results from employees (Aronauer, 2007). Methods of spreading information can include:

    - printing new employee handbooks,
    - conducting regular induction training,
    - having a chief officer give regular verbal feedback,
    - providing relevant team-briefings,
    - distributing a company newsletter,
    - establishing an e-mail campaign, and,
    - effectively using notice boards and posters.

    For example, in one company, managers told staff that a typical personal computer creates 1,000 pounds (454 kilos) of CO2 emissions annually – and that 15 PCs generate the same amount of CO2 that the average car produces in a year. This type of information (and more like it) helped provide a greater incentive for employees to turn off their computers when they weren't needed.
2. *Be specific rather than general*. Ideas distributed with ease are often discarded with ease. Again, tailoring a company's efficiency message to suit every job or task makes it more likely that employees will heed what needs to be done.

3. *Recognize top performers*. Recognize achievement with a plaque, an awards ceremony, acknowledgment, extra vacation time, a coveted spot in the employee parking lot, a cash bonus, a dedicated luncheon, or a fun-oriented get together that highlights the efficiency message.
4. *Name and shame poor performers*. If positive options fail, try using pointed reminders to get the message across. For example, managers at the *Esprit de Corps* apparel company in San Francisco were stymied at their employees' lack of enthusiasm to reduce waste so after work they rifled through workplace trashcans and filmed who was throwing away recyclable materials. Days later they asked the unsuspecting employees to contribute to an environmental video project. Naturally, every staff member insisted that he or she was doing as much as possible to reduce waste. At a big company meeting later, however, employees watched in horror as their hypocrisy unfolded on a giant screen. Needless to say, no one at *Esprit de Corps* throws away recyclable materials anymore.
5. *Get top managers involved*. If the message doesn't come from the top, employees won't budge.
6. *Radiate the message from every aspect of the business* (see Chapter 22). Efficiency and waste reduction are all-or-nothing endeavors that touch upon everything. Every department and task must strive for efficiency or the benefits will remain elusive.
7. *Don't establish a police state*. A sure-fire way to kill enthusiasm is to establish a 'green team' that pushes its message too hard and turns staff off. Again, get *everyone* involved.
8. *Be consistent*. Don't turn efficiency and waste reduction goals into a once-a-year pledge and don't settle for anything less than what you've envisioned.
9. *Provide plenty of feedback*. Employees won't know if they're performing correctly or going in the right direction without some form of feedback. Feedback is cheap, it can work wonders, and it can easily be provided at three stages of a task: (1) before the task begins, (2) during the task, or, (3) at the end of the task. When feedback should be used is contingent upon the situation, however, it should always remain timely, honest, simple, and constructive. The 'fresher' it is the better. A great wit once said that *the greatest problem in communication is the illusion that it has been accomplished*. The point is that feedback should be provided when the recipient can hear it without distractions. Feedback should also avoid

personal comments as well as outcomes that are beyond the recipient's control. One way of providing feedback is to inform employees of how they're doing through regular, written evaluations that remind them that their work is being monitored. This should not be a tedious or banal formality where little communication occurs. An evaluation should be a constructive exercise that clears the air, lets those concerned know where they stand, and shows where improvements need to be made.

(See also page 185, *What to do When Efforts Slow Down*)

Ultimately, Employees Reflect the Businesses They Serve

Delegation and empowerment are powerful and effective tools that require constant planning and maintenance. Only when employees have been convinced of the efficiency message and they've been educated about the direction their company wants to go and the ways it wants to get there can managers begin to:

- reduce their workload,
- tap into the strengths of their workforce,
- create an atmosphere of problem prevention and responsibility (work ownership),
- provide the ultimate in human motivation, and,
- keep the efficiency process moving in the right direction.

Chapter 10
Managing Teams

Almost every company that endeavors to improve its efficiency and reduce its waste arranges employees into teams to achieve its objectives. The word *team* refers to a group of people who get together (or are forced together) to accomplish a goal. Using the term implies that everyone in an organization is happily working to fulfill a common purpose. The truth of the matter can be somewhat different, but more about that later. For the most part, the reason for forming teams is to produce *synergy*, which is often explained with the mathematical equation: 2+2=5. In other words, the caliber of a team's work is usually expected to exceed the sum of what each individual can produce on his or her own. Put another way, common sense dictates that the wider skill and knowledge base of a group of people has a distinct advantage over that of one person. Defined in this manner, the purpose of a team is to:

- bring out the best in each member (motivate),
- help formulate ideas (brainstorm),
- conduct feasibility checks on ideas (reality test), and,
- complete a task better than can be reasonably expected of one person.

Teams work best in environments requiring change or innovation, but the key to their performance hinges on cooperation, co-ordination, conflict handling, and commonality. Put more succinctly, teams work best when basic social skills taught in kindergarten are put into practice. The challenge, of course, is that too many people need to relearn these basic manners. This means that in most cases, time and effort is needed before teams can be relied upon to produce results because the people within them will usually, at first, seek to satisfy personal needs.

Types of Teams

Teams fall into three categories:

1. *Cross-Functional Teams* (also known as *committees* or *task forces*) consist of individuals that come from different departments, different schools of thought, and/or different work areas. The idea is that different mindsets working together have a better ability to see the bigger picture. Cross-Functional Teams are known to work particularly well when it comes to establishing efficiency concepts, tackling environmental issues, redesigning products, and working with complex situations. The downside is that they tend to take a great deal of time to manage and 'get the ball rolling'.

2. *Problem Solving Teams* are designed to solve problems or give suggestions, but not to implement solutions. Historically, offering problem-solving advice was the main reason why teams were first formed in business environments.

3. *Self-Managed Work Teams* are Problem Solving Teams that have the ability (and authority) to regulate themselves and enforce decisions. Studies show that self-managed teams work best when handling equipment purchases, with customer problems, establishing departmental policies, scheduling jobs, and enforcing rules. Although a self-managed team environment can lead to an increase in work satisfaction (and has led to much positive press), the jury is still out regarding their long-term effectiveness. Absenteeism and high turnover are sometimes common with self-managed groups (Robbins, 1995).

Teams Take Time to Develop

Teams generally develop in five stages known as:

1. *Forming* or selecting the people that will be on the team. During forming, everybody is usually very polite and quiet. Group members often want to know what they will be asked to contribute and what the project will offer them. Since the grouping is new, most people are, at first, guarded and reserved in their comments and opinions and may defer to those who appear as leaders.

2. *Storming* is characterized by personality clashes, faction forming, fights for domination and lots of talk with little listening. During storming the group splits into separate factions and battle lines are drawn. Very little communication occurs at this stage. Bear in mind that this scenario rarely erupts into something easily observed. Instead, emotion and conflict seethe beneath a thin veil of civility and are often transformed into silence, sarcasm, or innuendo. Failure to pass through this stage without conflict resolution may result in lasting liabilities.

3. *Norming* begins when a team settles down and begins to work toward its goal. During norming the group finally recognizes that it must work together. In-fighting subsides. Bickering, fighting over turf, playing politics and, in effect, canceling each other out, reduces. Norms (acceptable standards of behavior) begin to be established. Most important, people start to *listen* to one another.

4. *Performing* develops when the group agrees on a system that allows it to get the job done and when everyone's input culminates into a single, shared outcome. During performing individuals express their views freely and support one another. In doing so, a clear and stable structure develops. More to the point, this is the stage during which the elevated performance of individuals emerges.

5. *Adjourning* involves reviewing results and disbanding the group. During adjourning, particularly with temporary or task-oriented groups, group members must break up and return to their former positions within the business. Ideally, the group does so with a sense of accomplishment. Although adjourning may sound like the easiest of the five stages, it is not. When employees who have successfully completed a team task are shoehorned back into their old positions it's not unknown for resentment to surface (Tuckman 1965 & 1977).

Making Teams Work

During any of the five stages of team development problems can develop. For this reason, many groups need a *facilitator* - a person whose role is to draw the group's attention to any agreed-upon norms as well as to keep everyone on track toward agreed-upon goals. Bear in mind that this person does not have superiority over the rest of the group. Respect is the operative word. For optimal success a facilitator should:

- be enthusiastic about efficiency and waste reduction,
- have credibility at all levels of the company,
- be able to communicate with staff as well as senior management, and,
- be a good motivator.

In theory, a team should develop its own norms and regulations, however, when putting together a team it might be best to start by having the group formulate a few ground rules. For example, the following issues must be discussed, agreed upon, and written down *before* a team can be expected to perform:

- *The purpose of the group posted for all to see*. For instance, in a waste reduction scenario, typical questions that should be presented beforehand can include: What is the waste? Where is the waste created? How much waste is created? When is the waste created? What can be done to reduce the waste?
- *Attendance expectations*. Some practitioners suggest that efficiency teams should meet at least two to four times a month. Whatever is decided, put it in writing and enforce it.
- *Behavior rules*. Examples include: no interruptions, no eye-rolling, no name calling, and no criticism focused on personality rather than the task.
- Work performance expectations. The standards that determine if members are pulling their own weight and what will be done if they are not.
- *Methods of agreement* (or dissent).
- *Clearly defined tasks and responsibilities* (both general and specific).
- *Explanations that articulate how deadlock will be handled*. Will lots be cast or will a coin be flipped?

As progress is made, ideas and suggestions should be recorded on a large display board where they can be clearly seen and referred to. Concentrating on positives is essential. Staying upbeat is a good way to build group morale and reinforce individual cooperation and participation. In this regard, many facilitators suggest that every negative criticism should be accompanied by a positive suggestion for improvement.

Now for the Bad News

Despite the proliferation of stories about the success of teams, forming people into groups is not a cure-all. Just as it would be absurd to ask a group of people to do something as simple as make a cup of tea, the same applies in business. Teams usually don't work well in environments requiring simplicity, speed, strong leadership and/or cost minimizing. Peters and Waterman (1980) cite a classic example in a large corporation that had formed 325 team task forces, none of which had completed its specified duties in three years and none of which had been disbanded.

Additionally, evidence has shown that assigning people to work in a team sometimes decreases their performance levels – particularly in situations where the number of people amounts to more than six. Apparently, the larger the team, the greater the chance there is of stagnation, conflict, miscommunication, and social loafing. *Social loafing* is defined as the tendency some individuals have to reduce their efforts when working with others. Perhaps the reasoning is that they hope to disappear into the crowd - or maybe they think that since others aren't pulling their weight they don't have to either. The result is that a few lazy individuals enjoy the labor of their hard-working colleagues.

Overcoming the Obstacles of a Team

Every team should do as much as it can to avoid the dangers of social loafing as well as the stigma universally known as *group-think*. These negative outcomes can sometimes be corrected through measures designed to overcome another team problem, which is commonly referred to as a 'committee mentality' where 'too much analysis leads to paralysis' and nothing gets done. All too often, a committee's solutions may not appeal to anyone or be so far removed

from the initial problem that they're meaningless. Further problems can develop when the smug air of superiority creeps into a team or when the team refuses to consider what it feels are weird or different viewpoints from outsiders. As a result, contradictory data is ignored or shelved, other alternatives are not considered, and a jumping to conclusions or inactivity dominates.

Typical comments associated with group-think or stagnation (particularly when it comes to efficiency and waste reduction) include: 'We don't have time for this', 'This isn't working', 'This stuff isn't relevant', or 'We're just treading water'. To avoid these remarks, psychologist Irving Janis suggests the following:

- Hold second chance meetings after a consensus has supposedly been achieved.
- Avoid being partial to only one course of action (perhaps make it a rule to always come up with two or three alternatives).
- Go around the table with team members and insist on feedback (this helps prevent quiet people's opinions from being withheld and big-mouths from dominating discussions).
- Encourage team members to do their own research and collect their own facts.
- Remember that the point of formulating a group is to *produce results* (i.e.: assigning teams is not a solution in itself).
- Understand that since every group is unique, each will require a different start-up, functional style, and form of leadership.
- Assign team members to criticize suggestions and obtain better solutions (Janis, 1971 & 1982).

Advice from the Pros: Putting Together a Waste Reduction Team

The following recommendations were compiled from a number of successful waste reduction programs:

1. *Before putting together a team, state the company's goals*. What does the business want to achieve? Zero-percent waste? The replacement of toxic substances with safer alternatives? A reduction of production times? A

revised accounting system designed to charge the cost of waste to the department that creates it? Be specific about what is desired.

2. *Involve individuals who are knowledgeable about the processes being examined*. Input may be needed from front-line workers, maintenance crews, environmental specialists, health and safety personnel, the purchasing department, engineers, the legal department, research and development researchers, etc. If you need these folks, ask them to help.
3. *Don't turn away volunteers*. Enthusiasm should not be curtailed and no one should be made to feel left out.
4. *Provide continuous communication and training*. Consolidate training courses to allow different groups to meet and communicate. Ensure every employee, regardless of his or her position in the company or the shift he or she works, is aware of what needs to be done, what is being done, and what has been done.
5. *Agree on motivational tools*. Determine how employees will be motivated. Recognition, extra vacation time, cash bonuses, or award ceremonies are all valid motivators. In one business, employees actually wanted to be rewarded with a large carrot cake baked by the wife of their foreman. Another business displayed team achievements on giant scoreboards designed to foster competition. Points were generated for reducing kilowatt-hours of electricity, saving amounts of raw materials, reducing production minutes, and so on.
6. *Maintain links between the team and the rest of the organization*. Be aware of what every team is attempting and accomplishing. Learn the fears and needs o the individuals involved.
7. *Update goals as they are achieved*. Emphasize the notion of on-going improvement, build on previous successes, measure and track all progress – and above all, remind everyone that there is no finish line (*MnTAP* and *Ohio PPWM*).

The Verdict on Teams

As one of my old college professors used to say, although it may be true that 'many hands make light work', and 'two heads are better than one,' whenever people work together the notion that 'too many cooks spoil the broth' must also be considered. Most companies that have achieved savings through waste reduction and efficiency improvements swear by the effectiveness of teams

- often insisting that their accomplishments couldn't have been made without them. Nevertheless, teams need management and direction. Avoid setting up a squad that walks around once a month pointing fingers and instilling a sense of dread (or worse) in others. Such behavior only encourages employees to pour-on-the-goods when a spotlight is turned on and return to business-as-usual once it's turned off. Teams and their purpose must be constant and consistent and the people they employ must make a commitment to work together, serve one another, fulfill an identified and common purpose, and be mutually accountable. Anything less and the individuals that comprise the team will end up as little more than a crowd.

Chapter 11

Making Meetings Matter

It's no secret that a many business practitioners believe that the vast majority of meetings held everyday at organizations around the world are either poorly conducted or unnecessary. Since most efficiency programs require a fair number of meetings – many of which may be conducted by people who have little or no experience putting a meeting together – it's important to ensure that every meeting is as professional and productive as possible.

Don't Take Your Eye off the Ball before the Meeting Begins

Color printers, eye-catching graphics, spreadsheet programs, and slide presentations, make it easy to lose site of that fact that meetings are not supposed to merely convey information. That in itself can be accomplished by holding a conversation, using a telephone, or writing a memo or e-mail. The purpose of a business meeting is to be *task-oriented*. The idea is to achieve an objective that can be better obtained through group participation. The aim is to address an issue or set of issues and have everyone walk away with a viable solution (or at least be closer to one). Because this takes forethought and planning, too many meetings (particularly those held at a specific time each week) are often cobbled together without much forethought, thereby becoming ineffective, demoralizing, time wasting, and even dreaded.

Ten Steps for Planning a Successful Meeting

Before calling an efficiency meeting, focus on the following points:

1. *Necessity*. Think about the meeting's justification. Is it really necessary? Will anyone's time be wasted? What can be done in place of a meeting? Can the meeting be held via teleconferencing to limit travel time and expenses?

2. *Purpose*. What is the meeting's purpose? What are its goals? What is the desired outcome? Keep in mind that all business meetings must be goal oriented. If you can't figure out how your meeting relates to your goals, you're wasting valuable time.

3. *People*. Who is best suited to lead the meeting? Who needs to be in attendance? Who doesn't need to be there? How will the meeting's planners avoid offending people who aren't invited? How will they encourage those who are needed, but don't want to attend?

4. *Planning*. Has the appropriate research been conducted to call a meeting? (meetings should rarely involve the input of only one person) Is there enough material for a complete agenda?

5. *Preparation*. Will pre-meeting information (a short description of the topic, an outline of what is expected to happen, references to any pertinent information or what needs to be done…) be properly distributed at least three days before the scheduled date of the meeting? It should.

6. *Tools*. Are all the items necessary to conduct a meeting available (projectors, computers, software, paper, pens, white boards...)? Is all the needed equipment in good working order? Sometimes displaying a large sign in the meeting room that clearly and concisely states the topic of the meeting helps keep everyone on track. For example, 'EFFICIENCY', WASTE REDUCTION' or 'SAFETY'.

7. *Practice*. Have the people involved with conducting the meeting practiced their presentation(s)?

8. *Introduction*. Will the meeting start on time? Will it end on time? When it begins, is the chairperson prepared to re-state its purpose as well as the 'rules' or procedures everyone is expected to follow? Will a run-down be provided on who will have the floor?

9. *Brainstorming*. After the presentations have ended, will the chairperson move quickly toward the brainstorming part of the meeting? (This is usually the reason why most meetings are called) Is the chairperson (or someone else) prepared to write down conclusions, assign responsibilities, and determine time limitations? Will an appropriate amount of time be made available for a question and answer segment? Will the meeting conclude with a summarizing of the discussion, a re-stating of the conclusions, and a going over of the agreed upon next step(s)?

10. *Follow Up*. Will everyone receive a copy of the meeting's minutes? Who will ensure that whatever has been agreed upon will be completed? Who will monitor or measure the meeting's results? How will this be done?

Pitching a Proposal

Most meetings provide a brief opportunity for attendees to pitch a proposal or try to win others over to their way of thinking. For a supervisor or manager intent on 'selling' efficiency, sustainability, and waste reduction to company colleagues, this is the chance to shine. Just bear in mind that success or failure will probably hinge on the seller's desire to serve his or her 'customers' as well as an ability to speak the language of the 'customers' he or she is addressing. Welcome to the world of selling, where putting the needs and interests of customers ahead of one's own is the most winning of strategies.

Selling 101

They key to successful selling usually lies in understanding customers and their motivation. Two factors are involved. The first is moving toward a goal or reward. The second is moving away from a fear or loss. According to sales genius Tony Parinello, if you can work out which one of these motivates your customers (or can figure out how both of them can), you're on your way to making a sale (Parinello, 2003).

Selling Efficiency, Sustainability, and Waste Reduction to Others

Don't assume that talking about financial savings and profit increases will win an audience over to efficiency. Yes, this type of information can be made interesting and intriguing, but according to many practitioners it rarely instigates action – and *action* (e.g.: approval, authority, and, funding) is what you're after. Before pitching an efficiency proposal, do a bit of research and identify a specific problem your business faces. Once that information is known a proposal can be tailored to show how it will help those who have the power to act. For example, if an astute salesperson wants to sell first-aid kits to factories, rather than explaining the low cost of the kits, the advanced materials they contain, the lives they've saved, or the design awards they've won, he or she will first find out what injuries have been suffered in the past by the business he or she is targeting and then use that information in the sales pitch. In a chemical factory where employees are prone to burns this could be accomplished by saying, 'Studies show that by using our first aid kits, chemical burn scars are reduced by 63-percent and pain is reduced by up to 80-percent. Furthermore, by having our kits on your premises, your insurance premiums can be lowered by up to 14-percent *and* your company will save an additional $2,000 per year because of the current discount we're offering. Our kits, and the support system behind them, will even help you sail through your next health and safety inspection.'

This type of approach helps the seller target three objectives. (1) It gets the customer emotionally connected to the product, (2) it targets the real problems of the customer with real solutions, and, (3) it shows the customer what is at risk by not using the product. In other words, in one fell swoop it shows how the customer can (a) move closer toward a goal or reward and, (b) move away from a fear or loss (Parinello, 2003).

Do Your Homework

The following advice comes from my own experiences as well as those of several managers interviewed for this book. Just because you think efficiency is wonderful and will save (and make) your company piles of money don't assume that your co-workers will agree. Most people are vaguely aware of the benefits of efficiency, but that hasn't prompted them to take action in the past so

why should it now? Remember to do your homework and target your customers. Calculate as accurately as possible the *exact* amount of financial savings your company can expect to achieve. Itemize all savings (or projected revenues) and combine this information with the agenda(s) of your colleagues. For example, if your calculations show that $25,000 can be shaved from the business's yearly electricity bills, and your company needs an additional worker in its production department, explain how this extra money can be used to pay the salary of that employee. If the company president has been trying to purchase new computers for the office, show how the savings from $40,000 per year in waste reduction activities can achieve that goal. If the shipping department needs a new vehicle or the operations team is desperate for a more advanced extrusion machine, state that these expenses can be covered by the $82,000 a year saved from the incorporation of sustainability concepts. Lastly, if your region, state, or country is poised to adopt new environmental legislation that could cost your company a fortune, show how taking action now can save the business $125,000 over the next five years. Proposals presented this way are difficult to ignore.

This Meeting is Adjourned

As with so much in management, a good meeting demands adequate planning, an examination of the whole picture, and a structured follow-through. If the previously mentioned ten steps are used and a positive answer can be found for most of the questions and issues raised, a manager interested in efficiency should be well on his or her way to making company meetings productive, enlightening, and - miracle of miracles - perhaps even anticipated (Scott, 2005).

Bibliography

Alderfer, Clayton, *Existence, Relatedness, and Growth*, Free Press, New York, 1992.

Band, William, *Creating Value for Customers*, John Wiley & Sons, New York, 1991.

Beck. Ernest, 'Do You Need to be Green?' *Business Week*, www.businessweek.com , Summer 2006.

Caudron, S., 'Delegate for Results', *Industry Week*, February, 6, 1995, pp. 27-28.

CNBC European Business, 'Climate Challenge: How You can Profit from a $600-billion-a-Year Emerging Profit', January/February 2007 (the entire issue is dedicated to this topic).

Cole, Gerard, *Management: Theory and Practice*, DP Publications, London 1991.

Edwards, L. & Torcellini, P., 'A Literature Review of the Effects of Natural Light on Building Occupants', the National Renewable Energy Laboratory (Technical Report), Golden, Colorado, July, 2002.

Friedman, Thomas, 'The Power of Green', *The New York Times Magazine*, April 15, 2007, pp. 15-19.

GreenBiz, 'Ten Keys for Educating and Engaging Employees', *The Green Business Letter*, Greenbiz.com, www.greenbiz.com/toolbox/printer.cfm?LinkAdvID=4201, accessed July 2007.

Hawken, Paul, & Lovins, Amory & L. Hunter Lovins, *Natural Capital*, Little, Brown and Company, New York, 1998.

Herzberg, F., 'One More Time: How Do You Motivate Employees?', *Harvard Business Review*, vol. 47, January-February 1968, pp. 54-63.

Janis, Irving, 'Groupthink', *Psychology Today*, November, 1971, pp. 43-46.

Janis, Irving, *Victims of Groupthink* (2nd edition), Houghton Mifflin, Boston, 1982.

Lewin, Kurt, *Field Theory in Social Science*, Harper Press, New York, 1951.

Makower, Joel, 'Meeting Expectations', #884, www.grist.org, 29 November 2005.

Manufacturing News, 'Natural Light Facility Boost Productivity 19% at DPC', www.themanufacturer.com (11, July 2002).

Matteson, M. T., 'Some Reported Thoughts on Significant Management Literature', *Academy of management Journal*, June 1974, pp. 386-399.

McClelland, D. C., *The Achieving Society*, Van Norstrand, New York, 1961.

MnTAP (the Minnesota Technical Assistance Program), 'Building a Successful Pollution Prevention Team', University of Minnesota, www.mntap.umn.edu, accessed October 2007.

NRDC, 'Building Green: Increase Employee Satisfaction and Productivity, www.nrdc.org, 2007.

Oakland, J., *Total Quality Management*, Butterworth-Heinemann, New York, 1993.

Ohio PPWM (Ohio Pollution Prevention and Waste Minimization), 'Organize the Pollution Prevention Program', *OPPWM Planning Guidance Manual*, www.epa.state.oh.us/opp/guide/p2pch8.html, accessed October 2007.

Parinello, Tony, 'Turning a Prospect's No into a Yes', www.entrepreneur.com/article/o,4621,309855,00.html, 14 July, 2003.

Robbins, S. P., & Hunsacker, P. L., *Training in Interpersonal Skills* (second edition), Prentice Hall, Saddle River, NJ, 1996

Romm. J. J. & Browning, W. D., 'Greening the Building and the Bottom Line: Increasing Productivity Through Energy efficient Design', Rocky Mountain Institute Publication D94-27, 1994.

Schein, Edgar, *Process Consultation: Its Role in Organizational Development*, Addison-Wesley Press, 1969.

Scott, Jonathan T., *The Concise Handbook of Management*, Haworth Press, New York, 2005.

Tuckman, Bruce, 'Developmental Sequence in Small Groups' *Psychological Bulletin*, vol. 63, pp. 384-399, 1965.

Tuckman, Bruce & Jensen, Mary Ann, 'Stages of Small group Development Revisited', *Group and Organizational Studies*, vol. 2, pp. 419-427, 1977.

US Department of Energy, The Office of Energy Efficiency and Renewable Energy, 'Applying Six Sigma Methodology to Energy-Saving Projects', www.eere.energy.gov (no date or author given).

Waterman, R. & Peters, j & Phillips, J, 'Structure is Not Organization', *Business Horizons*, vol. 23, no 3, June 1980, pp. 14-26.

PROCESSES

A *process* is defined as: (1) a series of progressive, interrelated steps or actions from which an end result is attained, or, (2) a prescribed procedure or a method of conducting affairs. Either way, processes form the belief systems, philosophies, or thought patterns that constitute the work environments in which goods and services are manufactured (seen from this angle, a business process can also be referred to as a 'business model' or 'the way we do things around here'). Most practitioners agree that for any business process to function properly, total commitment from all involved is mandatory. Success is also reliant upon a perfect fit between the process, its product, and the business's customers.

Chapter 12
Lean Thinking

Lean thinking (also known as *lean manufacturing*) is a business philosophy that demands the total and systematic elimination of waste from every process, every department and, every aspect of an organization. Although this may sound similar to the overall objective of efficiency, the difference with lean thinking is in the way that waste is defined. Lean thinking views waste as the use or loss of any resource that does not lead directly to what it is that customers want – and what customers want, say the advocates of lean thinking, is *value*. Any act or process in a business that a customer would balk at paying – or any process or act that can be eliminated without the customer noticing the difference - is often interpreted as having no value in lean-thinking.

The *Dell Computer Company* provides a good example of a company that embraces the lean-thinking concept. *Dell* became a computer-manufacturing powerhouse by allowing customers to personalize their purchase before a sale was made. In other words, *Dell* produced its products *after* it received a customer order. Until recently, before it decided to branch out into retail markets, *Dell* had a paying customer for every product it sold. No expensive inventory of computers was stacked away in a warehouse awaiting transportation nor were any shop shelves filled with unsold products. *Dell* never got stuck with an unsold product because only what its customers asked for was ever made. From the onset, one of *Dell*'s major production expenses involved maintaining a supply of parts to manufacture its products, but since these parts are designed for use in a variety of configurations every single one is always used sooner or later. Along with a focus on made-to-order merchandise, this allows the company to decrease its overheads and concentrate on client-oriented matters (Friedman, 2006) – all of which are hallmarks of lean-thinking.

The Wasteful Practices Inherent in Businesses

According to the *Cardiff Business School*, only five-percent of most business production operations are comprised of activities that directly relate to

what customers want in a product or service (CBS, 2007). This means that up to 95-percent of the activities in most businesses add no customer value at all.

Activities classified as 'non-value' can be split into two categories. The first, '*necessary, but non-value adding activities*', constitutes as much as 35-percent of most organizational work and is comprised of actions that do not directly contribute to what customers want in a product (e.g.: payroll, behind the scenes cleaning, the fulfillment of government regulations, and so on…). The second category, '*non-value adding activities*', can comprise up to 60-percent of work activities, yet adds no value to customers in any way, shape, or form (e.g.: production line snags, waiting periods, unnecessary paperwork, end-of-line quality inspections, etc). The aim of lean thinking is to find and eliminate the wasting of time, labor, materials, and money in both categories.

The Origins of Lean Thinking

Lean manufacturing goes back a long way. In 1926, Henry Ford was reported to have said that one of the greatest accomplishments in keeping the price of his automobiles low was the shortening of their production cycle. The longer a product takes to manufacture, he said, and the more it's moved about, the greater the cost.

After the Second World War, Eiji Toyoda (of the car company that bears his family's name) took Ford's words to heart. He visited American car manufacturers to learn about their production methods and returned to Japan intent on practicing what he'd learned. With the assistance of his colleagues, Taiichi Ohno and Shigeo Shingo, Toyoda spent years refining and continuously improving upon waste reduction. Eventually he hit upon the idea of trying to eliminate all the non-value tasks in his business for which customers were not willing to pay. Ohno in particular, became so good at eliminating waste while streamlining operations that the concepts and techniques he developed are now widely known as TPS (the *Toyota Production System*). Having witnessed American supermarket systems in the United States, Ohno came to realize that the scheduling of work should not be driven by production targets, but rather by sales. TPS concepts and techniques have since been reintroduced back into America under the umbrella of lean-thinking or lean-manufacturing (Alukal &

Manos, 2007). When incorporated into service firms such as banks, restaurants, hospitals, and offices, lean-thinking concepts are referred to as 'lean enterprise' (in other words, lean-thinking can be applied any place work is performed).

Why Go Lean?

According to James Womack and Daniel Jones, authors of the book *Lean Thinking: Banish Waste and Create Wealth in Your Corporation* (1998), the lean process is highly supportive of human dignity and begins by reassuring employees that no jobs will be lost. Once that fear has been eliminated companies have been known to enjoy 400-percent *increases* in production and 400-percent to 1,000-percent *decreases* in delays, inventories, accidents, defects, errors, and scrap. Womack and Jones go on to claim that if a business cannot: (1) quickly reduce its product development time by half, (2) cut its order processing time by 75-percent, and, (3) decrease production times by 90-percent, then the business is doing something wrong.

Why does Lean Thinking Elicit Strong Emotions?

Lean thinking contradicts just about every established production theory taught in business schools because it advocates making a shift from conventional 'batch and queue' production practices (i.e.: the mass production of large lots of a product based on anticipated demand) to a 'one-piece flow' system that produces products in a smooth, continuous stream based on customer demand (EPA, 2007). This means that customer wants must first be identified before manufacturing begins. Customer demand then 'pulls' a product or service through the manufacturing process rather than having the business push its mass-produced goods onto the market. Anything that does not contribute to the pull of customer demand is considered waste.

Typical Forms of Waste

Aichi Toyoda and his colleagues originally identified seven common forms of waste, but over time two more have been added. Today, the nine forms of waste that lean manufacturing seeks to reduce or eliminate are:

1. *Over Production*: which is defined as producing more information or product than a customer requires, or making the product or its components earlier than is required, or making them faster than required.
2. *Waiting*: the time spent waiting on materials or information.
3. *Moving Items* (i.e.: *Transportation*): needlessly shifting, storing, stacking, or filing materials and information, or needlessly moving people, materials, and/or information from one point to another.
4. *Over-Processing*: the time and effort spent processing information or material that does not add value to the product (usually in the form of unnecessary paperwork or employees or managers seeking approvals).
5. *Inventory*: any and all materials or information awaiting processing.
6. *Unnecessary Motion*: any activity that does not add value to a product or service.
7. *Defects*: the unnecessary repairing, scrapping, or re-working of material or information.
8. *Employee Resistance*: the political posturing, stalling, or passive resistance taken by employees in the hope that 'this project will also soon pass'.
9. *Under-utilizing People*: not involving all employees and not using everyone to their full potential.

The Obstacles to Lean Thinking

Like any new practice, introducing lean thinking into a business can create resistance. Following are typical objections that managers and employees have used to avoid lean thinking practices:

- *'What I do (or, my department does) is different. Lean thinking doesn't apply here.'*

The lean thinking response: It's true that most people consider themselves and what they do to be unique within the business that employs them. Unfortunately, no person or function is out of the overall loop. Waste exists everywhere and according to the lean thinking mantra, any activity for which a customer is unwilling to pay must be eliminated, simplified, reduced, or integrated.

- *'Lean thinking would take too long (or cost too much) to implement in my business.'*

The lean thinking response: This probably is the most common argument pitched against lean thinking practices because every business wants optimal improvement with minimal investment. Simply put, it makes no sense to avoid change while thousands of dollars are lost every year due to wasteful practices.

- *'Things like this don't work in our industry.'*

The lean thinking response: Change, it is said, works in two ways; it can either be used by you or it can be used to run over you. If a business doesn't change, rest assured that at some point its competitors will. When that happens trying to catch-up to competitors usually ends up costing more than the initial change.

Starting the Journey

Lean thinking is based on five principles that must be thoroughly researched and agreed upon before work can begin. They are as follows:

1. *Specify what the customer defines as value*. To obtain and record this information, a *customer database* should be established. A customer database lists and describes the wants, needs, buying behaviors, and other relevant information of paying customers. If answers to questions in a database are unknown, customers should be asked to supply them. This is best accomplished through attentive contact. It needn't be (and shouldn't be) an interrogation. Working separately, employees may not be aware of the whole customer picture, which is why a database - and its accessibility - is so important. As with most good business practices, setting up a customer database is not complicated (software programs are available). Many customer data bases are simple and look something like this:

    A. Customer Specifics
        - Name, Address, Age, Gender, Profession...
        - Geographic location and/or demographics
        - Economic information (such as income level)

- Basic needs and requirements
- Specific customer demands

B. Purchasing History
- Is the customer a long-term client, a short-term client, or is this a first-time purchase?
- Time limits the customer is working under
- Type of product purchased and the amount purchased
- Brand loyalty
- Reason for buying (price, convenience, a spur of the moment decision, etc.)

C. Future Prospects
- What are the customer's future plans?
- What might he/she/they need in the future?
- What type of future expenditures is the customer likely to make?
- How much can they spend? How much will they save by buying from us?

D. Other Pertinent Questions
- How did the customer hear about us?
- What does the customer need that we currently don't offer?
- How can our service be improved?
- Is the customer difficult? (explain)

2. *Draw up a value map*. A value map is much like a process map (see Chapter 5) with one distinct difference: a value map starts from the customer end and makes a clear distinction between value-added activities (transformational activities for which the customer is willing to pay) and non-value-added activities (activities that add cost without adding customer value). Some experts suggest making a third list of non-value-added-necessary activities, which create no value, but cannot be eliminated (i.e.: payroll, legal regulations, cleaning, etc…) so that everything is included. Once again, the idea is to eliminate, simplify, reduce, or integrate all non-value-added activities. If a customer were to observe a process and balk at paying its cost or, if a process was eliminated and the customer can't tell the difference, then it probably has no value.

3. *Place all value-creating steps in a tight sequence so the product flows smoothly toward the customer*. On the shop floor, this may involve moving machines and equipment into a tight assembly-line type sequence to minimize material and product movements as well as storage needs (see Chapter 34 and the section titled *Chaku-Chaku*). Successful lean-thinking practitioners often explain this stage by using the six-S model below.

    - *Sort* – Determine exactly what employees need to create customer value (tools, equipment, supplies, materials, etc). Eliminate all other clutter. Tools, production equipment, and information systems should be right-sized so they produce exactly what is needed – no more, no less. For example, many companies buy expensive equipment that produces huge amounts of unneeded materials with the belief that in the future customer demand will increase to a level the equipment can produce. If *current* requirements don't justify this level of production, however, such a strategy can be both costly and wasteful.
    - *Stabilize* (or *Set-in-Order*) - Place tools, equipment, supplies, and materials in logical sequences where they are needed rather than in off-to-the-side areas (in lean-thinking terminology this is called *Point-Of-Use-Storage* or *POUS*). Employees must take part in ensuring that the design, selection, correction, and maintenance of every machine, tool, and process is accurate and ready to perform without interruption.
    - *Shine* – Inspect work areas and eliminate physical barriers so that everyone can see (literally) what is going on. This allows for further introspection and observation.
    - *Standardize* – Reduce all variations, integrate processes, use standardized parts and materials where appropriate, establish uniform delivery schedules, make performance measures transparent, and empower each manufacturing unit so that it has the capability to produce exactly what is required without having to move along multiple work centers.
    - *Safety* – Develop and maintain a strict adherence to safety concerns, teachings, and practices.

- *Sustain* – Enforce a continuous commitment to change with robust planning, regular inspections, much patience, trial-and error allowances, and a good reward and recognition program.

4. *As flow is introduced, let customers pull value from the next upstream activity*. While wasteful activities are being reduced or eliminated, shift the business's efforts toward letting the customer determine production quantities. Remember, the point of lean-thinking is to create an enterprise that is responsive solely to providing what paying customers want, when they want it. No more, no less. This type of setup demands:

    - the building and maintenance of strong relationships with customers,
    - a streamlining of entire systems -- not just parts of the system,
    - the removal or re-assigning of anchor draggers (people or processes that slow down operations),
    - immediate results from everyone,
    - informing people that two steps forward and one step backward is okay; no steps forward is not okay,
    - the circulation of lean thinking strategies in every department and procedure,
    - the creation of a lean accounting system,
    - paying employees in relation to their performance, and,
    - asking suppliers and customers to also think lean.

5. *Keep going*. Just as with quality and efficiency, there is no finish line associated with lean-thinking. Once a system or process has been improved or fixed – DO IT AGAIN! Never stop observing, analyzing, questioning, and improving (sources: LEI, 2007; EPA, 2007; Alukal & Manos, 2007; and the *Lean Thinking Institute*, 2007).

Ready to Begin?

Many experienced lean thinkers suggest kick-starting the lean process via the following:

1. Find a leader who is willing to take responsibility for the lean transformation.

2. Research lean-thinking practices and inform *everyone* about them (i.e.: initiate a training program).
3. Find a change agent (a wasteful practice or a bottle-neck area) or locate (or create) a crisis for which action must be taken, or select a pilot project and run it for a few months during which time you can evaluate, review, and learn from, your mistakes.
4. Involve others and begin making changes as soon as possible. Don't procrastinate and don't waste time establishing any 'grand plans'.

Lean Thinking Weaknesses

Despite much positive press, lean-thinking has inherent weaknesses (both physical and behavioral) that must be prepared for. The good news, advocates say, is that these weaknesses can be avoided if researched in advance.

Physical weaknesses include making lean changes in production when:

- The design of the product or service is not ideal.
- The product or service is not economical.
- Customers are not satisfied with the current design of the product.
- The product's configuration does not fulfill the functional requirements of the market or the consumer.

Behavioral weaknesses include:

- Management does not support and nourish change.
- Measurement is not taking place.
- Lean thinking methodology is seen or addressed as a tertiary or secondary issue.
- Managers and employees are not rewarded for the improvements they make.
- The values of the business are not in sync with lean-thinking concepts (Nave, 2002).

A Recap: Lean-Thinking Summarized into Ten Concise Steps

1. Eliminate waste.
2. Minimize inventory.

3. Maximize flow (streamline processes).
4. Determine and meet customer requirements.
5. Pull production from customer demand.
6. Do everything right the first time.
7. Empower workers.
8. Allow for changes to be made rapidly.
9. Partner with suppliers.
10. Create a culture of continuous improvement (AHRQ, 2007).

For more information about lean thinking in the USA, visit the *Lean Thinking Institute* at: www.lean.org. In Europe and the rest of the world, visit the international arm of the LTI at: www.leanglobal.org.

Chapter 13

Waste Reduction, Service, and the Economy

As far back as 1973, several far-sighted individuals working for the *European Commission* realized that as demand grows oil prices are going to continue to increase and no matter how many jobs are created in the coming years it probably won't be enough to satisfy the continent's growing population. Not knowing the solutions to these challenges, the *EC* asked Walter Stahel, an architect working out of Switzerland, to see if there was a relationship between energy use and manpower and, if so, to examine it. Several months after looking into the matter, Stahel discovered that roughly three-quarters of all industrial energy consumption is associated with the extraction and/or production of basic materials. The remaining one-quarter, he observed, is used in the transformation of materials into finished goods or buildings. Conversely, he noticed that the opposite is true of labor. About three times the manpower is used to convert basic materials into finished products (or buildings) than is required in the extraction and production of basic raw materials (see FIGURE 13-1).

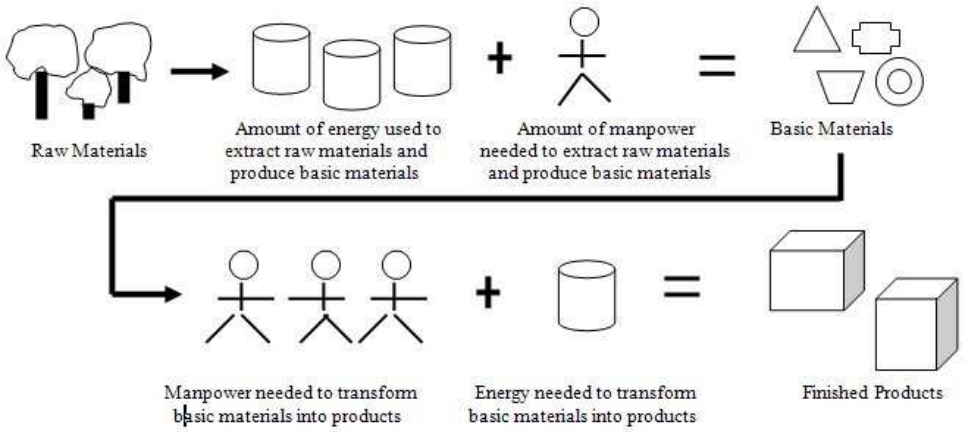


FIGURE 13-1

Being an architect, Stahel used this information to conclude that it's less wasteful and more cost effective to remodel old buildings than construct new ones. In other words, extending the life of a building draws out the value of the labor and energy that went into it. For example, increasing the use of a building to twice its intended life means that the original costs of its materials and energy are halved and the cost and subsequent waste of constructing a new structure are avoided. Perhaps not surprisingly, Stahel noted that his life-extension principle applies to most products as well. Put another way, it's less wasteful and more cost effective to reuse, recycle, or remanufacture existing products than to manufacture new ones from virgin raw materials (see Chapters 30 and 31).

Although it may seem simple, this observation is a business revelation because it reveals that in the first stage of many manufacturing processes more money is usually spent on energy than labor *when it could be the other way around*. In other words, by extending the life of the materials that go into a product or extending the life of the product itself - less energy is used, less waste and pollution is created, and more people are employed – with no long-term increase in costs (indeed, manufacturing costs tend to *decrease* with product life-extension practices).

To expand and build upon his idea, Stahel and a colleague (Orio Giarini) founded the Geneva, Switzerland–based *Institute de la Duree*, also known as the *Product-Life Institute* (www.product-life.org) to research and promote what they call a *service economy* (also known as a *lake economy* or a *functional economy*). Whichever term is used, the idea is that goods and materials should be used as long and as often as possible to promote a healthy, sustainable economy.

The opposite of a service or lake economy is a *river economy* or one in which raw materials continuously flow along an insatiable manufacturing stream and end up as landfill. In other words, the raw materials, manpower, and energy used to create river-economy products are used for a short period of time and then thrown away.

For the most part, there are two ways a more efficient 'lake economy' or 'service economy' can be created. The first is to reuse, recycle, or remanufacture products (or buildings) as often as possible. The second is to optimize the performance a product provides by converting the product into a service and keeping its materials in the hands of the manufacturer so they last longer. Like

reuse, recycling, and remanufacturing, offering a product as a service is designed to help increase the profit potential of the product by extending its life and the materials that comprise it. Before a product can be sold as a servicize, however, its benefits must first be carefully examined.

Benefit Perception

Benefit perception is defined as the advantage, gain, or benefit a customer wishes to obtain when he or she purchases a product. Understanding the benefit a customer seeks in a product is extremely important because good marketing is based almost solely on relaying the benefit a product provides. This is not as easy as it sounds. Although a benefit is usually the main reason why a customer is interested in buying a product it represents only one of three distinct attraction levels that every product has the ability to possess:

1. The *core product* is the first attraction level of a product and represents the actual benefit that a customer receives when he or she purchases the product. Put another way, the core product addresses the question: what is the buyer really after?
2. The *actual product* represents the physical attributes that make up the product and which separate one product from another in terms of quality, features, design, packaging, and so on.
3. The *augmented product* is the additional service(s) or benefit(s) tied to the core product to add value, such as free installation, a warranty, free delivery, credit, or after sales service (see FIGURE 13-2).

Needless to say, the benefit a product provides is usually found in the eye of the beholder. For example, the core product of most fast food restaurants can be seen as convenience. This explains why so many fast food establishments are situated in accessible locations. Confusingly, the core product could also be hygiene or uniformity, which is why many travelers choose to visit recognizable food establishments when journeying through unfamiliar areas. The actual product is the food being served. The augmented product could be a sale or promotional scheme used to add value.

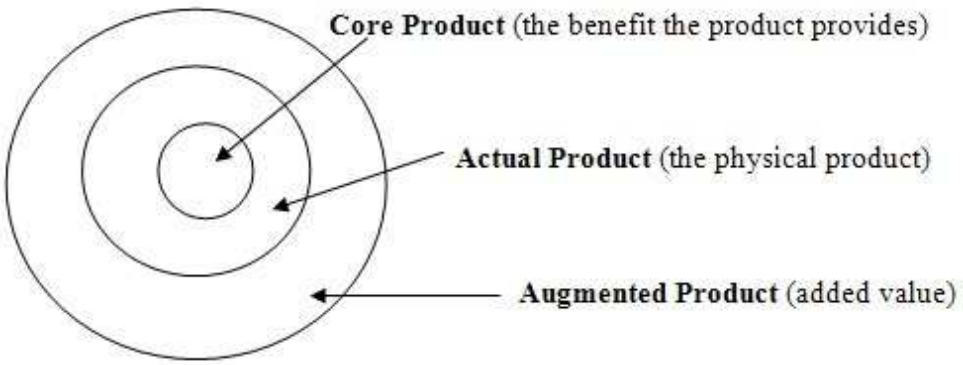


FIGURE 13-2: The Three Attraction Levels of a Product

The *core* product of a cosmetic company is usually the image the customer wants to obtain (e.g.: youth, sophistication, sex appeal, professionalism, etc.) by using the *actual* product. One cosmetic company CEO famously stated that her company sold *hope*. The actual product it sells is lipstick, make-up, rouge, eyeliner and so on. The augmented product can include two-for-one bargains, discounts, or other value-adders.

Now for the tricky part. The purpose of understanding benefit perception in a servicizing context is that most people, when they purchase a product, may not be interested in owning the product per say. Instead, they're probably seeking the *benefit* the product delivers. For example, when an airline passenger purchases a ticket, he or she seeks the benefit of traveling from one place to another. No passenger expects to purchase a part of the plane. This line of thinking can be adapted to fit other situations as well. For example, when consumers buy home heating oil most of them don't want to own a dirty, toxic, and expensive fossil fuel. Instead, they want the *heat* the oil provides - not the substance itself and certainly not the expense or involvement of delivering, containing, and burning the oil.

Adding Service to the Equation

A second business concept that is fundamental to the understanding of servicizing is an appreciation of the importance of service. Good service is seen by many successful business practitioners as one of the best ways to compete

against rivals. Stories abound, for example, about how local businesses have succeeded going head to head against *Wal-Mart*, *Office Depot*, and other giants by offering specialized services that many big companies cannot, or will not, provide. As mentioned in Chapter 7, good service is about knowing what makes customers feel unique and special – and that requires customer input. In her book *Alpha Dogs: How Your Small Business Can become Leader of the Pack*, author Donna Fell describes how a small bicycle shop in direct competition with a local *Wal-Mart* continues to rack up sales by knowing more about bikes than the folks at *Wal-Mart*. Furthermore, the shop offers upgrades, specialized repair services, and return policies that *Wal-Mart* could never offer and it actively listens to and implements the ideas that its customers suggest. For example, a customer once asked if he could rent a couple of mountain bikes. The business owner had never considered doing this before yet he nonetheless loaned two of his bikes to the customer on the spot. In return, the impressed customer (who happened to be a business consultant) donated thousand of dollars worth of free team training sessions to the owner's employees as a way of saying thank you. In another example, a shop owner fought against a giant retailer by giving free professional advice and offering house calls to his customers – something his large competitor wouldn't dream of providing. Further west, the owner of an ice cream parlor regularly beats her rivals by sponsoring community events and offering unique customer entertainment including 'locking in' customers at closing time. Before being granted permission to leave, the customers are 'forced' to dance *The Time Warp* from *The Rocky Horror Picture Show* – a practice that results in scores of customers wanting to be locked in almost every night.

As these examples show, personalized service not only keeps customers coming back - it can also help a business keep track of the benefits its customers seek. Studies have shown that a business can lose 20-percent of its customers if its products are of poor quality, yet 66-percent can be lost if the service itself is perceived as being poor. Additional statistics claim that it costs five to ten times more to attract new customers than it does to retain old ones – and that the average company can lose half its customers every four years if it's not careful.

Putting Benefit Perception and Service Together

Safechem, a division of *Dow Chemical* in Germany, is a chemical distribution company that delivers a range of services to general industries across

Europe. These services include waste collection and refinement, parts washing, oil collection, and chemical recovery and disposal. In short, *Safechem* is a service company. Its customers do not have to purchase the chemicals they need to conduct their operations nor do they have to pay for costly application equipment or high disposal fees. Instead, *Safechem* focuses on the benefits its customers seek by traveling to the place where its customers work and applying any needed chemicals for them. Afterwards, *Safechem* cleans up the work site, transports the used chemicals back to the *Safechem* workshop, and cleans and/or recycles everything that was used - including the chemicals, the washers, the spray guns, and the steel drums - in preparation for the next customer. This way, by selling 'square meters of cleaning' rather than gallons of solvents, *Safechem*: (1) extends the life of its materials, (2) focuses on the benefits customers seek, and, (3) reduces waste and costs by reusing its materials instead of making (or buying) more.

Clean Harbors Environmental Services in North America offers its customers similar services thereby reducing their overheads and ensuring that they're saved the expense of buying, storing, handling, and disposing chemicals.

The Payoff for Customers

Why would a customer want to choose a service (or the benefit a product provides) over a product itself? The incentives include:

- only having to pay for what is actually needed,
- the avoidance of major equipment purchases and subsequent maintenance costs,
- the elimination of end-of-life equipment and waste disposal costs, and,
- a reduction or elimination of inventory.

The Payoff for the Service Provider

Servicizing arrangements don't just benefit customers, they're also advantageous to the service provider. For example, in 2004 the Austrian government commissioned two studies that looked into the potential profitability that chemical companies have in regards to offering a service rather than selling a

physical product. Both studies concluded that over half of the 4,000 chemical companies in Austria would benefit by adopting a service program. Moreover, because of the efficiency inherent in a service system, it was estimated that chemical consumption in Austria could be cut by a third and the average company could expect cost savings equivalent to over $12,000 per year (Perthen-Palmisano, 2004). Bear in mind that although the chemical industry is being used extensively as an example in this chapter, chemical companies are not the only businesses that can benefit from a servicizing arrangement. Similar schemes have been devised for home washing machines (the customer would only pay for the number of washes), computers, cars, refrigerators – indeed, almost any product that is traditionally, bought, used, and thrown away.

The *Michelin* tire company, for example, has moved into selling the *performance* of truck tires rather than just tires, because it can produce a long-life tire that's easy to re-tread, thereby earning a higher profit. If a tire can travel twice the distance the company gets twice the money whereas, alternatively, if it produces a longer-distance tire that lasts twice as long, the buyer would probably not pay the higher price involved and company turnover would decrease.

The hotel industry has benefitted from a similar practice for years thanks to linen suppliers that provide a service rather than sell a product. Many hotels do not own their linens (sheets, towels, etc). Instead, these items belong to a textile company that does the washing and repair with an average economic break-even point of around three years per item. In other words, the linens have to last at least three years before the company can make a profit so the company is driven to lease high quality textiles that last longer. A similar example, called pay by the hour, is found in the gas turbine industry. Once again, the benefits enjoyed by the service provider include:

- control over the maintenance of the product and its equipment, which can translate into longer product life.
- the lowering of unit production costs because not as many units have to be produced (which reduces material and energy consumption).
- wastage is reduced to very low levels because money saved in waste reduction means lower costs and more profit for the provider.
- revenues either increase or are solidified because services are usually needed by customers continuously throughout the year, whereas equipment

purchases, particularly big-ticket items, are often only made during times when customers can afford them.

- a new dimension is added to the service provider's product portfolio package, which can provide a much needed boost in company competitiveness.
- skilled jobs are created because workers not needed on production lines can be trained as service appliers.
- overall waste is reduced because the product itself is no longer moving as quickly toward landfill.

The Hurdles

Obviously, servicizing is not a one-size-fits-all concept nor is it a practice that can be adopted overnight. Before most products can be servicized, the standards, operations, and procedures of the service provider must be adapted to work hand-in-glove with those of the service buyer to avoid dysfunctional conflict. Agreeing on a service fee is another formidable task that requires a full understanding of all operations and their costs. Additional servicizing challenges exist in changing outdated behaviors and old ways of thinking; both the service-provider and the customer may find it difficult to overcome institutional and personal stubbornness. Customers, for example, must break the habit of what Jonathan Chapman, senior lecturer at the *University of Brighton* (UK), calls 'adulterous consumption'. Chapman compares the possessions that consumers purchase with the idea of adultery. 'We make a commitment to one thing and then become distracted by a younger model,' he says, '(because nowadays) everything is temporary if we want it to be.' (Douglas, 2007). What Chapman is referring to is the human desire to own the products that we use – even though this attachment often vanishes when a newer version becomes available. This throwaway-and-buy-another addiction is difficult to stop not least of which because many businesses profit from, and promote, it. Indeed, the entire concept of 'Industrial design was specifically invented to convince people that their washing machine, their car, or the refrigerator they had was out of fashion,' says Walter Stahel (Grogan, 2006).

When one takes into account the low prices of everyday durable goods the concept of servicizing can become even more difficult to implement. 'You can't find anybody who will work on a microwave oven now,' laments Steve

Cruciani, owner and operator of *Steve's Appliance Installations* in Berkeley, California. 'What's the point? For $65 you can get another one.' (Nevius, 2005).

But the main reason why servicizing is of little interest to so many businesses (particularly small to mid-sized businesses) is the initial costs that can incur. Without a minimal density of goods on offer, servicizing products (i.e.: reverse logistics: collecting, taking apart, and remanufacturing used products) can be difficult and expensive. Selling a product outright avoids such problems because it delegates disposal responsibilities to the buyer. Even big companies can be turned off by servicizing not least because servicizing requires a uniquely different mindset. Large production-oriented businesses, for example, traditionally invest more in capital expenditures because they are geared toward a production setup intent on making as many products as possible. Service businesses, on the other hand, tend to invest more in research and development. A servicizing setup can therefore pose difficulties in terms of resource allocation to an organization that wishes to do both. More to the point, becoming service-based requires long-term thinking and commitment, which goes against the short-term production strategy of many companies (White, et al, 1999).

Lastly, although a service-oriented selling system is applicable to more products than most manufacturing-oriented businesses would admit, sometimes servicizing does not make sense. For example, a hardware store that sells drills may find it difficult to market and sell a hole-drilling service because the less expensive a drill is to buy, the more impractical and obsolete a hole-drilling service becomes. Moreover, a hole-drilling service may not be available when it's needed - or customers may want to drill holes on their own and conclude that owning a drill and having it on hand is more cost effective than paying for a service. In these situations, equipment rentals can handle short-term customer requirements. In the long-term, however, an alternative is needed that maximizes the benefits that servicizing provides while avoiding the perceived stigma of non-ownership. And that, say several pioneering industrialists, is found in leasing.

Chapter 14

Leasing, Waste Reduction, and the Economy

To say the least, leasing is a popular practice. In 2003 alone, American businesses spent $208 billion, or 31-percent of their asset acquisitions, on leases (GRA, 2007). A lease is an agreement between a product provider (the lessor) and a customer in which the lessor maintains ownership of a product while the customer uses the product for a fixed period of time. Generally speaking, leases fall under two categories: capital leases and operating leases. A capital lease is a financial agreement in which the leasing of the product is treated as a loan for accounting purposes. At the end of a capital leasing period, ownership of the product usually transfers from the lessor to the customer as though the customer had actually purchased it. An operating lease (also known as a *true lease*) usually requires that the leased product be returned to the lessor at the end of the lease term (in some cases the customer can purchase the product at the end of the lease agreement for its fair market value). Throughout this chapter, the word *leasing* refers to an operating lease.

Cradle to Cradle

After formulating his 'energy versus manpower' production ratio (see page 131) Swiss industry analyst Walter Stahel coined the phrase 'cradle to cradle' to help explain his notion of a 'lake economy'. Today the phrase 'cradle to cradle' is commonly used in connection with closed-loop business practices and *sustainability* (i.e.: reusing replenishable parts or materials that have already gone through a manufacturing process instead of extracting and processing virgin materials). According to Stahel, in an ideal cradle-to-cradle (or closed-loop) system, waste would not exist because waste would be used as a raw material. In other words, when a well-designed product reaches the end of its useful life it would be returned to its manufacturer to be reused, recycled, or remanufactured (see Chapters 30 and 31) into a different or similar product.

Many researchers credit the *Xerox* corporation with pioneering cradle-to-cradle practices when it started leasing its photocopiers instead of selling them in the 1980's. Just as with servicizing, the idea was to provide the company with a reliable source of parts and materials that could be used in remanufacturing processes. Two decades later, Michael Braungart (a German process engineering professor and founder of the *Environmental Protection Encouragement Agency*) and William McDonough (an American architect renowned for incorporating sustainable practices in his designs) expanded upon cradle-to-cradle thinking. In their book *Cradle to Cradle: Remaking the Way We Make Things* (North Point Press, 2002), Braungart and McDonough state that no matter how many parts a product has, they can be placed into one of two categories: (1) those derived from *biological* nutrients (parts or pieces that can be safely reintroduced into the environment where they will be naturally broken down into compost or fertilizer), and, (2) those that are built from *technical* nutrients (materials that can be reused in manufacturing processes). The implications of this will be explained later.

How Leasing Helps 'Close the Loop'

The *Collins & Aikman Floorcovering* company (now part of the *Tandus Group*) is widely considered to be the first business in the carpet industry to adopt closed-loop practices by collecting and breaking down old carpets into material for new carpets. Much to the company's surprise, making carpet backing from re-processed carpet waste not only proved to be much cheaper than that made from virgin raw materials, the end product also turned out to be more stable and softer. This pivotal discovery reduced the company's raw material costs, resulted in a new and inspiring company motto ('Mining buildings rather than resources') and allowed *Collins & Aikman* to enjoy double-digit growth in both revenues and profits when the entire carpet industry was growing at about four-percent a year (Hart, 2005).

With old carpets proving to be a superior raw material source, it wasn't long before another multinational carpet corporation, *Interface*, got in on the act. *Interface* makes 40-percent of all the carpet tiles sold on earth, has manufacturing centers in 33 global locations, and sells carpets in 110 countries on six continents. Such activity consumes a lot of raw materials and produces a lot of waste. Since most carpet-manufacturing processes require two pounds (about one kilogram) of

fossil fuel to make one pound (almost half a kilogram) of carpet material, and carpets can take up to 20,000 years or more to decompose, the head of *Interface*, Ray Anderson, decided that it would be in the best interests of his company to:

1. drive waste out of the company completely,
2. emit only benign emissions,
3. harvest old carpets into new carpets rather than use virgin raw materials,
4. only utilize renewable energy in production processes,
5. transport products from the factory to customers as efficiently and cleanly as possible,
6. sensitize people and communities about sustainable practices, and,
7. reinvent commerce itself using improved leasing services (de Blas, 2000).

To achieve these goals, *Interface* developed what it calls an 'Ever Green Lease' in which the company focuses on servicizing or leasing what a carpet is supposed to deliver rather than selling the carpet itself. According to *Interface*, color, texture, comfort underfoot, acoustics, cleanliness, ambience, and functionality are the reasons why most people wish to have a carpet. Since it's not necessary to own a carpet to obtain these benefits, *Interface* looked into the challenge of how it could lease these benefits instead of selling them. This way, *Interface* would retain ownership of its products as well as the value of the materials, labor, and energy that went into making them. Additionally, because servicizing demands a close relationship with customers to define what they want in terms of service - and the company needed to establish a steady supply of recyclable raw materials to make its leasing concept feasible – the people at *Interface* realized they had to do some work.

Through in-depth research, *Interface* discovered that most carpet wear occurs in heavily trafficked zones leaving the areas around furniture and walls virtually untouched. This is good news for customers because it means that when a leased carpet begins to show wear, *Interface* will come in, pull up the worn areas, and immediately replace them (a service that is part of the lease arrangement). Customers are thereby relieved of the expense of purchasing a new wall-to-wall carpet as well as the time and bother of shutting down an entire work area while a new carpet is installed. Moreover, the customer is not responsible for the costs of disposing the old carpeting because *Interface* takes it

back to its factory and uses it to make new carpets. Further cost reductions for *Interface* and its customers have come about as the company substitutes oil-based carpet fiber materials with more environmentally friendly fibers that use less materials (and energy) and create less production waste.

The payoff from these improvements has been enormous. By changing from a carpet selling business to one that more resembles asset management and reclamation, *Interface*, which claims to be halfway to achieving its sustainability goals, doubled its revenues, nearly doubled company employment, and tripled its profits (Frenay, 2007). Moreover, its stock price has increased 550-percent over the past five years.

Not to be outdone, *DuPont* has developed a similar carpet leasing program to enhance its carpet manufacturing arm. *DuPont*'s leasing service includes free consultations, quick installation that minimizes business disruption, professional cleaning, and on-the-spot spill and stain removal. Furthermore, because *DuPont* runs several different manufacturing operations, fibers from its carpet reclamation process can also be used to manufacture auto parts and sound insulation products (White, et al, 1999).

It's Not Just Carpets

Chemicals, carpets, and photocopiers aren't the only products that can be designed to take advantage of closed-loop leasing arrangements. Electronic equipment, paint, cars, wood pallets, reusable totes, furniture, rags and linens, parts washers, almost anything – including temperature - can be leased. The *Carrier* air conditioning company in the USA, for example, leases cooling services to its clients rather than air conditioners (Hawken, et al, 1999). As with any leasing arrangement, ownership of *Carrier*'s air conditioning equipment is maintained by the company, which means that *Carrier* is highly motivated to keep its products in optimum condition. This means they last longer (which reduces costs). *Carrier* is further driven to ensure that the building where it administers its cooling service is energy efficient because the more efficient the building the better and more cost-effective its product will be, which translates into higher profits for *Carrier*. Customers love the arrangement because *Carrier*'s commitment to increasing efficiency, reducing waste, and lowering

costs ultimately means lower all-around heating and cooling prices for consumers.

In a similar fashion, the *Bank of Japan* collaborated with Japanese power companies to facilitate the leasing of energy-efficient automobiles, home appliances, and water heaters to everyday consumers. The aim is to encourage and promote the development of energy-efficient appliances while reducing the nation's energy requirements, carbon emissions, and waste. Appliances that aren't efficient are not allowed into the program, which encourages the manufacturers of wasteful products (who want to be included in the program) to make their products more efficient.

Does Leasing Always Close the Manufacturing Loop?

Unfortunately, no. Sometimes a customer will purchase a leased product at the end of the lease term and never return it to the manufacturer. Similarly, after a transfer of ownership, the customer may sell the leased product on the second-hand market. Both of these practices can break the closed-loop cycle needed for leasing to provide its benefits. Additional problems include the fact that some products - such as inexpensive goods and short-lived consumables - are not seen as compatible with leasing. In this regard, certain products may need months or perhaps years of redesigning or rethinking before leasing can become a profitable way to conduct business. For example, a comprehensive study conducted in 2000 revealed that the following eight characteristics must be met before a closed-loop leasing program can begin paying dividends:

1. The lease should be an operating lease.
2. The lessor should be the manufacturer of the product or be a captive leasing company (i.e.: one that 'captures' the product and returns it to the manufacturer).
3. The lessor must get the product back at the end of its life.
4. The manufacturer should put reuse and remanufacturing ahead of recycling as well as provide a guarantee that recaptured products will not be sent to an incinerator or landfill.
5. The manufacturer must redesign its products so they are easy to take apart and reuse.

6. The manufacturer must make structural and organizational changes throughout its operations to increase communication and facilitate closer working relationships between product designers, company managers, and consumers.
7. Guidelines, agreements, and incentives must be set for product collection and reclamation.
8. The manufacturer should display the results of its closed-loop programs every year in an annual report (Fishbein, et al, 2000).

Laying the Groundwork

Modifying a product for leasing usually entails improving the composition and life expectancy of the product and its components. This conveniently brings us back to the 'biological nutrients and technical nutrients' concept formulated by Michael Braungart and William McDonough. For a closed-loop leasing system to work, Braungart and McDonough state that the raw materials used to make a leased product should be replaced with ones that are easily reconditionable, remanufacturable, or recyclable. In addition, the product should be redesigned so it can be taken apart quickly and easily for reclamation. Additional considerations include:

- making the product more durable and difficult to damage (i.e.: improving its quality),
- making the components of the product more modular,
- standardizing the sub-components of the product,
- making the product easy to repair,
- making the product from components that can be reused in other systems and products, and,
- making the product multifunctional.

Leasing: The Good, the Bad, and the Ugly

Following is a recap of the advantages and disadvantages of closed-loop leasing practices:

Benefits for the Business (the Lessor)

- Operating leases can create personal and ongoing relationships between manufacturers and customers.
- When a product is returned to the manufacturer to be taken apart and recycled or remanufactured for further use, raw material costs can be drastically reduced.
- With leasing, a new dimension is added to product portfolio packages, which can provide a much needed boost to company competitiveness.
- Operating leases give manufacturers greater control over the resale market, which can impact favorably upon the volume of sales and the pricing of new products (Fishbein, et al 2000).
- As with servicizing, a leased product can provide a continuous flow of revenue into a company during economic downturns (as opposed to trying to sell the product during hard times).

Benefits for Customers

- Payments for use of the product are spread out over the term of the lease.
- Operating leases can have accounting and tax advantages by shifting costs from operating to capital budgets, thereby conserving cash and preserving credit lines.
- Leasing can prove advantageous if the lease allows for upgrades, product changes, and other value-enhancing options.
- End-of-life product disposal costs (i.e.: landfill and cleanup charges) are eliminated through leasing.

Benefits for Society and the Environment

- If designed properly (i.e.: in a sustained way) the throwing away of leased products can be kept at low levels due to the built-in extended life of the leased product (or its components).
- Leasing tends to create jobs because in addition to needing workers on production lines, service appliers may also be needed. Moreover, workers are needed to re-process end-of-life leased products (ILSR, 2007).

The Bad and the Ugly

- For customers, the costs of an operating lease can be higher than purchasing a product outright. Additional costs can accrue if the re-leasing, selling, recycling, or reclamation of the returned (leased) product has to be funded with additional revenues.
- For the business, when a product is sold, manufacturers typically receive payment at a point of sale. Under a lease arrangement, payments are spread out over the term of the lease, which can prove risky if a customer goes out of business or defaults on his or her payments before the end of the lease.
- A conflict can arise within a company that both sells *and* leases its products because products that are sold have different marketing objectives (usually based on current fashions or trends) than those that are leased (which are usually based on durability and extended product life). (Fishbein, et al, 2000)
- A shift from selling to leasing may raise antitrust issues, because leasing is sometimes interpreted as a means to establish greater control of the product market. For example, a separation of wholesale and retail sales was a major issue in the IBM and AT&T antitrust actions as well as the separation of American automotive manufacturers from their dealership systems (Frosch, 1997).

Conclusions

Leasing is a long-term profit strategy that demands long-term thinking. Customer needs and desires must be ascertained, insurance and liability issues must be addressed, employee training must be ongoing, and an incentive must be provided for customers to return leased products to the lessor after use (see Chapter 31). When these issues are ignored, the demands of EPR (Extended Producer Responsibility) legislation, which requires manufacturers to take back all forms of their products (including packaging) or face legal consequences, can be more difficult to achieve. With careful forethought and planning, however, leasing has proven to be a good way for companies to move closer to efficiency and sustainability while lowering production costs, increasing revenues, and decreasing waste.

Chapter 15
Cooperative Networking

In Scotland, a construction business asks for (and receives) the ash waste from a nearby coal-fired electric plant, which it then uses to manufacture building materials. In Australia, a building designer teams with a rival architectural firm, a renewable energy supply business, and a construction company to create affordable, energy efficient homes. In the United States, a business that produces merchandise from wood enters into talks with a plastics injection firm to discuss recyclable packaging ideas. Further north, a consortium of northeastern and mid-Atlantic states create a cap-and-trade program to curb carbon emissions. What in the world is going on?

Cooperating Businesses

With increasing frequency, businesses (and governments) are discovering that by working together with carefully chosen partners each can accomplish what was impossible for just one on its own. This is particularly true with small businesses that need help with large-scale projects or those that lack the funding to take on new activities. The term used to describe this practice is *cooperative networking*.

The notion of working together to achieve a common goal has been around for thousands of years. By definition, cooperative networking is similar to *cooperatives*, *co-ops*, or *collectives*, in that a group of individual entities join together to undertake an activity for the mutual benefit of all. By doing so, one or more businesses combine forces with either a competitor or a seemingly unrelated business (or both) to work together on a temporary or permanent basis. How popular is cooperative networking? A recent survey conducted in 14 countries revealed that 42-percent of small business operators have at one time or another joined with other businesses (including competitors) in order to maximize profits.

Seven-percent of those who had not, said they would like to do so in the near future (Scott, 2008).

For the most part, the reason why businesses join a cooperative network is because going it alone requires considerable cost, effort, and risk, all of which can be reduced when others get involved. In practice, the number of businesses in a cooperative can range from two to over 100. In Europe, for example, cooperative networks account for 83-percent of Dutch agricultural production, 55-percent of Italian agricultural production, 21-percent of Spanish healthcare, and over 50-percent of French banking services. On the European continent, companies partaking in cooperative business networks employ approximately 4.8 million people – 20-percent more than the total workforce of large corporations in the same regions (Lotti, 2006). The common goals shared by these and other business networks include:

- banding together to ask suppliers to produce more sustainable or eco-friendly products or materials,
- joint purchasing projects (purchasing materials in bulk as well as purchasing new capital-intense machinery, tools, production facilities, and micro-energy equipment such as solar panels and wind turbines, etc),
- sharing resources and skills (sharing equipment or facilities, or pooling information, expertise, or systems),
- identifying and researching market opportunities (finding and tapping into customer bases previously not considered or, perhaps, combining one or more products or services with those of another business),
- combining marketing resources and expertise (promoting the services and products of cooperative partners in advertising schemes, trade shows, and promotional schemes),
- combining logistics and operations (offering coordinated deliveries, designing new products, services or event packages, improving production capacity by sharing production lines, and so on), and,
- the creation of reuse or recycling programs in which the waste or discharge from one business is used as a raw material in another (Scott, 2008).

Getting Over the Hurdle

For many businesses the notion of sharing ideas, equipment, employees, and customers, as well as discussing problems and forming links with competitors, evokes strong negative emotions. This is particularly true of businesses that view the role of their rivals as an adversarial one. Conversely, a growing number of businesses insist that forming alliances is fundamental to survival. Indeed, the notion of cooperative networking often becomes more palatable once it's understood that cooperating is not about giving away trade secrets or merging with another business. Rather, it's about working with others in a complimentary fashion. No company should involve itself in a network if it seems likely that the benefits of joining outweigh the costs and risks. The idea is to enhance the competitiveness of all members, reduce costs, create new capital bases, increase advantages of scale, scope, and speed, and open up new markets. For example, the *Recycled Products Purchasing Cooperative* operating out of Encinitas, California works to promote the use of recycled paper in both the public and private sectors by running a purchasing cooperative that offers members information on services, prices, shipping, and the cost benefits of reusing paper waste.

As with most 'new' business practices, joining a cooperative network requires a different way of thinking – one that debunks the traditional go-it-alone business mind-set, which dictates that every company must supply its own research, product design, marketing, office support, supply routes, financial functions, production processes, and management. For example, many agricultural producers have discovered that by working together they can purchase and share expensive planting and harvesting equipment, decide which crops should be farmed, work to reduce water usage, and even set a fixed price for wholesalers. This prevents having to needlessly compete against other growers. It also lowers costs, decreases risk in the marketplace, and ensures a fair outcome for each participant. The legendary success and stability of cooperative networks, however, is perhaps the most enticing factor to those that join. Although cooperative networks are not infallible, businesses that cooperate are more apt to satisfy social and entrepreneurial objectives, avoid ethical and legal lapses, and, in general, be more economically vigorous and competitive, especially against larger rivals (Lotti, 2006).

What Type of Businesses Prosper Most?

The foremost indicator of a successful business network is a common purpose. For example, the *Tokyo Metropolitan Government*'s 'Municipal Environmental Protection Ordinance' in Japan developed a series of cooperative networks one of which involves a shared delivery system enjoyed by 15 different retail companies. By consolidating deliveries to the 30 stores owned by the 15 companies, the network reduced the amount of delivery vehicles on Tokyo's roads by 50-percent, which eased traffic congestion and reduced carbon emissions by 4,000 tons per year.

Even seemingly unrelated businesses have a chance at prospering from cooperation if they share a common goal. Consider the *Desert Knowledge Australia* (DKA) network project. The outback of Australia is an enormous area containing thousands of small businesses. Despite the fact that many are hundreds of miles apart they still compete for tourism dollars. In the past this competition resulted in the development of numerous factions and rivalries. With the introduction of the DKA network project, however, the combined resources of the cooperating businesses have enticed a wider array of customers by introducing 'desert experience' packages. These include inter-linking activities such as sporting events, pub-crawls, heritage trails, eco-tours, and so on, each interspersed with restaurant deals, hotel accommodations, and transport services. On their own, each of these businesses lacks the skills or resources to promote such services to a wider customer base. Working together, however, they can. In fact, many of the companies involved now believe that cooperating with others, apart from being practical, is a natural way to do business.

Getting Started

How do networks begin? Two methods seem to dominate. The first method uses a third party such as a business development center or a chamber of commerce to bring different entities together and propose working in unison. The *Chamber of Commerce* in Henrietta, New York, for example, initiated an education and assistance program with the *Audubon International Sustainable Communities Program* to help foster energy and waste reduction programs

between local government, business, and the community. *The San Francisco Bay Area Green Business Program* offers similar networking support.

The second approach to the creation of a network is more personal and involves the introduction of two or more like-minded businesspeople at a social gathering or, a personal agreement between long-term acquaintances.

Whether through a third party or a social introduction, the ingredients for a successful cooperating network revolve around mutual interests (and trust) combined with a can-do attitude. Once the details have been hammered out, the formation of an agreement can be put into action through methods ranging from legal contracts to a handshake. Every network has it own unique arrangement.

Advantages and Disadvantages of Business Networks

Of course, not every cooperative network is filled with sunshine and smiles. As with any group endeavor, cooperative networks are susceptible to people problems. For example, a network can collapse when a key player leaves or if members grow too like-minded and become immune to new ideas and new ways of thinking. Similarly, networks can contain some participants who take more than they give or there might be a general falling out between individuals that results in the taking of sides. Claims have also surfaced, which state that business networks can take a great deal of time to make decisions because all participants must be brought to the table to have their say before a course of action can be embarked upon.

Supporters counter these arguments by insisting that it's easy to dismiss unproductive or disruptive participants and that the more brains that are brought to the table for the purpose of making a decision the better the resolution. Moreover, proponents of cooperative networking say that once decisions are made they're often carried out quicker and with more enthusiasm than those made in big corporations. This is because commitments and involvement tend to be stronger when they come from people who share a mutual interest and reach an agreement together. By most accounts it appears that cooperative business networks operate under much the same principles, and therefore need the same forms of maintenance, as those required by teams (see Chapter 10). Additional advantages include:

- The establishment of improved communication pathways (if communication pathways are nurtured and encouraged).
- Increased human development and innovation (from the sharing of skills and experiences).
- Better long-range planning and experimentation due to the spreading of financial risk and the fact that most cooperatives are responsible to themselves rather than shareholders who demand nothing more than ever increasing returns on their investment.
- The satisfying of social needs (i.e.: cooperating business owners and managers do not feel alone).
- An increased feeling of openness and learning, which is fostered by a genuine interest in what other members have to offer.
- Strength in numbers.
- Increased feedback from customers, employees, and participants (usually because cooperating partners demand it).
- Improved problem solving due to in-depth discussion and implementation – particularly when it comes to servicing niche or specialized markets.
- Improved motivation (ample research shows that close personal business ties heighten empathy and increase altruistic behavior). [Batson, 1990]

The Rules of Cooperative Business Networking

Most cooperative business networks rely heavily on relationship building. In other words, the same elements that create and foster human relationships (honesty, communication, straight forwardness, integrity, wisdom, honor, etc…) appear to be no different from those needed to maintain successful business relationships. Unfortunately, with marital divorce rates as high as 50-percent (or more) around the world, many people seem to be in the dark when it comes to relationship building. Perhaps the expectation is that a good relationship can unfold on its own with no real effort from the parties involved. Or maybe too many wannabe cooperative network participants can't be bothered to conduct a basic background check before they enter into a network agreement. The following suggestions have been designed to help avoid these pitfalls:

1. *Be prudent and careful as to whom you wish to do business with*. The last thing you want to do is damage your business by connecting with dishonest brokers or tarnish your reputation through an association with a less than reputable network partner. Check the backgrounds of proposed partners and consult with others before shaking hands or signing on a dotted line.
2. *Be a good partner*. Instead of adopting a single-minded 'what's in it for me' attitude, balance the needs of your business against those of your cooperating partners.
3. *Be honest and sincere*. Always try to exceed the expectations of your partners. Never inflate your business's abilities and never steal ideas or clients from cooperative partners.
4. *Take the initiative*. Rather than waiting for partners to come to your aid, be the first to plan meetings, raise issues, tackle problems, and introduce needs.
5. *Stay committed*. Enthusiasm, or the lack of it, are both contagious. Offer referrals and information on a regular basis. Such actions tend to ensure that partners reciprocate in kind.
6. *Be reasonable*. Cooperative business networks are professional relationships and should not be considered as friendships. Keep partners close yet still at 'arm's length'.

In Conclusion: Advice from Businesses that have Successfully Cooperated with Others

- Cooperative business networks are not for everyone, but don't rule them out because of ignorance or fear.
- Check the background, attitude, and nature of prospective network partners as you would any employee.
- Before joining a long-term cooperative business venture test run the partnership by partaking in one or two short-term preliminary projects.
- Trust is everything when it comes to cooperative business networks – and as with any human undertaking, trust is developed when extra effort is voluntarily given and reciprocated.

- Measure the strengths and weaknesses of a cooperative business network and ensure a solid match is made with your business before rushing into a network agreement.
- Like any relationship, a business network relationship cannot be left on its own and requires regular fine-tuning and attention. What you put into is usually what you'll get out of it (Scott, 2008).

Chapter 16
Quality: The Efficiency Synonym

Quality – like efficiency (or pregnancy) – is an all-encompassing concept. A business either has it or it doesn't. Seen this way, perhaps no other word in the business lexicon is as misused as 'quality'. Most business magazines and books are absolutely brimming with stories about how implementing quality resulted in massive savings, enormous efficiency improvements, and/or a sea change in employee performance. Unfortunately, in too many cases, little if anything is mentioned about how this newfound quality was acquired – and therein lies the wrinkle because quality isn't about a cost-saving idea or some spectacular work-check program. Rather, it's an all-out, do-or-die, in-your-face, bottom line, fanatical way of thinking. But I'm getting ahead of myself.

In October 2007, the CEO of *Wal-Mart* (Lee Scott) met with a great deal of criticism and doubt when he announced his company's intention to become a more sustainable organization. Scott is convinced that going green is an engine for innovation across the board because he sees quality, efficiency, sustainability, and waste reduction as inseparable. As he puts it: '*Sustainability is here to stay. It's not a fad or a marketing ploy…it's a part of what all of us are going to be doing with our businesses from here on out. (Sustainability) is not about higher margins and higher prices. It's about the elimination of waste. It's about making our businesses more effective. (And) it's about transferring those benefits on to the consumer… One of the key roles of sustainability is it's going to cause us to have better products because we're going to be thinking about the* ***quality*** *in those products: what is the defective rate… what are the lifecycle costs? …Sustainability as a driving force (will enable us to) have better suppliers and enhance (our) reputation*.' (Makower, 2007)

Some History

Before explaining what quality is, it's important to look at where it came from (in a contemporary sense). The father of modern-day quality is considered

to be W. Edwards Deming. During WWII, Deming established spectacular results in various lines of production (upwards of 200% improvement) by believing in the value of employees. He stated that most troubles faced by companies begin at the top by people who put more of an emphasis on numbers rather than people and that superficial gimmicks and slogans usually substituted for real improvement. He also said that the common business workplace, riddled with fear and short-sightedness, often resists innovation and change through counterproductive internal competition. And he found that employee respect and involvement unleashed the kind of improvements that met the challenges of competition and a changing marketplace head on.

Unfortunately, when the war ended and the troops came home, too many age-old practices resumed. Meanwhile, Japan was desperate to recover from its losses. For years it had suffered a terrible reputation for making cheap, low-quality goods, so when it came time to rebuild, the country decided to do so in a different way. In 1951, Deming was invited to Tokyo to explain his quality-control techniques. Decades later, the quality of many Japanese products became legendary. Today, the highest award a Japanese company can win is the 'Deming Prize' – an honor so prestigious it's awarded on national television.

W. Edwards Deming's Points for Achieving Quality (abridged)

Just about every 'new' management concept taught in business schools today is a derivative of one or more of the following practices developed or expanded upon by Deming throughout his career. They include:

- Create a business culture that regularly asks for, and accepts, innovation.
- Invest heavily in training and research.
- Spend revenues on maintaining current equipment as well as acquiring new items.
- Work to improve every system – not just the end result of that system.
- Ask for statistical evidence of processes.
- Eliminate financial goals and quotas.
- Learn to motivate rather than give orders.
- Take the fear out of the workplace by providing an environment of constant learning.

- Break down barriers between departments and place an emphasis on communication.
- Eliminate superficial goals and slogans.
- Retrain people (and yourself) in new skills (Deming 1986).

Condensing the Master

Deming's thoughts on quality (throughout this chapter the word 'efficiency' can be substituted for 'quality') have since been reduced to three fundamentals and re-christened *Total Quality Management*:

1. *Quality is an ongoing process*. In business, quality is usually defined as the ability to meet customer needs 100-percent of the time. Because this is a statistical impossibility, perhaps it's best to think about quality this way: in every conceivable way, quality - like efficiency - is a race without a finish line because it requires a dedicated commitment to continuous improvement. Quality is not about checking for defects after a product has been made; it's about building quality into every process *before* a product is made so nothing has to be redone afterward. Perhaps one of the loftiest goals in the quest for quality is that of zero-percent waste reduction or *zero defects* (managing an operation that runs perfectly, creating a product that never needs improving, and so on). Unfortunately, like the notion of achieving customer satisfaction 100-percent of the time, obtaining zero defects is probably unobtainable. So why bother, right? Once again, it's best to view zero defects or zero-percent waste reduction as a *means* to an end rather than an end in itself. For example, the reason why we educate ourselves and read business books isn't because we seek perfection, but rather improvement. Most of us know that perfection is unobtainable, yet that doesn't prevent us from going through the perfection process. It's the same with quality.

2. Q*uality revolves around making improvements in everything an organization does*. This requires an intense focus on the customer. Keep in mind the definition of the word *customer* (everyone an organization serves) and you'll start to understand the difficulty inherent in instilling quality into a business. Quality involves breadth and depth in its implementation. If you recall, this

means every department in the organization must be made aware of the need for quality (breadth) and everyone within these departments must be actively involved in the quality process (depth). The entire concept of quality therefore hinges upon a shift in perspective from manager to employee. Too many managers think it's their duty to determine quality work solutions. The error in this line of thinking is that quality, like efficiency, isn't just a management issue – it's everybody's issue. In the search for quality, employees (and other stakeholders) have to be trained to not only seek out problems, but their solutions as well. This requires time and effort.

3. *Quality must be viewed as a measurable degree of excellence*. Quality entails looking at all of an organization's systems and then breaking them down into countable units (the amount of waste created, the amount of energy or materials used, the number of goods produced, the number of customers served, the amount of time it takes to perform a task, the costs involved, the average number of errors made, etc…). Only when everyone has access to an accurate system of measurement can a determination be made as to whether or not what is being measured is good, bad, or average. Against this data, improvements can be made.

The Eight Dimensions of Quality

According to D. A. Garvin (1987), competing with products on the basis of quality requires identifying and enhancing eight different dimensions. Knowing what customers seek in terms of these dimensions helps a business gain a competitive advantage in the marketplace. The following attributes (or dimensions) are usually what customers (and efficient businesses) look for when they talk about quality:

1. *Aesthetics*: how the product looks, feels, sounds, tastes, and/or smells.
2. *Conformance*: the degree to which the product meets established standards (i.e.: how green is it?).
3. *Durability*: the ruggedness or amount of use the product provides (i.e.: can it be reused, recycled, or remanufactured?).

4. *Features*: the 'bells and whistles' that supplement the function of the product or service.
5. *Perceived quality*: the product's reputation.
6. *Performance*: the product or service's main operating characteristics (i.e.: how well does it do what it's supposed to do?).
7. *Reliability*: the product's ability to work when it's expected to work.
8. *Serviceability*: the speed and courtesy of attention given to customers as well as the competence and satisfaction that repairs provide.

An efficient business recognizes each of these attributes or dimensions and seeks to provide them while eliminating waste. That being said, efficiency – like quality - is not about cutting back. Quality and efficiency are about creating improved processes and products in a way that lowers costs and increases productivity and value. The *US Navy*, for example, improved the quality and productivity of its submarine maintenance program by, in part, switching from toxic chemicals used in its cleaning systems to more environmentally friendly water based solvents. In the process, toxin use was reduced by more than 750 pounds (340 kilograms) and the man-hours required for cleaning were cut by 85-percent. Total costs savings amounted to nearly $400,000 (Jones, 2007). Further examples of quality/efficiency improvements include companies such as furniture manufacturer *Herman Miller*, which redesigned several of its products so they needed less packaging during shipping (a move that cut costs by a quarter of a million dollars). In addition, the company created reusable shipment containers, negotiated with vendors to use less packaging, and developed an annual waste exchange program with other businesses. In yet another example of improving quality via sustainable thinking, a consortium of wineries in California, concerned over the amount of lead in the foil wrap used to cover the tops of wine bottles, switched to a higher quality, lead-free substitute that cost less, looks the same, and reduced environmental heavy metal pollution.

Benchmarking

A term frequently used in connection with measurement and quality is *benchmarking*. To put it bluntly, benchmarking is a process that involves copying somebody else's ideas or practices and incorporating them in your own business. The practice is common enough. Many companies routinely copy the

services, operations, billing set-ups, and other systems of their rivals. Even unrelated industries can generate benchmarking ideas. Stories abound about how IBM used a Las Vegas casino's security systems as a benchmark to reduce employee theft. In China, a clothing manufacturer copied a McDonald's menu format to simplify its catalog. Meanwhile, an American airline reviewed an Indy 500 pit crew to see if it could find ideas to help speed up its baggage control systems (Industry Week, 1993). No matter what practice a business wants to emulate, most benchmarking processes begin by:

1. Using another business's program(s), product, or service as a reference point.
2. A study is then carried out to determine what makes the program or product successful.
3. An analysis is next conducted to determine if the ideas gathered from the other business will fit the business that wants to adopt its methods.
4. The challenge is to implement the ideas of the successful company into the adopting business (Main, 1992).

Putting Quality into Action

With any new process, an attempt at quality without the input of customers is downright dangerous and could very well set a business marching off in the wrong direction. Just as important, quality (like efficiency) must be all-encompassing and exude from both the top and bottom of an organization. Following are two plans to get started (Sashkin & Kiser, 1993). Keep in mind that for either of these plans to succeed, the determination of a zealot must be maintained, the patience of Job endured, and an extraordinary amount of persistence exhibited (you may also wish to refer again to Chapter 10):

Plan A

1. Gather your employees together, or take an important client out to lunch, and ask how efficiency improvements can be made with your product or service. Make sure the problem is business-related and can be changed.
2. Don't be defensive or enter a state of denial. Become enthusiastic about finding a solution to the problem and search for and discuss quick ways to resolve it.

3. Set a target and implement the solution.
4. When the solution has been implemented, praise everyone involved.
5. Find another problem and repeat the above steps.

Plan B

1. Formulate a weekly quality meeting comprised of internal or external customers whose task is to make improvements.
2. Create an atmosphere where everyone feels unafraid to voice his or her opinions and comments.
3. Provide incentives for all members to participate.
4. Establish a few basic ground rules outlining what you want to achieve.
5. Give your team time to gather confidence.
6. Keep it going (Lawler & Mohrman, 1985).

With Quality It's All or Nothing

Again, it's of paramount importance that the establishment of quality and efficiency involve *every* aspect of a business. Nothing should be overlooked because *everything* an organization does is inter-linked and requires constant attention, upkeep, and care. Even an issue as seemingly trivial as the cleanliness of an organization's washrooms has an effect on the standard set in work areas because what employees are surrounded by is often reflected in the quality of their work. A long time ago, this concept was illustrated in a nursery rhyme:

> For want of a nail, the horseshoe was lost
> For want of the shoe, the horse was lost
> For want of the horse, the rider was lost
> For want of the rider, the battle was lost
> For want of the battle, the kingdom was lost
> And all for the want of a nail.

The Mother of All Battles

Quality and efficiency are more than just business terms – they represent a dedicated commitment to ceaseless work. As an ongoing crusade, quality and

efficiency are long-term goals and long-term term success should always be given precedence over short-term gains. To establish quality, time must be devoted to making products or services that work right the first time. Staff training and development must never be sacrificed. Reliability, waste reduction, and safety should always take priority over speed. For each and every employee the pursuit of quality must be an unassailable state of mind, or the kingdom *will* be lost.

Advice from the Pros

Each of these suggestions, derived from a host of business practitioners, should be thought of in terms of external and internal customers:

- Quality is best defined by customers… and when it comes to what customers want, never assume, always ask.
- Don't take criticism personally. Invest your passion and efforts in satisfying customer demands rather than in denials and/or justifications.
- Don't cut corners with quality. You'll pay dearly for it later.
- Always strive to have at least one aspect of your business be of higher quality than your competitor's.
- Regularly review the strengths and weaknesses of your organization through the unbiased eyes of a second or third party. This can be as easy as installing a suggestion box in your business.

Chapter 17
The Importance of Conflict

In April of 2008, Dennis Salazar, president of *Salazar Packaging* (a sustainable packaging company), attended a trade fair in Chicago, Illinois. During his visit he asked scores of exhibitors (from over 1,200 represented companies) about the efforts their firms were making to become more sustainable. Perhaps not surprisingly, the responses he received from the fair's attendees strongly resembled the famous 'Five Stages of Grief' model developed by Elizabeth Kubler-Ross in her 1969 book *On Death and Dying*:

- *Denial* – a number of companies had done nothing to reduce their waste, seemingly believing that the 'sustainability thing' would soon 'blow over'.
- *Anger* – a few exhibitors became rude or hostile when they were approached and tried to convince Mr. Salazar that *he* was the one perpetuating the sustainability problem by mentioning the subject.
- *Bargaining* – several companies had decided to handle sustainability by parroting PR-styled blurbs or by mentioning half-hearted measures or deceptive compromises their business had undertaken.
- *Justification* – a few individuals tried to hide behind the excuse that there was nothing their companies could do to reduce waste in their businesses because their 'suppliers are overseas' or the issue was 'out of (their) hands'.
- *Acceptance* – here and there throughout the trade fair, a number of businesses had recognized that waste is a problem and they were working to reduce it. Perhaps not surprisingly, these folks could also list concrete actions their employers were taking and could even cite some of the cost dividends their companies enjoyed (Salazar, 2008).

In effect, what Mr. Salazar observed were different forms of conflict manifested in the belief, which many people have, that human behavior doesn't

arise from altruism or selfishness, but rather the conflicts that develop between these two extremes. From recalcitrant employees that don't want to go through the hassle of learning something new, to gung-ho staff members who want to initiate change rapidly, conflict, it seems, is inevitable. Far from being obstructive, however, conflict can provide 'fruitful conditions of confusion and chaos, where different interests, values, and behaviors are tossed against one another (thereby) generating new approaches and ideas. To be sure, many of these combinations are often discarded, but a few can (and do) become a solid foundation for future evolution' (Allenby, 2003). Such is the value of conflict.

Conflict and Change

Efficiency, sustainability, waste reduction, closed-loop practices, servicizing, lean thinking, cooperative networking… all of these processes involve change. And as Chapter 8 explained, handling the conflict that results from change is crucial to a business's success. Many years ago, the authors of the book *In Search of Excellence*: *Lesson's From America's Best Run Companies* (*ISoE*) learned this lesson all-too-well. Basically, *ISoE* examined over 60 of the most successful businesses in America and identified eight common traits they shared. The book subsequently racked up sales of over 8 million copies – making it one of the best selling business tomes of all time. Ten years later, one of the book's contributors (Richard Pascale) decided to take another look at the companies he and his colleagues had researched to see if they'd made any additional improvements – and what he discovered shocked him. About two-thirds had lost huge amounts of market share. Several appeared on the verge of bankruptcy. What on earth had gone wrong? (Pascale, 1991)

The problem, according to Pascale, was that many of the companies had, over time, eliminated one, often over-looked (or *avoided*) ingredient that's crucial to the development of business success -- conflict.

Probably the Best Business Story Ever Told

When I was in business school one of my professors told the following story to our class in the hopes that it would illustrate the importance of conflict.

Although I've never been able to confirm it, its message is nevertheless worth repeating.

The quality of *Honda* products is legendary, but who would ever believe that the quality *Honda* achieves is often born out of conflict? The *Honda Motor Company* has been listed as one of the world's best-managed companies for so long that few researchers seem to take notice of it anymore, and even fewer examine the company's dramatic history. As a young man, Soichiro Honda, had a fascination with small engines and motorbikes. Keep in mind that this was in the days following WWII. As a Japanese man, Honda therefore had huge obstacles to overcome. Yet despite these setbacks, Honda's reputation for producing engines of superior quality grew – and beside him almost every step of the way stood his long-time friend and business partner Takeo Fujisawa. Success followed success until, one-day, Honda decided to enter the automobile market. This was a big step that required much forethought and after careful consideration, Honda concluded that the future of the automobile lay in air-cooled engines. He then decided to set up his car manufacturing accordingly. Fujisawa disagreed, insisting that liquid-cooled engines were the only way to go. Thus began a disagreement of epic proportions. Eventually, the two men could no longer work together. 'It's my company, we're going with air-cooled engines, and that's final!' Honda shouted. Fujisawa stormed out of the company and quit. Sometime later, however, Honda came to the sobering realization that the future of automobiles did indeed lay with liquid-cooled engines – *and he had driven away the only person in his company who had the courage to tell him so*. Aghast at what he'd done, he went to find his friend. As legend has it, and here's where the story starts sounding biblical, he found him in a monastery. Apparently, Fujisawa was so angry he was considering becoming a monk. Honda then did two of the most astonishing things any company CEO has probably ever done: (1) he apologized and admitted he was wrong, and, 2) he vowed that from then on he would create a company in which *anyone* would be able to look their boss in the eye and say, 'You're wrong' without suffering any consequences.

Think about it. Soichiro Honda worked during a time when *nobody* in any Japanese company dared question his superior. Yet he decided to break away from this culture and tradition (as well as popular hierarchical business practices) and create a work environment that embraced the one thing that almost everyone

tries to avoid with a passion. Soichiro Honda wanted a company that welcomed, and in many instances *encouraged*, conflicts. By doing so, he felt that his employees would forever be able to openly question one another, thereby helping to eliminate future bad decisions.

Major Truths Behind Conflict

Why is handling conflict important? As the Honda case shows, having everyone follow a misguided company policy (e.g.: 'sustainability is just a fad') can, if left unchecked, result in disaster. There are other reasons too. According to the *American Management Association*, 20-percent of a manager's time is spent dealing with conflict situations (Thomas & Schmidt, 1976). That's one hour out of every five! With this in mind, here are some important considerations to keep in mind:

- Not all conflicts are worth a manager's time and effort (conflicts can be trivial).
- Some conflicts are unmanageable (they may be outside a manager's sphere of influence, or the involved parties may not be interested in a resolution).
- Conflicts have causes (they don't spring up out of thin air). So it's in management's best interests to dig for the sources of disagreement and know the personalities and interests of the players.

Major Causes of Work Related Conflict

Most work-related conflicts don't transpire into open dramatics or fistfights. Instead they fester under a thin veil of civility that invisibly consumes energy, productivity, and money. The process of conflict resolution begins by accepting that solutions tend to fall into two categories: *cooperating* (the desire to satisfy another person) and *assertiveness* (the desire to satisfy the self). Of course, it's the needs of the business that should be satisfied. Next, it's important to ascertain what type of conflict is occurring. The three major types are:

1. *Communicative conflict*, which results from misunderstandings or a crossed wires (but not, as many people believe, a lack of talking because in most conflicts a lot of talking is going on. It's the *listening* that's lacking.).

2. *Substantive (structural) conflict* involves differences in goals, allocation of resources, distribution of rewards, policies and procedures, and job assignments.

3. *Emotional (or personal) conflict* results from feelings of anger, distrust, dislike, fear, resentment, and personality clashes (Walton, 1969).

Two Directions Conflict Can Take

Conflict can make or break a business depending on how employees perceive it. With *dysfunctional conflict*, everyone either avoids or sadistically prepares for the imminent confrontation of those with opposing views. Issues presented in a dysfunctional environment are constantly seen as black or white - or right or wrong. The result, more often then not, is that tempers run high, battles erupt, and employees end up canceling each other out.

With *functional conflict*, however, employees are trained to respect opposing views and agree not to be threatened by them (see Chapter 10). Establishing a company culture that copes with disagreement in the form of functional conflict helps emphasize the importance of individual input and creativity. Conflicts can then take the form of civilized (if not animated) discussion, thereby clearing the air and lowering an organization's collective blood pressure. In other words, disagreement does not mean that war has been declared. Instead, employees *learn* to express their views without attacking others and to listen without taking offense (Pascale, 1991).

Typical Options that Develop When Conflict Arises

Following is a list of options most managers resort to at one time or another when trying to handle conflict. Which method will best suit the needs of your internal or external customers when you begin making your business more efficient?

1. *Avoidance* – best used when the conflict is trivial, when emotions are running high, or when attempts at resolution can be more disruptive than the conflict itself.
2. *Accommodation* – placing another's needs or interests ahead of your own. This is useful when the issue under dispute is not of great interest to you or if you need to build up credits for later use.
3. *Forcing* – getting your way at the expense of another. Forcing views on others becomes necessary when a quick resolution is needed, when unpopular actions must be taken, or when commitment by others is not critical.
4. *Compromise* – requires each party to give up something of value. Usually compromise results when all parties are of equal power, when time pressures are being felt or when a temporary solution is needed for a complex problem.
5. *Collaboration* – ends in a win/win solution for all parties. This can only occur when honesty, trust, and empathy are an integral part of discussions (Filley, 1975).

Suggestions for Turning Disagreement into Functional Conflict

Employees that fight amongst themselves rarely realize how damaging their behavior is. The following five conflict resolution strategies were designed to avoid long-term damage by helping to clear the air without clearing the room:

1. *Don't let emotions or tempers increase*. Many disagreements start out small then escalate into something far greater. To avoid this practice, psychologists suggest trying a tactic called 'active listening'. Active listening requires each party to take turns repeating or paraphrasing what others are saying (without parroting them). Doing this may make the listener feel slightly ridiculous and self-conscious, but that's the idea. Active listening slows things down, makes people listen, and helps avoid the build up of argumentative counter-measures by making the listener focus on what is being said.
2. *Stay focused on the disagreement*. Keep personal comments out of the discussion. When attacked unfairly, slowly repeat inappropriate comments out loud. The effect of this tactic is similar to holding up a mirror and allowing the opposition to see the ugliness they have created.

3. *Don't be patronizing*. Avoid trying to invalidate the opposition's memory by getting involved in a who-remembers-it-better shouting match. Lower your voice and avoid using the words, 'never' or 'always' (they are rarely the case).
4. *Don't make others read your mind*. When it's time for your input, speak clearly and state exactly what you mean. Equally, ask for clarity from those who aren't giving it. This helps reduce communicative conflict from arising.
5. *Don't withdraw to avoid conflict*. Giving up only allows problems to fester. Get everything out in the open. Listen to what the other person is saying and find a resolution together. Make it known that the outcome is to do what's best for customers – not to declare war (Robbins & Hunsacker, 1996).

Conflict Stimulation: Making Conflict Work for You

Functional conflict is healthy and stimulating, but employees must first be trained in its implementation before it can produce results. Functional conflict is best introduced when:

1. Subordinates believe it's in their best interests to maintain the appearance of peace and cooperation. (i.e.: when 'yes men' dominate).
2. Employees show high resistance to change.
3. There is a general lack of ideas in the business.
4. A business has unusually low employee turnover.
5. An emphasis is placed on maintaining the status quo (Scott, 2005).

Playing With Dynamite – or, Suggestions for Stimulating Conflict

Dynamite, invented by Alfred Nobel, was originally intended as a construction tool to help build roads and railways. Unfortunately, much to Nobel's consternation, it was quickly adapted into a tool of war. Horrified at the unforeseen side of this development, he established his world-famous peace prize as a way to alleviate his guilt. Keep Nobel's story in mind when using methods (such as the following) to introduce conflict into a situation:

1. *Toss Communicative Grenades*. When things need to get moving quickly, one way of lighting a fire under everyone is to state something ambiguous

(money is being lost, two departments are merging, people are going to be laid off…), or send out a nasty memo and wait for the reaction. Be careful though. Tactics like these should not be used often and the person who instigates them may end up getting burned.

2. *Bring in Outsiders*. Bringing in people whose backgrounds, values, attitudes and styles are different - or who have a specific expertise - often helps shake things up.
3. *Restructuring*. Reassigning jobs and responsibilities is yet another way to get the ball rolling – a practice commonly displayed in governmental cabinet reshuffles.
4. *Play the Devil's Advocate.* Assign a person(s) whose job in meetings is to counter every argument. The idea is to foment different options and get people communicating (Robbins, 1974).
5. *Tell Employees, 'That's just not good enough.*' Send workers back to the drawing board (along with an explanation as to why) to help push them out of their complacency.

One More Time: Even Though It Hurts, Conflict is Necessary

The reason why the anti-monarchists (the 'Levelers') in the English civil war and the founding fathers of the United States felt so strongly about freedom of speech is because they fully understood the need for debate and dissent. Yet of all human trials and tribulations, wisely catering to differences of opinion must certainly be among the most difficult. The truth of this was once beautifully (and pointedly) explained to me when I was working in the Middle East. An English-language Arab newspaper had contacted me in the hopes that I would write a weekly column about business and management affairs. Unfortunately, the editor and I could not agree on a format. After one particularly fruitless meeting, I explained my predicament to a Palestinian journalist who had taken an interest in what was going on. 'That's what these meetings are for,' he said. 'The editor pushes you, you push him back, and hopefully something better will arise out of the stubbornness and pride that now holds both of you back.'

Advice from the Pros

For several years I collected business advice from successful practitioners across Europe, North America, Australia, and parts of Africa. I can't think of a better way to end this chapter than by relaying this advice here.

- Never take disagreement personally. Disagreement simply means that another person does not agree. It does not mean, nor should it be interpreted as though, war has been declared.
- Don't be afraid to ask for advice from employees. Valuing employee input is not a sign of weakness, it's a sign of good management.
- Be thankful for differences of opinion. They might just save your neck.
- If a paying customer or an employee has a complaint or raises a sticky issue in an annoying manner, listen carefully to what is being said without thinking of ways to get the upper hand. He or she may have a valid point and is merely presenting it in an inappropriate way.
- It's okay to be wrong. It's not okay to pass it along.
- Almost always, a display of anger in the workplace is a sign of insecurity. Never lose your temper or get too emotionally involved in a conflict. The objective of every business conflict is to do what's best for the business, not satisfy someone's ego.
- Don't try to squeeze blood from a stone. There are situations in life (and at work) you can change and others you can't. Learn your own limitations as well as those of the people you employ.
- As your business becomes more efficient, consider bringing in outside expertise. Adding the additional (and often different) experience, knowledge, or neutrality of outsiders can break deadlock, lead to new horizons, and be worth its weight in gold.

Bibliography

Allenby, Brad, 'Complexity and Conflict', www.greenbiz.com, December 8, 2003.

Alukal, George & Manos, Anthony, 'How Lean Manufacturing Can Help Your Mold Shop', (Gardner Publications), www.moldmakingtechnology.com/articles/100204, 2007.

Batson, Daniel, 'How Social an Animal: The Human capacity for Caring', *American Psychologist*, April 1990, vol. 45, pp. 336-346.

CBS (Cardiff Business School), '*What is Lean Thinking*?', Lean Enterprise Research Centre, www.cardiff.ac.uk, May 2007.

De Blas, Alexandra, from an interview with Ray Anderson titled 'Sustainable Carpet Tiles', the ABC Radio Network (Australian Broadcasting Company), www.abc.net.au/rn/science/earth/stories/s28472.htm

Deming, W. E., *Out of the Crisis*, The W. Edwards Deming Institute & The MIT Center for Advanced Engineering, Cambridge, MA, 1986.

Douglas, Ed, 'Better by Design: Battling the Throwaway Culture', *New Scientist* magazine, Issue 2585, January 4, 2007.

EPA (the Environmental Protection Agency), 'Lean Thinking and Methods', *Lean Manufacturing and the Environment*, www.epa.gov/lean/thinking/index.htm , May 2007.

Faktor-X, 'Walter Stahel's Performance Society', www.faktor-x.info/cms.php?id=154 , June 2007.

Fell, Donna, *Alpha Dogs: How Your Small Business Can Become a Leader of the Pack*, Harper Collins, NY, 2005.

Filley, A. C., *Interpersonal Conflict Resolution*, Scott Foresman, Glenview, Illinois, 1975. See also, Thomas, K. W., 'Conflict and Negotiation Processes' as mentioned in *The Handbook of Industrial and Organizational* Psychology (by M. D. Dunnette and L.M. Hough (Consulting Psychologists Press, Palo Alto, California, 1992).

Fishbein, Bette & McGarry, Lorraine & Dillon, Patricia, 'Leasing: A Step Toward Producer Responsibility', *Inform, Inc*, (NY), 2000.

Frenay, Robert, *Pulse*, Farrar, Straus & Giroux Publishing (New York), 2007.

Friedman, Thomas L., *The World is Flat*, Penguin Books Ltd., London, 2006.

Frosch, Robert, 'The Industrial Green Game: Implications for Environmental Design and Management', *The National Academy of Sciences Press*, Washington DC, pp.37-47, 1997.

Garvin, D. A., 'Competing on the Eight Dimensions of Quality', *Harvard Business Review*, vol. 65, no. 6, 1987, pp.101-109.

GRA Position: Financial and Environmental Performance of Product Leasing, www.srl.gatech.edu , accessed June 2007.

Grogan, Richard, 'The Next American Idol: Corn-Based Ethanol', *EJ Magazine*, www.ezmagazine.com , Fall 2006.

Hart, Stuart, *Capitalism at the Crossroads*, Wharton School Publishing (Pearson Education), 2005, pg. 46.

Hawken, Paul, & Lovins, Amory, & Lovins, Hunter, *Natural Capital*, Little, Brown and Company, NY, 1999.

Industry Week, 'Benchmarkers Make Strange Bedfellows', November 15, 1993, p.8.

ISLR (the Institute for Local Self-Reliance), 'Waste to Wealth: Recycling Means Business', www.irls.org, 2007.

Jones, Tyler, 'Pollution Prevention Team Recognized for Environmental Stewardship', www.navy.mil, February 12, 2007.

Lawler, E. E., & Mohrman, S. A., 'Quality Circles After the Fad', Harvard Business Review, January-February 1985, pp. 65-71.

LEI (the Lean Enterprise Institute), 'What Is Lean Thinking?', www.lean.org , 2007.

Lotti, Riccardo & Mensing, Peter & Valenti, David, 'A Cooperative Solution', Strategy + Business, www.strategy-business.com, July 17 2006.

Makower, Joel, 'Wal-Mart's Sustainability Summit', *Two Steps Forward*, http://makower.typepad.com, October 14, 2007.

Main, J., 'How to Steal the Best Ideas Around', *Fortune*, October 19, 1992, pp.102-106.

Nave, David, 'How to Compare Six Sigma, Lean, and the Theory of Constraints', *Quality Progress* (the American Society for Quality), www.asq.org , March 2002, pp. 73-78.

Nevius, C. W., 'Disposing with the Fix-It Guys', *The San Francisco Chronicle*, Saturday, July 16, 2005.

Pascale, Richard T., *Managing on the Edge*, Penguin Books, New York, 1991.

Perthen-Palmsino, B. & Jakl, T., 'Chemical Leasing: The Austrian Approach', www.sustainable-chemistry.com , 2004.

Peters, T. J., & Waterman, R. H., *In Search of Excellence: Lessons from America's Best-Run Companies*, Harper & Row, New York, 1983.

Robbins, S. P., *Managing Organizational Conflict*, Prentice Hall (Englewood Cliffs) NJ, 1974.

Robbins, S. P. & Hunsacker, P.L., *Training in Interpersonal Skills* (2nd edition), Prentice Hall (Upper Saddle River) NJ, 1996.

Salazar, Dennis, 'Sustainable Packaging and the Five Stages of Grief', www.greenbiz.com, April 14, 2008.

Sashkin, M, & Kiser, K J., *Putting Total Quality Management to Work*, Berret-Koehlor, San Francisco, 1993.

Scott, Jonathan T., *The Concise Handbook of Management*, Haworth Press, 1995.

Scott, Jonathan T., *The Entrepreneurs Guide to Building a Successful Business: the Fundamentals Involved from Startup to Survival and Beyond*, A Management Education Services Publication, Panama City, Florida, 2008.

Thomas, K. W., & Schmidt, W. H., 'A Survey of Management Interests with Respect to Conflict', *Academy of Management Journal*, June 1976, pp. 315-318.

Walton, R. E., Interpersonal Peacemaking: Confrontations and Third-Party Consultation, Addison-Wesley, Reading MA, 1969.

White, Allen & Stoughton, Mark & Feng, Linda, 'Servicizing: the Quiet Transition to Extended Product Responsibility' (DuPont Case Study), published by the Tellus Institute & the US Environmental Protection Agency Office of Solid Waste, May, 1999.

Womack, James, & Jones, Daniel, *Lean Thinking: Banish Waste and Create Wealth in Your Corporation*, Simon and Schuster, New York, 1996.

PRESERVATION

Preservation is defined as:

- the process of keeping something in existence, or,
- to keep up or maintain something, or,
- the act of protecting or safeguarding something from harm or injury, or,
- keeping possession of, or retaining, what currently exists.

Any way it's looked at, preservation is not about standing still. In an efficiency context, preservation involves creating an environment that locks into place programs and practices that are successfully implemented (with an eye toward improvement), staying on top of new developments, and improving motivation and momentum so that new successes can be achieved.

Chapter 18
Making, and Living with, Decisions

Many years ago, when I was attending business school in London, England, one of my professors, a former business practitioner (and a respected consultant to a number of top financial lawmakers) began class by saying, 'If a good manager has ten decisions to make, he'll probably get four right, two wrong, and the rest, well, it really doesn't matter.'

It took me some time to come to terms with that statement. What he meant is that decisions need not be set in stone and not every outcome is right or wrong. In many instances, it's the *degree* to which a decision is right or wrong – as well as how a person chooses to carry out his or her decisions – that's just as important as the decision itself. A spectacular finish can be achieved after a poor or lackluster start. For example, in the late 1990's *Hewlett-Packard* made a commitment to reduce waste and pollutants by experimenting with alternative materials in its production processes. Unfortunately, try as they did, these measures did not produce the results the company was seeking. Rather than give up, however, *Hewlett-Packard* changed tack from material substitution (e.g.: replacing toxic materials with more benign substances) to process changes (e.g.: redesigning more efficient products and introducing clean production methods) and watched as emissions dropped by 15-percent per product unit. In other words, by remaining open to an optimal outcome rather than a satisfactory one, *Hewlett-Packard* discovered what many companies seeking improvement learn: that efficiency and waste reduction constitute an ongoing journey – not a destination.

Setting Off in the Right Direction

Producing optimal decision outcomes begins by recognizing the difference between *problem solving* (the process of identifying and resolving the discrepancy between what is actually happening and what should be happening)

and *decision-making* (the process of finding and making a choice among alternative courses of action). Both involve recognizing that the processes and outcomes of almost every decision are influenced by three different mind-sets:

1. *Avoidance* – ignoring the warning signs, doing nothing and hoping the problem goes away.

2. *Battling problems* (or *fighting fires*) – reacting to problems as they arise.

3. *Problem prevention* - proactively finding ways to deal with problems before they occur.

So which direction is best? Although many people believe that the third option is the least costly and most effective, it's the first or second course of action that's all-too-often taken. This is a shame, particularly when one takes into account that warning signs often make themselves evident long before major difficulties erupt. Granted, sometimes the solution to a problem can be more costly than the problem itself, which makes avoidance the right option. And yes, there are times when a problem is not foreseen and it can only be dealt with *after* it occurs. But more often than not, actively seeking ways to deal with problems before they occur is the best way to go. For example, some years ago, *Motorola* began experimenting with different ways to clean the circuit boards it produced after they'd been soldered. The traditional way was to use hazardous materials, but this practice was deemed unacceptable – even though the materials the company used hadn't yet caused any overt problems. At one point a cleaning solution based on orange peels appeared to produce a satisfactory outcome, but closer examination revealed that a better idea would be to redesign the entire soldering process so it required no cleaning at all (Lovins, et al, 1999). This not only eliminated the expense of purchasing and disposing cleaning chemicals, the improved design also reduced the costs of producing the circuit boards by completely doing away with the time and effort that went into cleaning them.

Decision-Making Styles

For the most part, when making a decision one of two approaches is employed. The first is called a *systematic approach* (or *maximizing*), which addresses decision challenges in a rational and analytical fashion. Maximizing usually involves breaking a situation or problem down into smaller components and tackling each component in a logical way. In this manner, a systematic or maximized approach can take into account the judgment and opinions of others - even though gathering the input of others can be a time consuming process. At a managerial level, systematic approaches are therefore more about listening than telling and more about understanding than directing.

The second approach to decision-making is called an *intuitive approach* (or *satisfycing*), which allows for more flexibility and spontaneity. With an intuitive approach experience, creativity, and the ability to be spontaneous are key. This is why an intuitive approach (*satisfycing*) is sometimes explained as acting on a 'gut feeling'. At a managerial level, satisfycing can translate into taking charge through the issuing of orders and directives. For decisions requiring an immediate response as well as those that have no far-reaching repercussions, this style of decision-making can be both timely and appropriate. On the flip side, intuitive approaches can alienate employees who are constantly on the receiving end of them. Intuitive approaches can also be disastrous if the decision-maker is uninformed or inexperienced.

So, which approach is the most effective? That depends on the circumstances. Obviously, it might be risky for an inexperienced manager to rely on his or her gut feelings before making a decision. On the other hand, analyzing the minutiae of every option while gathering different opinions can be both time-consuming and tedious. Most managers boil down these processes by making a judgment call regarding which approach should be used. So perhaps a better question is: How open and flexible is the judgment of the manager?

Decision-Making and Career Advancement

Interestingly, the style a manager adopts when problem-solving or decision-making not only has a profound effect on the judiciousness of the decision's outcome, it can also effect the decision-maker's career advancement.

For example, on-the-spot decision-making may be considered suitable and necessary for supervisors that work on a front line, but as a manager's responsibilities grow it becomes increasingly important to ask for, and use, the expertise of others before coming to a conclusion (Brousseau, et al, 2006). Not gathering the collective wisdom of others, particularly if the decision has far-reaching implications, increases the chances of coming to a bad conclusion. Furthermore, failure to gather opinions can anger colleagues who feel that they've been left out of the decision-making loop. At an administrative level, particularly when setting policy, decision-making should therefore rely more on collaboration than a go-it-alone, intuitive style.

Good Problem Solving and Decision-Making: A Step-by-Step Approach

One method of ensuring that problems are examined accurately - and good decisions are made - relies on a five-step approach that actively seeks out the input of others (see FIGURE 18-1). Here's how it works:

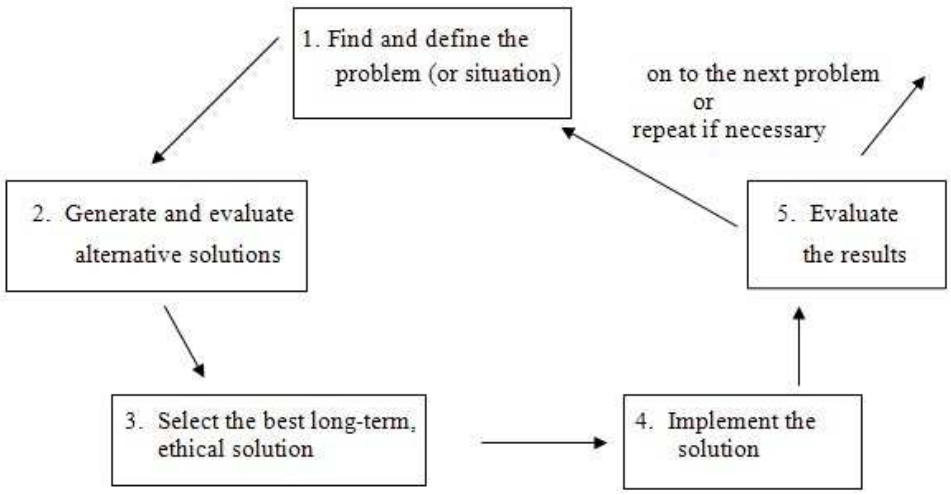


FIGURE 18-1

Step 1: *Find and define the problem or situation.* Every problem has a cause and every situation has alternative solutions - find them. Get as many opinions as possible. Investigate and dig deep. Asking the question 'why' five times is an old, yet effective way of getting to the bottom of things.

Step 2: *Generate and evaluate alternative solutions.* Don't go it alone. Gather as many creative solutions as possible. Ask knowledgeable people for their advice (even external customers). The more stakeholders that get involved, the more involved they'll be. Just be certain that the *cause* of the problem is being treated – not the symptom.

Step 3: *Think ahead and select the best long-term solution.* By definition, short-term solutions are rarely a good option because they will have to be addressed again. Therefore, seek out long-term solutions that best serve your business and its customers. Investigate any implications. Keep in mind that if the long-term effects (or inter-related aspects) of a decision are unknown then the solution could create more problems.

Step 4: *Implement the solution.* Take action by following through with the decision. Often, the difference between an effective manager and an ineffective one is that effective managers are people of action.

Step 5: *Evaluate the results of the decision.* Was the outcome effective? If not, learn why not and start the process again (Scott, 2005).

Major Obstacles to Good Decision-Making

Poor interpersonal and management skills, inadequate tools, and inferior work practices that set targets, measure performance, and hand out rewards are major contributors to bad decision-making (see also Chapter 1, pages 12-16, *Twelve Major Efficiency Obstacles*). Following is a list of the most common of these practices and how they can adversely affect efficiency:

- *Not thinking in the long-term*, particularly with purchases, short-term thinking involves buying items based on their price tag rather than their full lifecycle cost (i.e.: not considering that every purchase carries two costs: (1) the price of the item itself, and, (2) the cost of operating the item).

- *Establishing crude or unrealistic payback metrics*. Some businesses demand that the capital they spend on efficiency improvements must be paid back in less than two years – a situation equivalent to requiring an after-tax return of around 71-percent a year (which is about six times the marginal cost of capital). Ironically, when a two-year payback can't be obtained, the company then goes the more wasteful and expensive route - and ends up paying for its bad decision year after year after year.
- *Treating a business as an overhead to be minimized rather than a profit center to be maximized*. Put another way, this means decreasing the number of employees in a business rather than providing additional training – as well as using everyone to his or her full potential to cut costs and increase profits.
- *Working with deficient measurements and accounting practices*. Many manufacturers keep strict records regarding how many units of a product they produce, the cost of labor, and the price of raw materials, but few take the time to measure how much money is spent working with, and disposing of, waste, or how much energy they need to produce a unit of chilled water for production facilities or sterilized air for clean-room manufacturing.
- *Passing mistakes along*. Just because a product or production process is successful doesn't mean it can't be improved. Businesses that build replicated facilities elsewhere often repeat the inefficiencies inherent in their old production facilities, products, and systems.
- *Obsolete reward systems* include compensating managers with the amount of money they spend (or outputs being produced) rather than how much they can *save*. The classic example, mentioned in Chapter 23, is the rewarding of architects and engineers – either directly or indirectly - with a percentage of the total cost of a project rather than a percentage of the amount of money the project will *save* in energy and operation costs.
- *Heuristics*. Heuristics is a fancy name for judgmental shortcuts in decision-making based on bias, stereotypes, misinformation, outdated thinking or other inappropriate experiences. For example, because energy expenses can amount to only two-percent of the costs of large businesses, some managers think that tackling energy efficiency isn't worth the effort. Unfortunately, this line of thinking doesn't take into account the knock-on cost-savings of

efficient practices or the fact that resource savings go straight to a business's bottom line and therefore represent a greater percentage of profits

- *Not putting customers first.* The classic example of this practice occurred in the 1970's when the *Ford* automotive company produced an automobile called the Pinto. Somewhere along the line it became apparent that the Pinto had a tendency to burst into flames during collisions. Yet the company's executives decided to ignore the problem. Their conclusion was that the amount of damages they would have to pay as a result of court actions would actually be less than fixing the car's design flaw. Similar thinking in regards to toxic chemicals in products and production processes is no less unsettling.
- *Escalating commitment* is the tendency to increase effort and apply more resources (people, materials, money, etc) when a chosen solution is not working. This usually happens when a decision-maker can't admit that he or she is wrong.
- *Reinventing the wheel.* Few business decisions are novel. Chances are that someone in another organization has had to make a decision similar to the one your company is facing. Before making a bad decision or inducing an ulcer trying to make a good one, do some research and find out what other businesses have done when they were faced with similar situations. The results may be as cost-effective as they are creative.
- *The finish line syndrome.* The belief that a few successful achievements are enough to win the end game. Unfortunately, there is no finish line with efficiency. Improvements are always possible. (Lovins, et al, 1999 & Scott, 2005)

Creativity, Problem-Solving, and Decision-Making

'If you think that the solution to every problem is a hammer,' states an old saying, 'then you'll probably see every solution as a nail.' In other words, when attempting to make a decision, too many managers tend to: (1) be too conservative and miss out on a full opportunity, (2) try the same old approach they've been using for years, or (3) happily settle for a *satisfactory* solution rather than an *optimal* one. To facilitate an optimal solution when making a decision,

consider the following tips from *A Kick in the Seat* of the Pants by author Roger Von Oech (1986):

- *Believe in your creativity*. If you have the right attitude and think you can be innovative and creative, chances are you will be.
- *Encourage nonconformity*. Allow differences to be presented.
- *Reach out beyond your specialization*. Use other people to expand upon ideas and assumptions.
- *Search for more than one right answer*. Don't get stuck in a close-minded attitude.
- *Step back*. Take time to think, tinker, and play around with ideas.
- *Don't be afraid of trial and error*. Accept the fact that failure is often a path to success.

The Personal Touch

Once a decision is made, the successful outcome of a decision still relies on the mindset of the person who implements it as well as how that person carries it out. This is where good employee relations enters the picture. For example, not long ago, an MBA student asked me for suggestions on how he could get his employees to carry out a series of decisions he'd made that were designed to improve product quality. The student stated that he'd recently started working at a new company and that no one there was listening to him.

'How many different courses of action have you taken?' I asked.

'Half a dozen or so over the past few weeks,' he replied.

Clearly, a few weeks is nowhere near enough time to instigate a major new work procedure – particularly when no training has taken place – let alone half a dozen. To add to his woes he was new to his job and his employees were testing him to see how much they could get away with. Our meeting ended with me advising the student to study change management (see Chapter 8) and incorporate a bit more MBWA (see Chapter 3). 'If you don't get to know your employees and don't talk with them about little things that don't matter,' I said, 'then they'll probably never talk to you about the things that do.'

A few months later the student visited me again, but this time it was under vastly different circumstances. 'I finally got to know my employees,' he said, 'and I even involved them in a few decision-making processes.'

'Did that help reduce their resistance?' I asked.

'What resistance?' he replied, grinning.

What to do when Efforts Begin to Slow Down

Of course, not every management story has a happy ending. Sometimes the enthusiasm and efforts behind even the best decisions can slow or falter. More often than not, this usually results from a lack of clear goals (see Chapter 4). Suggestions that can help overcome this problem include:

- *Make sure that everyone knows what is expected of him or her and what needs to be done*. This may involve establishing some form of moral compass that helps explain where the business wants to go and what it wants to do (and why) *before* numerical targets are set.
- *Make a 'to do' list*. Although it may seem a bit basic, a simple list filled with clear, itemized tasks that can be checked off after they've been completed could be just what's needed to help employees focus on one goal at time and affirm that progress is being made.
- *Delegate tasks*. Reward good people with additional responsibility and recognition by letting them come up with their own solutions.
- *Analyze and reflect*. Divide every workday into time blocks and record what was done in each. Compare what was accomplished to what was expected. Do the two compare? If not, why not?
- *Avoid procrastination*. If a task seems too daunting or elusive stop thinking about it and move on to the next item on the 'to do' list. This can help maintain momentum. (See also page 102, *Maintaining Momentum*)

The End Result: Living with Your Decisions

Problem-solving and decision-making are two processes subject to apathy and bias. Concentrating on being proactive rather than reactive is perhaps the best way to meet challenges and reduce future problems. Equally as

important, involving employees and colleagues in the decision-making process is fundamental in ensuring that an optimal decision will be made *and* carried out.

When faced with an important decision, take a deep breath, think about your customers (both internal and external) and analyze and discuss your options and their outcomes. Doing so may bring you closer than you ever thought possible to an optimized, cost-effective, and efficient solution.

Chapter 19

Record-Keeping and Environmental Audits

The *Sierra Nevada Brewing Company* began production in 1979 after company founders Ken Grossman and Paul Camusi cobbled together a brewery using second-hand dairy tanks, equipment salvaged from defunct beer businesses, and a soft-drink bottling machine. Today, *Sierra Nevada* employs over 450 people and produces nine award-winning types of beer, ale, and stout. Although the company has always believed in the economical viability of reuse and recycling, in 2007 it kicked its efforts up a notch when it began recycling over 31,000 tons of its waste instead of sending it to landfill sites. Examples of this waste included cans and bottles (including those sold in employee break rooms), cardboard, shrink wrap, and other packaging materials - as well as spent grain, hops, and yeast, which constitutes the majority of waste and which is now converted into animal feed. As a result of its recycling program, *Sierra Nevada* saved over $1 million in landfill fees and just under $2 million in annual waste haulage service fees annually (i.e.: bin charges, fuel costs, environmental charges and general service expenses) – and that was just the beginning.

Being located in (Chico) California, a state prone to power shortages, *Sierra Nevada* also looked at renewable energy as a means of reducing costs and establishing a more reliable source of electricity. 'Every minute of lost power equals a loss in product,' says the company's sustainability coordinator, Cheri Chastain, 'and that translates into lost revenues so we began looking into ways in which we could have more control over our energy supplies.' To resolve this challenge, *Sierra* purchased four 250-kilowatt fuel cells powered by natural gas and waste methane generated from the company's on-site waste water treatment plant (the wastewater treatment plant was installed seven years earlier to reduce the company's water treatment fees). An array of solar panels that produce 203-kilowatts of electricity has also been installed on the grounds and more are being

added to the company's office and warehouse rooftops. All in all, over 120,000 square feet (11,148 square meters) of space will be covered with solar panels when the project is complete. Thanks to rebates, tax credits, and incentives, the payback for these improvements is expected to occur within six to seven years.

Further efficiency and waste reduction measures that have been put into practice at *Sierra Nevada* include switching the method of raw material deliveries from trucks to trains – a practice that not only saves the company almost a million dollars a year in costs, but also cuts its carbon emissions. Using rail networks to transport finished products *to* regional destinations (rather than trucking them) has been equally as effective in helping to reduce shipping costs and emissions.

The Importance of Measurement

According to *Sierra Nevada*'s sustainability coordinator, Cheri Chastain, regular measurement helps determine where the company is wasting water, electricity, and other resources as well as where physical waste is being produced. After a waste source is revealed, Cheri then works with teams of company employees to reduce it. 'Record keeping is absolutely critical for keeping track of progress,' she explains. 'I keep detailed spreadsheets for all of our sustainability related programs. Without records, there's no way to know what baselines might have existed and whether or not we're improving and reaching our goals.'

Typical measurements recorded by *Sierra Nevada*'s waste reduction program include:

- the amount of material that is recycled through the company's various vendors (which includes weight measurements as well as income received),
- the amount of material that the company reuses (by volume [quantity or weight] – as well as what part of the company it went to), and,
- the amount of material sent to landfill by weight (based on waste hauler invoices).

To measure energy generation and consumption, Cheri records:

- the amount of natural gas and electricity purchased from local utility companies (which is provided by *Sierra*'s account representative),

- the amount of power produced by the company's fuel cells and solar panels (through online tracking),
- the amount of bio-gas produced and used onsite, and,
- company water records, which are collected monthly from the local utility company and entered onto a spreadsheet with other figures.

To round out *Sierra*'s waste measurements, greenhouse gas inventories are also kept. 'The amount of water produced and electricity consumed, as well as our natural gas and water consumption figures – and carbon emissions - are then compared to the number of beer barrels we produce every month,' Cheri says, 'all of which provides me with some great ratios to work with.' (Chastain, 2008)

It's All in the Numbers

As the *Sierra Nevada Brewing Company* has discovered, it's difficult, if not impossible, to know how much waste a company produces, how much waste it has eliminated, or how much money it has saved without accurate record-keeping. This is hardly surprising. Since the beginning of recorded history, accurate record-keeping has traditionally helped businesses:

- accurately assess investments and cash savings,
- measure success,
- point out weaknesses, and,
- indicate areas that need improvement.

Typical measurements recorded by many of the efficiency-oriented companies examined for this book include electricity and gas use, water consumption, raw material purchases, and overall amounts and types of waste being produced. More in-depth measurements can involve charting the toxic or hazardous materials a company purchases and uses (as well as the costs involved), examining the amount (and types) of waste different departments or processes produce (usually by recording what each one throws away), and the fees, extraneous charges, and taxes associated with current waste-handling practices.

The Requirements of a Good Record-Keeping System

Although measuring and recording a business's inputs, outputs, and waste on an *on-going basis* may sound complicated and time-consuming, an efficient waste record-keeping system is not difficult to set up and maintain. Indeed, simplicity is fundamental. Key guidelines include:

- the system should be easy to understand,
- information and results should be expressed in real-time,
- collected data should be accurate, reliable, and essential,
- the entire system should be easy to use (i.e.: more time should be spent pursuing efficiency rather than keeping records), and,
- all information should be easily transferable (i.e.: easily shared and compared with other departments and employees).

Additional requirements of a good record-keeping system are transparency and accessibility. Transparency can involve displaying the results of efficiency improvements (or the lack thereof) on notice boards or equipping machinery with real-time measurement devices. Accessibility involves making this information easily available and readable. Apart from providing informative feedback, regular monitoring helps provide transparency, and assessment while showing that the business is serious about efficiency. Transparency has also been known to create friendly competitions between employees or departments as teams try to outdo one another to reduce waste and resource use.

Environmental Audits

As Chapter 5 revealed, although a process map depends upon good record-keeping program, the term *process mapping* isn't normally used by business practitioners who document the inputs and outputs of different departments and production processes. Similarly, many practitioners when setting out to gather the facts and figures behind waste creation don't refer to what they're doing as an *audit*. The word 'audit', however, is both appropriate and explanatory. Professional auditors go a step further, using the term *environmental audit* to describe the gathering, checking, and analysis of material

use - as well as the measuring of waste and emission levels - in a waste reduction program.

Just as with financial audits, environmental audits can be performed by either trained employees or licensed professionals. Likewise, environmental audits come in all shapes and sizes ranging from a simple checklist to a full-blown and comprehensive investigation of a company's operations. Typical areas of examination include:

- facility inspections,
- the collecting, analyzing, and explaining of data,
- communicating with contractors, customers, regulators, and suppliers,
- the measurement of key environmental parameters,
- going over internal records, policies, reports, and objectives,
- comparing audit results to industry standards (such as *ISO 14001* standards and guidelines), and,
- employee skills, thoughts, and motivation levels,
- Additional services can include degrees of compliance with environmental laws and regulations, uncovering the expectations of customers, and liability obligations.

Types of Environmental Audits

According to the American *Environmental Protection Agency*, the six most common audits performed by professional environmental auditors are the:

- *Acquisition audit*. An audit performed before or after a major purchase is made (the purchase can include another company, an area of land, and/or a major piece of equipment). The focus of an acquisition audit is usually on potential claims or liabilities – particularly regarding environmental damage – that can arise from a major purchase.
- *Compliance audit*. Usually part of an overall environmental assessment with an emphasis placed on company compliance with environmental legislation, compliance with established company procedures, and comparisons with ISO 14004 environmental management systems.
- *Due diligence audit*. Similar to an acquisition audit in that an assessment is carried out to determine potential legal claims and liabilities (usually for

potential investors). Health, safety, and fire risk assessments are also included as well as a comprehensive site history analysis and legislative reviews.

- *Waste audit*. Often linked with general environmental reviews, a waste audit usually forms the first stage in a waste reduction drive. The emphasis is on exploring waste creation and handling (i.e.: ensuring that waste is handled safely and stored safely at a reasonable cost). For this reason, quantities of waste are recorded during the audit as well as their origin and reason for production. Hidden waste such as unused raw materials, wasted energy and water, and wasted time are also taken into consideration.
- *Waste disposal audit*. Often undertaken to comply, in part, with 'Duty of Care' regulations to investigate the transport and disposal of waste by contractors. During the first part of this audit, waste management documentation is usually the first thing that is checked (e.g.: waste management licenses, waste carrier licenses, and duty of care reports).
- *Water audit*. Similar to a waste audit, however, the focus is on water wastage. Onsite water use is analyzed as well as wastewater production and treatment. Water flowing into a site is measured and compared with what leaves the site. Any discrepancies can signify leakage or other problems. Once areas of high water use are identified, steps can then be taken to introduce savings. (EPA, 2000)

Is an Environmental Audit Necessary?

Particularly for first-timers, there is no shame in admitting a lack of knowledge regarding the full range and impact of one's business operations in terms of regulatory compliance, energy and resource use, raw material sourcing, supply-side issues, the creation and delivery of products and services, the inputs and outputs of offices and/or production facilities, cost relationships with suppliers, and subjects related to environmental management. This is when a professional service can come in handy. For example, the *Glasgow Housing Association* in Scotland (the largest landlord in the UK) had a first-time environmental audit performed at its headquarters by the *British Safety Council*, which identified over $51,000 in savings. In the process several waste minimization plans were developed, a library of resources was created,

recommendations were made to get employees involved in an efficiency drive, and obtainable waste reduction goals were set.

Despite a growing acceptance of environmental auditing, however, it's not uncommon to hear experienced practitioners say that the results they obtained from a *generalized* outside environmental audit did little more than reaffirm what had already been discovered by employees. As one practitioner put it, 'When we conduct a waste audit we not only measure the amount of waste produced we also know exactly where the waste came from. An outside auditor who does not have specific expertise in certain fields or equipment can only measure it.'

That being said, businesses that have been successfully reducing their waste levels for years sometimes do feel the need to step back and ask an outside specialist to provide a second opinion, reveal a new way of thinking, or perhaps instigate a more serendipitous outcome (see Chapter 34). For example, *Ecoprint*, an environmentally conscious printing company in Silver Spring, Maryland was able to procure a pollution prevention grant of $25,000 from the American *Environmental Protection Agency* after proving to EPA officials that it was serious in its efforts to explore new ways of producing commercial quality inks free from metal pigments. The printing industry has a standard for ink colors called a 'Pantone Matching System' (or PMS colors), which is formulated for color fastness, compatibility with printing plates, and consistency in hue. These must be taken into consideration with the pH levels of paper, the chemicals in ink formulas, and the printing process being used – all of which makes the hunt for safe inks very difficult (Nickbarg, 2006). Through a process of trial and error, however, *Ecoprint* achieved its goal of creating environmentally benign inks thanks, in part, to the keeping of records.

Environmental Audits Don't Hurt

According to companies that have undergone an environmental audit, the process is relatively painless. For the most part, an assessment begins with the questioning of management and non-management staff. An examination of current operations is then followed by recommendations for gradual improvement based on the abilities (both financial and in human terms) of the business being audited. Many businesses that have never conducted a waste-reduction drive beforehand state that the suggestions presented after an environmental audit often lead to cost savings that more than pay for the price of the auditing process. *Genzyme Diagnostics*, for example, a biotechnology company in the UK, had an

environmental audit performed that uncovered over $80,000 in potential annual savings resulting from waste minimization suggestions, reuse and recycling tips, and lighting and water reduction measures.

Getting Started

Before conducting an environmental audit (or a waste reduction audit) the business being audited should develop and build the following foundation:

- *Communicate the goals of the audit to everyone beforehand.* Inform every employee in every department what will be done and why.
- *Identify the parameters of the audit*. Determine what will be studied: Waste? Water? Energy? One program? The entire facility?
- *Establish measurement metrics*. How will the audit's findings be recorded? How will waste be measured (in units, in monetary terms…)? These issues will need to be determined before an audit begins.
- *Establish a 'no blame' policy*. Keep the emphasis of the audit on discovery rather than assigning blame.
- *Carry out the audit during normal, every day operations*. This helps ensure that the figures are accurate.
- *Verify and review the results*. Check finished work and measurements and review them with all concerned.
- *Discuss the results*. Bring your employees together, ask questions, identify areas that need improvement, gather improvement suggestions, and share successes when they've been achieved.
- *Repeat the process*. After agreeing on goals and objectives, set a date for the next audit and review the results. Environmental audits should be conducted on a regular basis.

Organizations that Conduct Environmental Audits

Because environmental auditing is a relatively new field, a good rule of thumb is to conduct a thorough background check before hiring a professional service. As for where these services can be found, many financial auditing firms have widened their service range to take advantage of growing environmental concerns. Look for specialized private companies, government agencies, and academic institutions with experienced staff. Following are a few examples:

- *Environmental services firms* often incorporate the services of skilled engineers. An example is ERM (*Environmental Resource Management*), which has over 135 offices in more than 40 countries. ERM (www.erm.com) conducts audits for waste disposal, chemicals handling, staff training, process safety, and other related areas.
- *Independent auditors* offer customized services to specific manufacturing sectors and geographic regions as well as different businesses based on their size.
- *Nonprofit organizations* including local, state, and federal agencies as well as trade associations and universities. The services these organizations offer are usually free or low-cost. To find the name and location of the nearest free environmental monitoring program in the USA, examine the map at: www.smallbiz-enviroweb.org/sba/seasbapweb.html and click on the appropriate state.
- *Traditional accounting firms* such as *PriceWaterhouseCoopers* offer environmental services divisions designed to help businesses assess and understand their environmental impact. Check the local or regional offices of these companies for details.

For More Information

For more information about conducting environmental audits, contact:

- The American *Environmental Protection Agency* (www.epa.gov). Enter 'inspections and evaluations' into the search engine displayed on the Home Page. The EPA also offers a *Small Business Source Book on Environmental Audits* (EPA 233-B-00-003) for small to mid-sized enterprises, which is available at: www.resourcesaver.org/file/toolmanager/customO16C45F38101.pdf.

Additional material can be obtained by entering 'environmental audit' into the search engines of:

- The *Global Reporting Initiative* (www.globalreporting.org)
- *Greenbiz.com* (www.greenbiz.com).

- The *Institute of Social and Ethical Accountability* (www.accountability.org.uk)
- The *United Nations Conference on Trade and Development* (www.unctad.org).

Chapter 20

Taxes and Legislation: the Efficient Business's Unlikely Allies

There is nothing new in governments searching for unique ways to make money. History has shown, for example, that Nero taxed urine, Peter the Great of Russia taxed souls, and British Prime Minister William Pitt (the younger) introduced a tax on windows. Modern day politicians are no less creative. For instance, in July of 2005 the American state of Utah began taxing 'nude or partially nude individuals' in strip clubs. During the same month and year Arkansas introduced a tattoo and body-piercing tax (electrolysis treatments are included). Alabama imposes a tax on decks of playing cards. In Chicago, 'fountain soda drinks' are taxed at nine-percent, yet the same soda purchased in a can or bottle is only taxed at three-percent (Sahadi & Christie, 2005). Iowa introduced a sales tax on pumpkins in 2007, claiming that most consumers don't use them as food, but for carving into jack-o-lanterns (which is why they were taxed). People who could prove that the pumpkins they bought were for eating were entitled to a rebate. Perhaps not surprisingly, so much ridicule was focused on the state of Iowa as a result of this tax that it was eventually repealed.

Meanwhile, in Canada packages of six or more donuts are exempt from the country's *Goods & Services Tax*, but sales of five or less are not. Microwave popcorn is also exempt from Canadian sales tax, but popcorn coated with caramel is not. And few Canadians can explain why their country taxes servings of plain milk, but not chocolate milk.

The Positive and Negative Sides of Taxation

As laughable as some taxes may be, collecting money for the good of society is no laughing matter. Taxes pay for local and national infrastructures, which help promote general welfare. When setting a tax the idea is to match

price with cost. This is why, in part, alcohol and tobacco are saddled with higher taxes – to pay for their costs to society. Unfortunately, the cost of what's *heavily* taxed, what's *minimally* taxed, and what's *not* taxed sometimes doesn't square up. For example, a chemical that sells for $20 per unit may be subject to minimal taxes to encourage its sale on an industrial scale, but what is its true cost when it makes its way into water supplies, food supplies, and human bodies?

Of course, raising money isn't the only function taxes perform. Taxes also carry the potential to *discourage* the sale of the items or activities being taxed (which, again, is why high taxes are placed on alcohol and tobacco). Unfortunately, an often unprepared for consequence of this practice is that when taxes are placed on items or activities that people consider *valuable* they can have the same effect. Consider the duty placed on employees as a case in point; most businesses are taxed, in part, on the number of individuals they employ (a practice that began in 19th century Germany). Put another way, the more people a business hires the more taxes it has to pay. Does this have an impact on employment and the number of people a business decides to hire? And if so, how much influence does it have?

Equally as frustrating (at least to taxpayers) is the fact that the more a person works the more taxes he or she has to pay (in the USA alone, two-thirds of personal income tax - which constitutes 80-percent of the tax funds raised by the US government - is derived from the sale of labor). What effect does this have on consumer spending (the engine that drives a nation's economic growth)?

Making Taxes Pull Double Duty

For years, a growing number of independent thinkers have been proposing that current tax structures could be put to better use. The idea is a simple one: to tax what society wants *less* of (e.g.: pollution and waste) and to reduce or eliminate taxes on what it wants *more* of (employment and income). A tax on carbon emissions, for example, could help reduce climate change and the costs and dangers associated with it. Unlike a cap-and-trade system, which allows markets to stipulate the amount of emissions that are tolerated (and which allows for the price of carbon to vary), a greenhouse gas tax would set a fixed price and let *it* determine the amount of emissions put forth. In other words, the

higher the tax on greenhouse gases, the greater the incentive to reduce emissions. How much tax would have to be imposed? To achieve an adequate reduction in CO2 emissions without unduly hurting the world economy, it's estimated that the tax would probably have to amount to between $20 to $50 per ton of carbon produced. In the United States, this would, in part, mean imposing a tax on gasoline, diesel fuel, and motor oil of around 6-percent and a coal-produced electricity tax of about 14-percent (Economist, 2007).

Since carbon emissions aren't the only harmful discharge the world wants less of, a similar duty would be placed on all dangerous discharges including chlorine, sulfur, and nitrous oxides as well as hazardous materials such as chemical fertilizers, pesticides, and phosphorous. Detrimental practices including topsoil depletion, non-renewable logging, and most mineral and metal extraction processes (including the mining of bauxite, chromium, coal, gold, and silver) would provide additional taxation targets. Waste sent to a landfill site or tossed into an incinerator would be included as well.

No doubt many businesspeople and industrialists will cringe at the prospect of a massive shift in taxation, but it's what would *not* be taxed that makes this proposition all the more appealing. Corporate taxes would be reduced or eliminated, employment taxes would end, and personal income tax would cease to exist. People and businesses could then pocket most, if not all, of their earnings and no company would be penalized for employing more workers. Taxes on interest, savings plans, retirement accounts, and college tuition accounts could also be eliminated. In addition:

- Businesses endeavoring to become more efficient would have more control over their tax burdens.
- Profits would increase as businesses became more efficient.
- The quality of goods and services would improve (such is what happens when waste is eliminated).
- The costs and dangers associated with climate change would be mitigated.
- People and businesses would have more money to save and spend.

Needless to say, a move of this magnitude would have to be gradual to allow industries to adapt to all the necessary changes. Afterwards, however, once a more sensible shift in taxation has been put into place, a common sense

approach to subsidies could also be adopted. Energy (including wind and solar power) could then trade at its true cost and billions of taxpayer dollars currently being directed toward problems that create waste and pollution could be redirected toward schools and social programs, job creation, and the promotion of cleaner and healthier working and living environments.

A Lot of Thought has Gone Into This

Redefining Progress (www.redefiningprogress.org) is a leading sustainability think tank located in the USA. For 12 years it (and several other organizations) has been studying the effects of taxing waste. The basic conclusion is that a quarter or more of all American public revenues could be replaced if the government started taxing waste *and* natural resource consumption instead of revenues and income. *RD* claims that a modest introductory tax increase placed on the burning of fossil fuels, for example, ***coupled with a reduction in payroll taxes***, could boost America's GDP and create 1.4 million new jobs while cutting climate change pollutants by 50-percent (Hoerner, 2005). The nation's economy would thus be put on a sounder footing because its growth would be more sustainable, less costly, and less dependant on foreign commodities. The problem, of course, is that there are few people in government who have the vision (or backbone) to commence such a change. Equally as true is that most people don't want higher taxes placed on anything - particularly (and paradoxically) if they've already invested significant amounts of money in inefficient homes, wasteful heating systems, fuel-guzzling vehicles, and so on. Enter the need for measured legislation.

Businesses Encouraging More Legislation: an Unlikely Oxymoron

Historically, businesses have always fought against most forms of legislation (except when used against competitors), but the costs associated with climate change are causing many CEO's to think twice about how laws that promote higher taxes and carbon caps can be used to help industry. In early 2007, for example, the CEO's of several top American corporations called on President George W. Bush to enact mandatory reductions in carbon emissions to combat global climate change (their goal was to cut greenhouse gas emissions by

at least 60-percent by 2050). The group, calling itself the *U. S. Climate Action Partnership* (USCAP), consisted of chief executives from *Alcoa*, *BP America*, *Caterpillar*, *Duke Energy*, *DuPont*, *the FPL Group*, *General Electric*, *Lehman Brothers*, *PG & E*, and *PNM Resources* – along with four leading non-government organizations including *Environmental Defense*, the *Natural Resources Defense Council*, the *Pew Center on Climate Change*, and the *World Resources Institute*. Because of the worsening state of the Earth's environment, the group realized that strict new legislation is bound to be enacted sooner or later. 'We felt it was better to be in the formative stages of any legislation,' said Jim Owens, CEO and Chairman of Caterpillar, '(otherwise we) could cost (ourselves) out of the market.' By banding together to avoid a patchwork of potential costly and conflicting state or regional regulations, Jim Owens and a host of other far-sighted CEO's are trying to work with lawmakers to set goals and targets that allow businesses time to make changes and implement solutions that will improve both the environment and energy efficiency, while protecting national trade and the economy (Source: CBS, 2007).

Investor Involvement

The *Securities and Exchange Commission* (SEC) is another American business body that has recently been approached by voluntary representatives who are concerned about waste and the relationship it has in regards to increasing costs. In September of 2007, a prominent group of state officials, state pension fund managers, and environmental organizations filed a petition with the SEC asking it to adopt guidelines requiring all public companies to disclose the risks of climate change to their business as well as the actions they're taking to mitigate those risks. The 115-page petition, signed by state treasurers, attorney generals, and state fund managers in California, Florida, Maine, New York, North Carolina, Oregon, and Vermont, states that 'climate change has now become a significant factor bearing on a company's financial condition… Investors are (therefore) looking for companies that are best positioned to avoid the financial risks associated with climate change and to capitalize on the new opportunities that greenhouse gas regulation will provide.' The petition went on to claim that 'Interest in climate risk is **not limited to investors with a specific moral or policy interest in climate change;** ***climate change now covers an enormous range of investors whose interest is purely financial***…'

The group claims that investors have the right to know:

- how seriously companies are taking climate change into account when making strategic business decisions (particularly the physical risks that climate change imposes on a company's operations and financial condition),
- the names of companies that are 'out front' in their response to climate risks and opportunities,
- the names of companies that are 'behind the curve' (so they can be avoided by investors), and,
- legal proceedings relating to climate change.

Although the SEC has not yet responded to the petition, the collective strength of its signers combined with the evidence they provided has led many to believe that the SEC may take action in the near future (Butler, 2007).

It's Not Just Big Business

Small businesses are also calling for increased legislation with the expectation that they'll soon reap its benefits. For example, one organization called *Small Business California* recently worked to support the state's *Global Warming Solutions Act* (AB 32), the passing of which imposes the toughest legislation enacted in the USA (to date) to tackle global warming. The idea behind *AB 32* is simple: to balance the reduction of hazardous emissions with incentives for improvement. In other words, businesses are encouraged to exchange the profits they normally lose through wasted energy for energy-saving solutions that quickly pay for themselves. The irony is that environmental groups have been lobbying for such changes for years - yet their efforts obtained fruition only after the local business community jumped on board (Kennard, 2007).

Further Examples

Although taxation and legislation designed to reduce waste will undoubtedly leave some people fuming in frustration, a recent government report published in the United Kingdom states unequivocally that businesses and consumers do indeed want their governments to do more to make it easier to be less wasteful (Web, 2006). The mandatory labeling and ranking of electrical goods and machinery in terms of efficiency (e.g.: *Energy Star* labels) is just one example of how legislation helps inform consumers about cost and energy

savings while increasing the demand for environmentally friendly goods. Additional changes being considered in the UK would make it easier for companies to install green technologies like solar panels and wind turbines. Currently, most businesses have to go through a lengthy planning application process (ranging between 8 to 16 weeks) and pay the equivalent of $3,000 if they want to install a solar panel or small wind turbine. To encourage greener and cleaner energy practices, however, the government has expressed an interest in placing renewable energy equipment under a 'permitted development' category, which would allow it to be installed without the need for planning permission. A 'route map' for improving the efficiency of new buildings with the aim of reducing carbon emissions is also being considered.

In California, state officials discovered that most HVAC air ducts leak 20 to 30-percent of the heated or cooled air they carry – so the government reduced leakage rate allowances to 6-percent. Further studies revealed that outdoor lights for parking lots and streets directed 15-percent of their beams up, not down. So outdoor lighting waste and leakage was set at 6-percent. The products these measures effect are now more efficient and cheaper to operate – and they're more competitive in the marketplace no matter where they're sold. Most importantly, however, the state 'de-coupled' utility profits from consumption rates (basing profits on the number of customers serviced rather than the amount of electricity sold) while allowing power companies to share the savings that consumers and businesses obtained from becoming more efficient (which is the only way more customers can be served from a limited supply) (Romm, 2008). This move lowers the state's energy needs while contributing to higher power company profits and an increase in consumer savings. Additional moves to promote efficiency include tax breaks for buyers of fuel-efficient vehicles, equipment, appliances, and buildings. Financial penalties placed on items and activities that do not comply with efficient practices are also a consideration.

Efficiency on a National Scale

The outcome of the many available efficiency options that are available to businesses have led many to wonder what would happen if a large number of companies in a particular region became more efficient, less wasteful, and less dependent on foreign energy and materials. Although it's still too early to tell, Germany might be providing an example. Germany pioneered the concept of

'extended product responsibility' and enacted national legislation in 1991 that is commonly referred to as 'take-back law'. Six years after its waste reduction laws were introduced, German households and industries reduced their packaging needs by 17-percent, increased the use of recycled packaging by 74-percent, increased plastic collection by 1,790-percent, and shipped over three-fourths of the country's produce in standard reusable crates. This desire to innovate, create less waste, and control costs may also have contributed to the fact that Germany now exports more merchandise than any other country in the world (including the USA and China) while dominating the market for specialized factory machine tools (Germany increased its number of export jobs by 2.4 million during the same period). 'China may be the world's factory,' says Hermann Simon, the CEO of a German consulting firm, 'but German companies are building (that factory).' Keep in mind that this growth happened – and continues to happen - while most other Western nations experience economic slowdowns. In November of 2007, for example, Germany's machinery producers' association revealed that its sector is growing by 15-percent, the fastest rate since 1969. The German auto-industry is benefiting too with exports rising by 11-percent and industry jobs increasing by 20-percent. In fact, of the world's major economies, only Germany and China have boosted their share of world exports since 2000. Germany's is up 5-percent, while France, Japan, and the United States have steadily slipped to minus 10, 25, and 30-percent respectively. This is the reason why Germany's manufacturing-heavy *DAX* index soared 22-percent in 2007; 18-points more than the *S&P 500* and Britain's *FTSE*, 21-points more than France's *CAC 41*, and 33-points more than Japan's *Nikkei* (Theil, 2008).

Far from clamoring for low quality, low-priced merchandise, many consumers, it seems, want high quality (the hallmark of efficiency) and are willing to pay for it. Granted, Germany has a long way to go in terms of reducing extraneous costs, and a number of other factors are also involved in the country's achievements (including rapid innovation, the combining of products with high-tech integration and services, and an ability to provide outstanding customer support), but a dedication to efficiency, sustainability, and waste reduction may well have helped lay the foundation for the country's current success. Equally as intriguing is that the German exchange students I teach every year repeatedly claim that efficiency, sustainability, and waste reduction are taught to most students in Germany during the first year or two of their university studies.

Is that a coincidence?

Chapter 21

The Perils of Green Washing

In the spring of 2007, *TerraChoice Environmental Marketing* (a green-certification organization) sent researchers into six national retail businesses to gather data about 'green' products. All in all, 1,018 products were looked at that covered a broad range of the consumer spectrum from air fresheners to appliances and televisions to toothpastes. Astonishingly, only one product turned out to be truly green – a paper product from Canada. All the others contained misleading claims that could not be proven. These claims included:

- *Not Revealing Hidden Trade-Offs*: 57-percent of the misleading claims made by manufacturers involved suggesting that the entire product was green when, in fact, the green aspect being promoted represented only a part of the product. The remainder of the product was both wasteful and destructive in terms of energy consumption, forestry destruction, and water usage.
- *No Proof to Back Up Claims*: 26-percent of the products examined boasted green credentials of some kind, yet the manufacturer was not able to confirm the claims being made.
- *Vague Labeling*: 11-percent of all misleading statements involved making a claim that was either poorly defined or meaningless, which made it likely to be misunderstood by consumers. For example, displaying a recycled symbol on the product without explaining what had been recycled.
- *Irrelevant Claims*: Four-percent of the green claims turned out to be true, yet were of no real value. For example, boasting that a product is free of CFC's may sound good, however, since CFC's have been illegal for almost 20 years making such a claim can be seen as a deliberate attempt to mislead the public into thinking that the manufacturer has gone the extra mile.
- *Promoting the Green Side of Hazardous Products*: Around one-percent of manufacturers made claims that could be used to distract the consumer from

the fact that the product is harmful to begin with (e.g.: 'organically grown' tobacco).

- *Out-and-Out Lies*: Less than one-percent of the products studied issued claims that were absolutely false, usually by using or misrepresenting a 'green' certification by an outside authority (TerraChoice, 2007).

Green Washing

The term used to describe the deliberate distortion of the truth in order to make false environmental claims is called 'green washing' and the legislation that covers this area is notoriously lax. For example, it's well within the law for the 'recycled' symbol to be placed on any product or its packaging even if either one (or both) contain just one-percent recycled material. Similarly, a business can make its products (or production processes) *slightly* less harmful to the environment, yet still boast in its advertising that it's 'greener'. In fact, this practice is seen as so profitable that the noise made by 'green' marketers is growing louder by the minute (Melillo & Miller, 2006). Major oil companies are particularly vocal. Under attack for reaping windfall profits from soaring fuel prices, many oil companies are trying to reposition themselves as part of the solution to the world's energy problems rather than its chief cause. Other manufacturers have recognized that they too can burnish their environmental image - without having to do much - as a way of promoting their products. The reason why, of course, is that many industries are trying to make socially conscious investors and customers more comfortable about buying their products and shares (Deutsch, 2005). Naturally, there's nothing wrong with touting green credentials if the efforts behind a business's claims are valid. But problems can and do occur when talk and promises turn out to be nothing more than green washing, as the following examples show:

- Food producers have made claims that their products (both plant and animal) are organic even though the main ingredients of these products have either been genetically modified or are laden with antibiotics.
- Power companies claim that they're concerned about the environment and are actively protecting environmental habitats, yet their actions (and fuel sources)

more-often-than-not continue to add to climate change concerns (Deen, 2002).

- A major arms manufacturer in Britain actually promoted several of its weapons as being environmentally friendly.
- A number of automobile companies, while claiming to be designing more efficient vehicles (that never seem to make it to the market in numbers equivalent to inefficient vehicles), actively lobby to reduce fuel efficiency standards. For example, in 2006, a major producer claimed in its advertising that it was 'dramatically ramping up its commitment' to more environmentally friendly cars. Left unstated was the company's dropped promise three years earlier to increase the fuel efficiency of its entire sport utility fleet. Also unmentioned was the fact that the company joined with other auto manufacturers in 2004 to block a California law that sought to limit emissions (Robison & Viscusi, 2006).

Why Do Businesses Green Wash?

Apart from the short-term financial benefits involved, the main reasons why organizations engage in green washing include:

- an attempt to divert the attention of regulators and reduce pressure for regulatory change,
- the desire to persuade critics that they're well-intentioned and/or have changed their ways,
- a need to expand market share at the expense of rivals that are legitimately trying to become greener,
- an attempt to reduce the turnover of environmentally conscious staff (or to attract more staff), and,
- a desire to make the company appear more attractive to investors (source: www.sourcewatch.com).

Another Twist: Capitalizing on Guilt

During the Middle Ages, professional pardoners working for the Catholic Church sold 'indulgences' that allowed sinners to be forgiven for their sins. This,

some believed, was tantamount to the buying and selling of salvation. Nevertheless the practice became so widespread that in the early sixteenth century (mostly through Pope Leo X's efforts to raise funds to rebuild St. Peter's Basilica in Rome) it sparked the Protestant reformation. Suffice it to say, the concept of paying a second party to atone for the sins of another goes back a long way - and many people now see a comparison between it and the current practice of neutralizing a person's (or business's) environmental impact through the purchase of carbon credits.

The idea behind buying and selling carbon credits began in 1989 when global power firm *AES* invested $2 million in a forestry project in Guatemala. The company made its purchase under the belief that laws would soon be enacted which limited carbon emissions and that these same laws would probably give companies struggling to reduce their carbon emissions the option of offsetting them. From that moment on a growing number of businesses have climbed onto the bandwagon by making it easy for customers to offset their carbon emissions by purchasing carbon credits. For example, some airlines will voluntarily add a few dollars more to the price of their airline tickets and several power companies allow customers to pay a higher monthly fuel bill to help offset the carbon emissions that their energy consumption creates. In another example, *Range Rover* automobiles have an emissions offset for the first 45,000 miles (72,000 kilometers) factored into their purchase price. Meanwhile, a ski resort in Vail, Colorado encourages its skiers to buy wind energy credits so they'll be carbon neutral as they're lifted to the top of a nearby mountain.

In theory, the money raised for any carbon credit program is supposed to be used for building or promoting environmentally friendly projects such as the planting of trees, the protection of forests, the funding of alternative energy programs, or the instigation of a pollution cleanup campaign. According to the *World Bank*, approximately $100 million is given on behalf of customers every year strictly for these purposes. Yet, apparently, some of this money never reaches it intended destination. Brokers have been known to skim as much as 60-percent off of carbon-offsetting investments as they're passed from one middleman to another. In addition, tree-planting schemes have been found to be nonexistent, and some solar energy projects have reportedly turned out to be little more than scams. Money invested in environmental cleanup campaigns has also

been called into question (particularly campaigns that have already been paid for) and countless carbon credits have been sold over and again to any number of different buyers.

What a Little Elbow Grease Can Reveal

In July of 2007, Katherine Ellison, a writer and mother, began seeking ways to reduce her family's carbon footprint. Not knowing how to go about this, she began investigating an offer from her electricity provider. Through what it calls a 'Climate Smart' program, the company had announced that its customers could pay an additional $4 or $5 a month to offset the emissions created by their electricity consumption. This idea was considered so revolutionary (it has since been touted as America's first utility-sponsored carbon offset program) that it helped the company's director win a special award from the *Environmental Protection Agency*.

Because Ellison's power provider has a captive customer base of 5 million people, five-percent of whom are expected to sign onto the program, the company believes it can raise $20 million to offset carbon emissions. In the meantime, $16 million has already been allocated to administer and market the program – most of which will be funded from a rate increase of two to three cents a month. In other words, even customers that don't buy into the program will end up paying for it. Where will the remainder of the money the company raises ($4 million) be invested? Initially, a company spokesperson announced that most of the money would be invested in California forests. One forest in particular was mentioned, the '*Fred M. van Eck Forest*', a sustainably managed wooded area that had a conservation easement placed on it in 2001. In other words, the money the company was earmarking for its carbon offsets was going to be channeled to an already protected forest. Further investigation revealed that some money might even be used to fund the construction of a building at a university.

In her article ('Shopping for Carbon Credits'), Katherine Ellison admits that it can be difficult to predict how a company's offset funding will be spent and that it's equally as difficult checking up on the validity of an earmarked program. For example, a recent declaration by a prominent environmental group stated that businesses commonly use the practice of carbon offsetting as a smokescreen to ward off legislation and delay action to cut greenhouse gas

emissions. Other critics say that due to a lack of oversight with most programs, offsetting carbon is a bad idea to begin with because there's too much room for abuse and it takes too much time to figure out which schemes are legitimate (Ellison, 2007). Quite a few realists are also concerned about the value of carbon-offsetting, claiming that once carbon emissions have been created it's too late to 'offset' them – they're already out there doing their damage. Apparently, indulging a second party to negate carbon emissions will never be as effective as reducing the original sin itself.

Separating the Wheat from the Chaff

With so much room for abuse, businesses wishing to partake in green or carbon offset programs are encouraged to investigate any and all claims before handing over their hard-earned cash. Creators of greenwash campaigns are professionals who are very good at fooling activists, customers, journalists, and politicians alike. Protective suggestions include (see also 'Ignorance is No Excuse' pg. 312):

- *Use common sense*. If a company's claims seem too good to be true they probably are (particularly if the company is situated in a traditionally non-green industry or its product portfolio is filled with goods that aren't green). Don't be fooled by colors, slogans, tear-jerking commercials or images, or safety claims used to seduce the public. If natural beauty has nothing to do with a product, it's green advertising is probably greenwash.
- *Do your homework*. All products have a hidden history. Even bamboo, which is often billed as a green alternative to everything from building materials to clothing textiles, uses hazardous chemicals in its processing. In particular, sodium hydroxide (a corrosive chemical used in drain cleaners) and carbon disulfide are often used to turn bamboo into useable fibers. Both chemicals are rarely, if ever, recaptured and reused after processing. The message? Do some research before buying into *any* green claim.
- *Ask questions and demand documentation*. If a company can't back up its claims with valid certifications, official audit reports, or similar documentation it's probably not telling the truth. Some companies, for example, state in their advertising that they fund endangered forests,

wetlands, and species. What is not said, however, is that they were forced to do so by law because of their destructive practices.

- *Seek consistency over time*. It's quite common for companies to make announcements about changes in policy or the launching of new initiatives only to starve their plans of funds later on (particularly when the spotlight fades). To avoid falling victim to this practice, investigate the longevity and success of a company's previous green projects as a way to help predict the feasibility of new ones.
- *Confirm the validity of industry associations*. There's no shortage of questionable 'regulatory' industry associations that companies claim are watching over them and their industries. False third-party tactics makes it easy for companies to hide behind a façade of smoke and mirrors. Again, do your homework.
- *Look for trustworthy certifications*. These include the 'EPA' label, 'Energy Star' (for appliances and electronics), the 'EcoLogo' and 'Green Seal' (for cleaning products), and the 'Forestry Stewardship Council' (for wood and paper products). See the bottom of page 310 for a list of reliable websites.
- *Follow the money*. Many businesses make private donations to groups or interests that don't square with their public statements. Examples include companies that claim to be doing everything possible to lessen waste and pollutants, but are secretly funding lawsuits, legislation, and other measures to prevent them from having to do so. American car companies often provide a classic example of this practice.
- *Test for international consistency*. To determine if a company is truly trying to become greener, see if it operates under different standards in different countries. Environmental laws and regulations vary in many nations so check to see if the company enjoys lower standards in countries that have little or no regulation.
- *Examine how the company handles its critics*. Some companies will try almost anything to silence their critics. Tactics range from spouting legal threats to collaborating with police and military forces. Obviously, such practices are not a good indicator of environmental compliance (www.sourcewatch.com, 2008). For additional suggestions on how green-washing campaigns can be spotted, visit: www.greenwashingindex.com.

Short-Term Gains, Long-Term Pain

With an increasing number of consumers and consumer groups on the lookout for disingenuous companies and their green washing campaigns, it's becoming more difficult to figure out why businesses deliberately make false claims in order to obtain a short-term influx of revenue. To be sure, the desire to inflate the price of shares is a powerful incentive, but the long-term effects of being deceitful can be devastating. One need look no further than *Monsanto* (see page 45) – a company that was merely *seen* to be deceitful – to learn the truth in that. Additional examples of companies that have been leaned on by investigators and consumers include the *Royal Dutch Shell* corporation, which, in July of 2007, was ordered by French authorities to withdraw million-dollar advertisements that showed flowers coming out of smokestacks. *Woolworths* in Australia was publicly named and shamed in August that same year for selling toilet paper that carried fake sustainable forest fiber labels. Other companies have faced fines and/or experienced drops in sales for similar unethical or illegal behaviors and companies that partake in questionable environmental activities have been tarred with the same brush. For example, *MacMillan Bloedel*, one of Canada's largest forest-product companies, was labeled a serial forest-clearer and a chronic chlorine user by environmental activists and subsequently lost five-percent of its sales almost overnight when it was dropped as a UK supplier by *Scott Paper* and *Kimberley Clark* (Lovins, et al, 1999). Simply put, neither *Scott Paper* nor *Kimberly Clark* wanted the negative publicity.

As these examples show, companies that either greenwash or choose to remain inefficient not only weaken brand image and invite further scrutiny, they also tend to diminish the concept of becoming greener, which is something that doesn't rest easy with companies that make the effort. Recently, the *Federal Trade Commission* called for a special meeting dedicated to the update of environmental guidelines - a decision that should make green washing even more of a bad idea.

As a former manager, I can't help but make a comparison between businesses that greenwash and deceitful employees who spend more time and energy trying to appear busy rather than in being busy. In the end, those who fake their industriousness only hurt themselves (not to mention the fact that *being* busy is much easier than *looking* busy). What a business puts into its efficiency

and waste reduction efforts is what will be obtained from them. Period. Short-term duplicity designed to fool customers and the public only leads to long-term pain. All it take is one dishonest practice to hit the Internet and in a flash, weeks, months, or perhaps even years of consumer retribution may have to be dealt with.

Bibliography

Agor, W.H., *Intuition in Organizations*, Sage Publishing, Newbury Park (CA), 1989.

Brousseau, Kenneth, & Driver, Michael, & Hourihan, Gary, & Larsson, Richard, The Seasoned Executive's Decision-Making Style, *Harvard Business Review*, February 2006 (reprint R20602F), pp. 111-121.

Butler, Jim, 'Hotel Lawyer: Why the SEC May Make You Go Green', www.hotellawblog.com, September 30, 2007.

CBS (and AP), 'Big Business Pushes Bush on Carbon Caps, Top U.S. CEO's Tell President Action on Climate is Necessary', www.cbsnews.com/stories/2007/01/23/business/main/2387501.shtml, January 23, 2007.

Chastain, Cheri, (interviews and e-mail exchanges with the author), February-March 2008.

Deen, Shireen, 'Don't be Fooled: America's Ten Worst Greenwashers', *Valley Advocate*, www.alternet.org/story/13984, August 29, 2002.

Deutsch, Claudia, 'It's Getting Crowded on the Environmental Bandwagon', *the New York Times*, www.nytimes.com, December 22, 2005.

Economist, 'Business can do it with Government's Help', *The Economist*, www.economist.com, May 31, 2007.

Ellison, Katherine, 'Shopping for Carbon Credits', *salon.com*, www.salon.com, July 2, 2007.

EPA, *The Small Business Source Book on Environmental Auditing*, EPA 233-B-00-003, May 2000.

Friedman, Thomas, L., 'The Power of Green', *New York Times Magazine*, April 15, 2007.

Hoerner, J. Andrew, 'Tax Waste not Work', www.tompaine.com, April 15, 2005.

Hogarth, R.H. & Kahneman, D. & Tversky, A., *Judgments in Managerial Decision Making* (3rd edition), John Wiley & Sons, New York, 1994.

Huber, G.P., *Managerial Decision Making*, Scott-Foresman, Glenview (IL), 1975.

Kennard, Byron, 'Business Gets a New Voice', www.greenbix.com, circa 2007, (accessed March 2008).

Lovins, Amory & Lovins, L. Hunter & Hawken, Paul, *A Road Map for Natural Capitalism*, Harvard Business Review, May-June 1999, pp. 145-158.

Melillo, Wendy & Miller, Steve, 'Companies Find It's not Easy Marketing Green', *Brandweek*, www.brandweek.com, July 24, 2006.

Nickbarg, Susan (principal of SVN Marketing, LLC), 'Ecoprint: Greening the Industry One Print Run at a Time', available at www.greenbiz.com, January 2006.

Pounds, W., 'The Process of Problem Finding', *Industrial Management Review*, Fall 1969, pp. 11-12.

Robison, Peter & Viscusi, Gregory, 'Ecologists are Unmoved by Green Wave in Advertising', *the International Herald Tribune*, www.iht.com, January 18, 2006.

Romm, Joseph, 'Why We Never Need to Build Another Polluting Power Plant', www.salon.com, July 28, 2008.

Sahadi, Jeanne & Christie, Lee, 'America's Wackiest Taxes', *CNN Money*, New York, http://money.cnn.com/2005/02/18/pf/taxes/strangetaxesupdate, February 22, 2005.

Scott, Jonathan, T., *The Concise Handbook of Management*, Haworth Press, New York, 2005.

Simon, H.A., *Administrative Behavior*, Free Press, New York, 1947.

Theil, Stefan, 'The Factory of Factories', *Newsweek*, www.newsweek.com, January 12, 2008.

Von Oech, Roger, *A Kick in the Seat of the Pants*, Harper & Row, New York, 1986.

Web, Toby, 'Sustainable Consumption: We Will if You Will, Say Consumers', *Ethical Corporation*, www.ethicalcorporation.com, July 21, 2006.

Part II

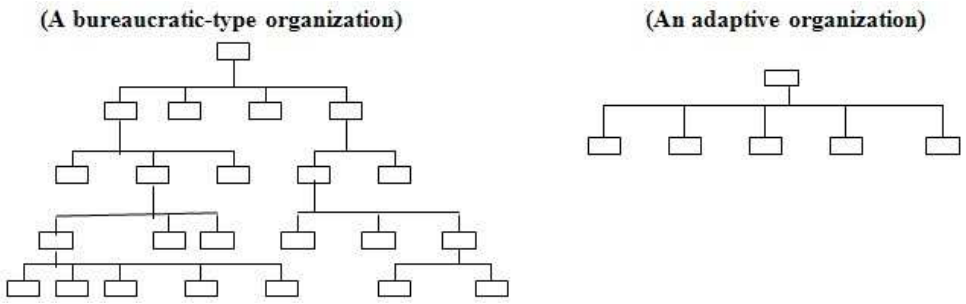
Practical Application Solutions

PLACE

Whether in an office, a factory, a store, or a home, most work is conducted in buildings – and the vast majority of the world's buildings are inefficient. In the United States alone, buildings consume more than 68-percent of all electricity produced. Buildings also account for over 39-percent of America's energy demands and are responsible for contributing 38-percent to the country's total carbon dioxide emissions. Equally as unsettling, it's not uncommon for indoor pollution levels to be two to five times higher (occasionally 100 times higher) than outdoor levels due to dust and fumes from interior building materials, cleaning solutions, production processes, central heating and cooling systems, radon gas, pesticides, paint, glue, carpets, and so on. Building-related productivity losses and illnesses resulting from these toxins are estimated to cost businesses between $60 billion and $400 billion annually. Eliminating this waste is therefore fundamental to the efficiency process. (Source: the US Environmental Protection Agency)

Chapter 22
Organizational Structures and Cultures

Before a place of work can be made *physically* more efficient, the *mental* processes inside it must be conducive to change and improvement. In this regard the size of a business can be used to its advantage. Small businesses can make decisions quickly and can change course very fast, something many big companies just can't do. Consider the chain of command 'boxes' displayed in the two hierarchical pyramid diagrams below. Both show how people and departments can be tied together (or kept apart) as well as how information can move or not move within each structure. The diagram on the left is a caricature of a *bureaucratic* (or mechanistic) structure. The one on the right is an exaggeration of an *adaptive* (or organic) organization. Many shake-ups in the corporate world are designed to help take a company from the example on the left to the one on the right.



Although these illustrations may be over-simplified, they help show why the process of moving from a bureaucratic structure to an adaptive one is referred to as *flattening* an organization. Flat organizations have fewer layers of management and lots of autonomous (empowered) employees (see pages 99-102). In a flat organization, employees can react to customer needs and changes faster because fewer managers, fewer piles of paperwork, and fewer rules and procedures stand in their way. Equally as important, flat organizations tend to bring managers and non-managers closer to customers. The not-so-good news is

that having fewer managers and fewer chain of command restrictions increases personal responsibilities and workloads.

Which Organizational Structure is Best?

Bureaucracies work best in situations where on-going, previously encountered problems can be met with predetermined rules and procedures. This means that employees rarely perform beyond the basic requirements that are expected of them. Due to a from-the-top-down hierarchy style, employees in a bureaucracy typically step outside their perceived boundaries only when they're ordered to do so – and as a result, 'That's not my job,' is a common refrain repeated by bureaucratically-minded employees when confronted with new situations. Simply put, bureaucracies don't tend to welcome change

Adaptive or organic organizations, on the other hand, thrive in dynamic and changing environments. In an adaptive organization, employees are motivated by freedom, challenges, and the ability to make their own decisions. The downside is that some employees may lack the self-discipline and direction that an 'I'm-the-one-responsible' structure demands.

So which organizational structure is best? Most companies, particularly those seeking to reduce waste, covet the speed and flexibility inherent in adaptive or organic organizations even though this type of setup requires a lot of self-motivated employees and a great deal of change-management work.

The Power of Speed and Flexibility

Business tales are notorious for being full of so much hyperbole that it's often difficult to separate fact from fiction, however the lessons they generate are sometimes reason enough to repeat them. One case in point is the story of how *IBM* (the company that invented the *office* computer) developed its first computer for *personal* use. Prior to the development of the personal computer, IBM dominated the business machine market – including business computers. Yet, when personal computers entered the market IBM famously decided to ignore this 'fad' and stick to manufacturing office systems. In fact, many years earlier the CEO of IBM had publicly proclaimed that computers were a dead-end market because the world would only ever need five or six of them. Of course by the

time IBM realized this wasn't the case, it was too late. Almost overnight, dozens of smaller companies sprang up to fill the void that IBM chose to ignore.

Stymied by the company's colossal infrastructure, IBM's administrators desperately gathered together several of the company's best people and removed them from the confines of the organization so they could design a profitable PC. Freed from IBM's bureaucracy (which could take years to approve a project), the newfound team designed a new product in record time. Unfortunately, afterward they were shoehorned back into the same tight, unyielding bureaucratic system that had prevented them from developing a PC in the first place. As a result, according to legend, every person involved in the creation of the new PC eventually quite the company. IBM did, of course, survive thanks to its new product line, but by then too many competitors had entered the market and the company never regained the reputation or market share it once enjoyed. It has since (famously) changed its culture and dedicated itself to becoming a flatter organization.

The Importance of Organizational Culture

Does a flat organization have a better chance of becoming more efficient compared to a bureaucratic organization? Many people think the answer is yes because flat organizations are somewhat easier to manage and change.

According to a recent survey conducted by *Business Week Research Services* (for accounting firm *Grant Thorton*), three-quarters of respondents stated that promoting corporate responsibility (i.e.: a foundation stone of efficiency) increases profits. Similarly, a study conducted by investment bank *Goldman Sachs* concluded that companies, which have established **e**nvironmental, **s**ocial, and **g**overnance (ESG) policies tend to outperform the general stock market by 25-percent (Odell, 2007). What these two studies don't mention, however, is that before an organization can enjoy the advantages of increased responsibility it must first ensure that its people are ready, willing, and motivated (in the long-term) to be more responsible - and that may require a change in company culture.

A business's culture is much like the culture of a nation or a people in that it provides individuals with a unique sense of identity that dictates to some degree, either by rule or example, the way the business is organized, its values,

how its people think, how work gets done – and ultimately how successful the company can be. The best organizational cultures provide a perfect fit between products, employees, paying customers, and overall goals and objectives. Characteristics, traits, and abilities that establish company culture include:

1. *Innovation and Risk Taking* – the level to which employees are encouraged to take risks or do new things without fearing punishment.
2. *Attention to Detail* – the degree to which employees must exhibit precision or analysis in their work.
3. *Outcome Orientation* – whether management focuses more on results and outcomes - or - the techniques and processes to achieve those outcomes.
4. *People Orientation* – the importance the organization places on its people and their ideas.
5. *Team Organization* – the degree to which an emphasis is placed on teams rather than individuals.
6. *Aggressiveness* – the level of 'hunger' and competitiveness the organization has.
7. *Stability* – the emphasis placed on maintaining the status quo in contrast to growth and improvement (O'Reilly, et al, 1991)

Subcultures

To accomplish goals and better develop employees, departments working within the overall organizational framework of a business sometimes have to establish their own separate system and culture. These are called *subcultures* – distinct cultures that operate on a smaller scale. For example, the precision and focus of an accounting department usually requires a formal, controlled environment. On the other hand, a product design or marketing department relies on spontaneity, creativity, and individuality. Both the accounting department and the marketing department can be part of the same company (and operate under the same overall cultural umbrella), yet they each have their own unique way of doing things. This is because the type of culture a department develops should reflect the product or service it offers, the talent and norms of its people, and, of course, the wants and needs of its customers.

With Culture, It's Everything or Nothing (a Case Study)

By developing an environmentally conscious company culture that, in part, supports the causes its internal and external customers care about, outdoor equipment company *Patagonia Inc*. sets itself apart from its competitors, racks up stellar sales, and keeps its customers fiercely loyal. How? Mostly through vibrant internal education programs that help employees understand and prioritize opportunities that minimize the business's environmental impact. Equally as important is the creation of an ideology in which *everything* within the company (from retail operations to products to the food served in employee cafeterias) is scrutinized and assessed for possible environmental harm. As a matter of course, *Patagonia* also maintains an extensive recycling program (including the recycling of used products and garments), composts its food waste, uses low-flow toilets, and voluntarily participates in national energy-efficient lighting programs. Even the company's landscaping is kept organic. In addition, *Patagonia* works closely with its suppliers to minimize the environmental impact of its products and has even 'split the difference' with external customers over the increased price of organic cotton in its clothing line. To maintain this culture, *Patagonia* uses company brochures, displays, and donations to keep its efforts fresh in the minds of both the public and its customers (Ottman, 2007). In doing so, no one who works for *Patagonia*, or who buys from it, misunderstands what the company is about – and in a such a culture, waste-reduction practices can be easily introduced.

Cultural Classifications

In 1972, management researcher Roger Harrison identified four distinct organizational culture categories. They are:

1. The *Power Culture* is based on a key individual (or individuals) that directly controls others. Few rules and little bureaucracy exist in a power culture because the central figure makes most decisions. Power cultures can move quickly and react well (if they are inclined to), however, if the key individual(s) is removed, the organization (or department) is vulnerable to collapse. Examples of power-culture organizations include companies with celebrity CEO's, companies where the top person either invented or

innovated the product, or in general, any company where one person has extraordinarily high levels of control.

2. The *Role Culture* is rigid and formal and is often stereotyped as bureaucracy. Co-ordination is maintained by a narrow band of senior management. Performance above and beyond established guidelines is not needed and personal power is usually frowned upon. Rules and procedures are therefore the major methods of influence. Examples include the military, governments, and large corporations.
3. The *Task Culture* is project oriented. The emphasis is on good judgment and proven skills and getting the job done. Indeed, the entire work ethos is designed to put the right people in the right job and let them get on with it. Since task cultures are results oriented they're usually very adaptable so they thrive where creativity, competitiveness, and speed are required. Methods of promotion include team projects, flexible work hours, and employee-led change. Examples of task culture businesses include advertisement agencies, computer software developers, construction contractors, animated film-making, and product designers.
4. The *Person Culture* has the individual as the centre point. Person-culture organizations exist because the highly skilled people within them are doing their own thing yet still pulling in the same direction as their colleagues. Examples include lawyers in law firms, physicians in medical centers, and university professors.

Where Does Company Culture Come From?

Culture can derive from a number of sources. Following, adapted from Schein (1990), are the three most prevalent:

1. *Location or physical environment*. Whether in a city or the countryside, landlocked, or near the sea, a business's location can have a profound influence on its culture. The country where the business operates, its customs, technology, the levels of education, local and national politics, the economy - even weather and climate - are also influential. For example, companies in countries that experience drought are often very efficiency-

minded because they fully understand the value of raw materials and commodities (such as water).

2. *Leadership* (and in particular, company founders). The interests and quirks of leaders and founders can be quite influential in determining organizational culture. For example, if company leaders are not enthusiastic about efficiency, sustainability, and waste reduction, their followers probably won't be either.

3. *Past Successes or Failures*. How a company treats its successes is equally as important as what it does when it fails. Are workers punished when they don't succeed (and are thereby taught to never attempt anything new again)? Or are mistakes considered a part of the learning process?

Two Levels of Organizational Culture

In every business, culture exists on two separate levels. The first is *observable* or what one sees and hears when walking around the company's premises. Observable culture trademarks include:

- *Stories*. Tales told again and again about incidents within the company that help enforce desired behavior.
- *Heroes*. The people singled out for special attention whose actions encourage similar behavior.
- *Rites and Rituals*. Ceremonies, meetings, and celebrations that instill teamwork.
- *Symbols*. The use of language, colors, or non-verbal expressions to communicate important themes. Examples include corporate logos, charity funding, PR campaigns, architecture (Deal & Kennedy, 1988), or even the placement of recycling bins in waste disposal areas.

The second level of a business's culture, *core culture*, is unseen. Core culture reflects the true values or underlying beliefs that influence employee behavior. This means that core culture is usually only seen and experienced by the people who work in a particular organization. Examples include:

- *Performance Excellence* (the way employees are judged).
- *Innovation* (if or how new ideas are welcomed).
- *Social Responsibility* (the importance placed on environmental and social ethics).
- *Worker Involvement* (the level to which employees are involved in decision making)
- *Quality of Work Life* (the state of general working conditions)

How is Company Culture Maintained?

Usually in three no-nonsense ways:

1. By hiring people who think the way management does and firing those who do not.
2. Through indoctrination (i.e.: training).
3. By having management set an example (Hesselbein, et al, 1997).

Strong versus Weak Cultures

Culture plays a significant role in a company's work climate because strong cultures usually influence behavior more profoundly than weak cultures. A good way to demonstrate this is with *DisneyWorld* in Orlando, Florida. *DisneyWorld* is renowned for having a very strong company culture. Apart from the lingo (uniforms are called *costumes*, employees are *cast members*, being at work is considered being *on stage*, and so on), employees are told how much jewelry they can wear, the type of hairstyles allowed, the intensity of perfume or cologne permitted, and so on. The purpose is to establish a 'Disney look' and enforce unity. On the surface, this may sound awful, but the company balances its demands with a welcoming attitude that's hard to beat. Years ago, on my first day at work there (all new employees attend two days of *Disney University* prior to beginning their jobs), the manager in charge of training cheerfully made his presence known by announcing, 'Welcome to DisneyWorld! Before we begin, I want each of you to know that for every person sitting in this room over 200 applicants were turned down because we wanted *you*!' No employer had ever

said that to me before and it made me (and everyone else) feel very good. I was ready to toe the line.

Of course that doesn't mean strong cultures are for everyone. Organizational structures and cultures can manipulate employee behavior to such a degree that they can also *adversely* affect performance. The days are long gone when IBM employees had to stand beside their desks each morning and sing the corporate anthem, but some companies still encourage unity and high morale with similar practices (a trend that seems to be accepted more readily in America). Having workers stand in a circle while clapping and chanting uplifting slogans ('We're number one, we're number one…) is but one example. Be warned, however, that this type of behavior can be seen as humiliating and, if forced upon those who don't like it, can build resentment. On the other hand, if employees respond positively to it, then it's worth continuing.

Changing an Organization's Culture

When changing an organization's culture, much debate exists as to whether it's easier to work *within* the culture or to try and change it outright. The most widely held belief appears to be the former. The following considerations have been suggested to help facilitate organizational change. Think of each in terms of instilling efficiency, sustainability, and waste reduction in a business (see also, Chapter 8):

Primary Factors for Change (Embedding Mechanisms)

1. Make it clear what your organization will pay attention to, measure, and control.
2. React appropriately to critical incidents and crises (don't expect too much too fast)
3. Role model, teach, and coach your values (i.e.: lead by example and provide good training).
4. Communicate priorities by allocating rewards and recognition.
5. Ensure that your company's human resource criteria are consistent with your organization's values (i.e.: hire the right people).

Secondary Factors (Articulation and Reinforcement Mechanisms)

1. Make sure the vision and mission of your organization reflects every new value and priority and that your vision, mission, values, and priorities are available for all to see.
2. Ensure all work systems and processes reflect your organization's values and priorities.
3. Physically design all work areas and environments so they reflect your organization's values and priorities.
4. Provide constant and 'fresh' (timely) feedback (Schein, 1985).

The Mental Before the Physical

Remember, before the *physical* environment of an organization can be made more efficient, its *mental* state must first be primed and readied. For a reminder of relevant issues to consider when changing an organization, see Chapters 7-11.

Chapter 23

Building Better Buildings

The *Rocky Mountain Institute* (RMI) is an entrepreneurial, non-profit, environmental think tank located in Old Snowmass, Colorado. Within its 4,000 square-foot (372 sq. meter) headquarters is a fishpond where turtles, frogs, carp, and catfish swim year round. Bougainvillea blossom under insulated skylights that cast a warm glow upon a profusion of grapevines and mango trees. Papayas, passion fruit, and bananas are also harvested inside the RMI building despite the fact that the entire structure is situated at an elevation of 7,100 feet (2,164 meters), the outdoor growing season amounts to 52 days a year, midwinter cloudy spells last as long as a month and a half, and temperatures occasionally drop to minus 47 degrees Fahrenheit (- 44 Celsius). Yet the RMI has no central heating system and its monthly energy bill amounts to around five dollars. Layers of super efficient insulation, heat-recovering ventilators, and insulated windows help keep the building and its occupants warm all winter long. Most astonishing, however, is the fact that this building actually cost *less* to construct than a conventional structure its size and that the efficiencies which make it so cost-effective came from 1983 technologies that paid for themselves within ten months.

Further north, in Minnesota, stands the *Phillips Eco-Enterprise Center* (PEEC), a $5.3 million commercial and industrial facility. Currently, PEEC, which is a pilot project for the *Green Building Council*, is home to 20 manufacturing companies and office tenants. Features built into the 64,000 square foot (5,946 sq. meter) building include salvaged and recycled construction materials, wind and solar power sourcing, geo-exchange heating and cooling (heat pumps), active daylighting, a green roof, non-toxic low-emission wall coatings, and exterior stormwater retention and treatment systems. Because of these efficiencies PEEC has won two design awards - including one from the *American Institute of Architects*. Interestingly, however, that's not why the

building is in such high demand on the rental market. What draws clients to PEEC is the fact that it's less expensive to operate a business under its roof. According to the *Building Owners and Managers Association* (BOMA), normal utility costs for a 64,000 sq. foot (5,946 sq. meter) building add up to around 20-percent of its annual operating budget. PEEC's annual utility bills amount to only $25,000 or about five-percent of its annual operating budget. Furthermore, PEEC spends only 17-percent of its operating budget on repairs, security, and ground maintenance, compared with the 23-percent that BOMA says is typical.

Additional Examples of Efficient Buildings

Commercial buildings that pay for their costs and, in some cases, produce more energy then they use, are not a fantasy. Low cost technologies combined with common sense have been producing such efficient structures for years. For example, as highlighted in a USGBC white paper prepared for the U.S. Senate Committee on Environment and Public Works, *Verifone* (a division of Hewlett-Packard) renovated its California headquarters and subsequently saw its energy consumption drop by 59-percent. Soon thereafter, employee absenteeism decreased by 47-percent and employee productivity increased by five-percent. Meanwhile, the *California State Automobile Association* office in Antioch, (the cheapest CSAA building ever built), decided to flood its 15,704 square-foot (1,459 sq. meter) interior with lighting from energy-efficient light bulbs and (free) daylight that streams in through super-insulated windows. The resulting 63-percent reduction in energy bills covered the cost of improvements in six months. One of the most written about case studies in commercial building efficiency, however, concerns the *ING Bank* in Amsterdam (The Netherlands), which was built in 1987. The *ING Bank* building requires 92-percent less energy to operate compared with standard structures its size. Moreover, the $3 million in annual reduced energy costs paid for the building's efficiency upgrade in three months. Today, the building is so aesthetically pleasant to work in that absenteeism is down 15-percent, productivity is up, and employees sometimes don't want to leave in the evening (source: RMI).

Overcoming Wasteful Building Practices

Slowly, architects and builders are waking up to the fact that buildings – where most people spend over 90-percent of their time – do not need to be a major cause of waste or inefficiency. Indeed, according to architect and ecologist Ken Yeang, there's no reason why any building - or any part of any building – has to be inefficient. Yeang reasons that every building should integrate into its environment in three ways:

- *physically* (harmonizing the building with its topography, its water supply, and its vegetation).
- *systematically* (maximizing the use of water, energy, and waste in the building).
- *temporally* (balancing the building's resource use with its rate of resource replenishment). (CNN, 2007)

Unfortunately, there are two reasons why most of the world's buildings either remain inefficient or are built inefficiently. First, the compensation paid to architects and engineers is usually based either directly or indirectly on a percentage of the cost of the building or the equipment specified for it (i.e.: fees are based on how much the building costs rather than how much it saves). Second, most property developers do not expect to pay the energy bills of the structures they build so they have little or no interest in energy-saving or waste reduction solutions -- even though green, more efficient building projects typically sell or lease faster and retain tenants better than their inefficient counterparts. In addition, green buildings have greater visual, thermal, and acoustic comforts that yield valuable financial gains in terms of productivity, retail sales, and manufacturing output.

Fortunately, progress is being made remunerating contractors for the amount of energy their buildings will save in the long run rather than how much money can be saved in the short-term. This is good news when one takes into account a study conducted by the *Lawrence Berkeley National Laboratory* in Berkeley, California, which estimates that potential savings and productivity gains from creating better indoor environments in the United States can add up to $6 billion. An additional $14 billion could be saved from reducing respiratory ailments resulting from indoor pollution and a further $30 billion could be saved

by reducing the causes of 'sick building' syndrome (Laudal, 2007). Indeed, in a 2004 survey of 719 building owners, developers, architects, engineers, and consultants, 91-percent of these professionals believed that green buildings improved the health and well-being of their occupants (NRDC, 2007).

Efficient Buildings also Increase Profits

Financial savings in terms of lower energy needs are not the only benefit provided by energy efficient buildings. A well thought-out and well-constructed building that makes the most of natural daylight *and* cross ventilation can also boost revenues. *Lockheed Martin* discovered this firsthand when it moved some of its offices to a building lit by natural light. The company immediately experienced a 15-percent drop in absenteeism (which usually hovered around seven-percent). Further analysis revealed that a 15-percent drop in a seven-percent absenteeism rate is equal to a one-percent improvement in productivity and that every minute less of wasted employee time represented a 1.67-percent gain in productivity. The company then concluded that a two-percent increase in productivity equated to $3 million in additional revenue every year.

Lockheed Martin is not alone. Following is a list of documented improvements obtained after natural light was introduced into companies and workplaces around the globe:

- Staff turnover reductions of 200-percent.
- A doubling of customer numbers.
- Customers shop for longer periods of time.
- An increase of up to 40-percent in retail sales.
- Productivity increases of up to 18-percent.
- A drop in accident rates by as much as 50-percent.
- Improvements in task performance times.
- Employees able to identify items (including defects) better and faster.
- An increase in patient recovery rates (hospital staff also benefit from the stress reduction properties of natural light).
- Improvements in the vision abilities of the elderly.
- Students enjoy increased health benefits and, strangely enough, fewer dental cavities (Edwards & Torcellini, 2002).

Improvements like these have not just been recorded in the United States. The *Canada Green Business Council* drew similar conclusions when it discovered that the introduction of natural daylight raised productivity 13-percent in select Canadian businesses, increased retail sales by up to 40-percent, and helped improve school test scores by as much as five-percent. Improved ventilation added to these enhancements by increasing productivity an additional 17-percent and decreasing sickness by up to 50-percent (Laudal, 2007).

Getting Over the Hurdles

Without question, the greatest misconception about energy-efficient buildings is that they always cost more - an allegation that many architects insist is not true. Any building can be made either more expensive or less expensive depending on how it's designed and constructed. Yes, adding more insulation, installing rainwater collectors, fitting higher quality windows, placing solar panels on roofs, and putting passive shading structures over windows can incur extra expenses, but when these improvements eliminate the need for an entire heating and cooling system (which they can do) the extra costs are often negated.

High-rise tower buildings can also enjoy the benefits of efficient construction even though, on average, they require 30-percent more energy and materials to build and operate than other structures. Just as with small buildings, most extra costs can be neutralized through efficient design and materials. The *Rocky Mountain Institute* has shown how a six-story building can fit into a five-story structure (five-stories is usually the limit for building code heights in many towns and small cities). This is possible by making a few structural changes and virtually eliminating ducts and suspended ceilings. Under-floor ventilation and wiring and super efficient windows and day-lighting are also incorporated. Construction expenses remain virtually unchanged (mostly because of a reduction in heating, ventilation and air-conditioning needs) with subsequent energy costs reduced by one half to three-fourths (Hawken, et al, 1999). The use of natural light and ventilation, the building's low energy and maintenance costs, a propensity to produce more income, and natural good looks and interior comfort

means that everybody wins: the owners of the building, the occupants of the building, and the neighborhood where the structure is located.

Putting Building Improvement Plans Into Action

Efficient buildings do not have to be built from scratch. Anyone looking to build a new factory, an office building, or a retail operation, should first consider upgrading an existing building before constructing a new one. It's relatively easy (and often more cost-effective) to re-fit an old building - even historical buildings that are over 100 years old – than to build new. For example, the American *National Audubon Society* upgraded a 100 year old, 98,000 square-foot (9,104 sq. meter) building in 1992 at a cost roughly 27-percent below that of building from scratch (all costs were recouped within five years). The resulting retrofit cut two-thirds off the building's energy requirements, improved ventilation, eliminated indoor toxins, and introduced an office recycling program that reduced waste by 70-percent. Similarly, a 73,000 square-foot (6,782 sq. meter) municipal office building in San Diego was retrofitted by using over 40 tons of recycled construction debris and sustainably sourced recycled materials. The resulting 60-percent reduction in energy costs covered the price of the retrofit in four years (RMI, 2007).

Thinking Ahead *before* Construction

If upgrading an existing building is not an option then the construction of a new structure should be planned well in advance. Most buildings can cut 20-percent to 50-percent (or more) off their annual heating and cooling costs - with no additional expense - by maximizing three factors (location, positioning, and shape) before construction begins:

Location

- Well-placed buildings protected by hillsides and areas covered with trees are insulated from cold north winds as well as the heat of the sun.
- Close proximity to major transportation routes can promote environmentally friendly commuting methods and reduce the energy requirements of employees, customers, and suppliers.

- Factories reliant upon heat, chemicals, or raw materials can lower the cost of these inputs by locating next to companies that produce them as a waste product (see Chapter 33).

Positioning (for buildings situated above the equator)

- If possible, the geometry of a building should coincide with the trajectory of the sun to maximize solar gain. Buildings with a southern exposure can decrease their need for artificial light by incorporating larger energy-efficient windows and maximizing solar gain with solar voltaics. Offices or rooms that need minimal solar gain should face north.
- The longest axis of a building should run east and west rather than north and south. Windows facing north or south promote solar heat gains in the winter (when the sun is lower in the sky). Roof overhangs or awnings reduce solar heat gains in the summer.
- Retain as many existing trees as possible and plant new ones. Deciduous trees on the north and west side of a building reduce wind, provide shade during the summer, and let light in during the winter when leaves fall. Just three trees properly planted around a mid-sized building can reduce the heating and cooling costs of the building by a few hundred dollars while decreasing summer air temperatures around the structure by several degrees.
- Tall buildings are exposed to the full impact of external temperatures, radiant heat, and the sun. They should therefore use whatever technologies are available to take advantage of these conditions (e.g.: solar voltaics, solar water heating, natural light, window awnings, roof overhangs, etc).

Shape

- The shape of a building determines how much of its surface area is exposed to outdoor temperatures. For example, a square or rectangular building is usually more economical because complex shapes tend to increase exterior surface areas. An efficient shape maximizes exterior insulation and can even allow for an exterior water-spray system (using water collected from rain) that promotes cooling through evaporation

- Low-height buildings should consider positioning their southern-facing exterior walls at an angle to the ground (as opposed to being perpendicular) to maximize solar gain.
- To maximize the use of sunlight and avoid excess heat, a good rule of thumb is for window areas to account for about 40-percent of the wall space they occupy on northern and southern sides (Bayside, 2006).
- Use the structural mass of a building to its utmost benefit. In hot climates, the exterior of a building can be designed to lose heat at night while keeping the interior cool during the day. Conversely, in temperate climates, exterior surfaces (such as bricks) can be used to absorb heat during the day.

Putting It All Together: Building an Efficient Building from Scratch

If the following suggestions were used to build the over 170,000 commercial buildings constructed across the USA every year, it has been estimated that these structures would not only pay for themselves very quickly (and be cheaper to operate), they would substantially reduce the country's dependence on foreign oil and drastically reduce its carbon emissions:

- *Reuse, reclaim, or recycle as much as possible from demolition sites*. Nearly 44,000 commercial buildings in the USA are demolished every year – and the construction, renovation, and demolition debris from these work sites accounts for nearly 60-percent of America's total non-industrial waste. Recoverable materials include concrete, asphalt, metal (including wiring), bricks, plumbing material, and wood.
- *Use local materials*. The further afield materials are sourced, the more energy, labor, and money it may take to harvest, package, and transport them.
- *Reduce the use of concrete*. Cement production accounts for almost ten-percent of global carbon emissions. If concrete must be used, consider a mixture of 55-percent concrete and 45-percent slag (a waste product from blast furnaces) which saves energy and produces an alternative that is

stronger than concrete alone. When bricklaying, use reclaimed bricks with a carbon-neutral lime mortar.

- *Use sustainable engineered wood products in place of standard wood products*. Also called *composite wood*, engineered wood is manufactured by binding fibers from young trees, sawmill scraps, and wood particles. Even hemp stalks, straw, and sugarcane pulp can be used. Engineered woods are stronger than conventional wood, which means that they can produce more open living and working space (which reduces the amount of wood needed for load-bearing interior walls).
- *Ensure that all wood products are approved by the* Forest Stewardship Council *or a similar recognized environmental organization to ensure that they come from a sustainable source*. This helps prevent deforestation.
- *When wiring a building, use the next higher size diameter of electrical wire than that recommended by building code requirements*. Thicker copper wire costs more, but because it reduces electrical resistance it costs less to operate. In a typical office lighting circuit, using a larger wire size yields about a 193-percent-per-year (after tax) return on investment (Copper Development Association, 1996). A student of mine in France, for example, lowered his monthly electricity bill more than two-thirds by re-wiring his house with fatter wire and replacing all the light bulbs with energy efficient bulbs.
- *Choose the exterior color of your building carefully*. The color of a building has a direct impact on its ability to absorb or reflect sunlight. This can alter interior temperatures by ten-degrees or more. Dark colors soak up the heat of the sun, lighter colors reflect it.
- *Use water-based paints and wood treatments* that are less toxic and emit fewer harmful fumes.
- *Insulate, insulate, insulate*. By insulating a building both *inside* and *outside*, it's possible to dramatically reduce, or even completely eliminate, a heating and cooling system. For example, around 10,000 affordable structures (called *passive houses*) without furnaces or air conditioners have been built in Germany, Sweden, and Switzerland. Within these structures, everyday appliances (such as a television) or hot water heaters emit enough heat to keep the occupants warm and snug in winter. The United States, on the other

hand, has constructed just three of these buildings (Source: *Time* magazine, 2007).

- *Use energy efficient windows*. Energy efficient windows are fundamental to the overall reduction of a building's energy requirements. It has been estimated that a routine renovation of all big office towers in the USA with insulated windows would probably save the country $45 billion in energy costs. Most standard glass windows have an efficiency *R-value* of 1, which means that more heat can be lost through a window than an entire exterior wall (a reasonable R-value of an efficient wall is between 25 and 30). Super-insulated windows have an R-value of up to nine (or more) and can actually be 'programmed' to reflect unwanted heat and/or ultraviolet light while letting in more ambient light. For example, a 200,000 square foot (18,581 sq. meter) office building in Chicago replaced its 20-year-old windows with energy efficient 'superwindows' that let in more daylight, reduced the amount of heat that was let in, and lowered the cooling load of the building by 85-percent. This meant that the old climate control system the building used could be replaced with a model that was three-fourths smaller and a quarter of a million dollars cheaper. Furthermore, because the new air-conditioning system is smaller it requires 75-percent less energy to operate - thereby saving the occupants of the building hundreds of thousand of dollars each year in energy costs (Hawken, et al, 1999).
- *Ensure the heating and cooling system is both efficient and not too big for the building*. Far too many buildings are constructed with HVAC systems that are more powerful than what is actually needed. Additional expenses accrue because up to 30-percent of most ventilation systems leak (see pg 203). Know what is needed before installing HVAC equipment.
- *Solar shading is essential for all glass exteriors that face the sun*. Although super efficient windows and skylights do a good job of letting in light while keeping out heat, 'light shelves' (a type of awning) offer additional protection from solar heat and are much cheaper than buying and running an air-conditioning system to offset solar heat. Adjustable window glazing also allows a building to either deflect unwanted light and heat or capture it like a greenhouse during cooler months.

- *Look into drilling geothermal wells that use ground temperature to both heat and cool*. Just a few meters down, the Earth's crust remains relatively constant at 55 degrees Fahrenheit (14 degrees Celsius). Low-cost interior environmental control systems can use this consistency to either warm or cool a building.
- *Consider installing a green roof on your building*. Roofs are huge accumulators of heat that usually require massive amounts of air conditioning to offset. A green roof is a low-maintenance, inexpensive and lightweight roofing system planted with heat-loving foliage. The benefits of a green roof include a reduction in ultraviolet radiation (which helps prolong the life of the roof), increased energy efficiency for the building (green roofs provide excellent insulation properties), a decrease in rainwater runoff, and excellent noise reduction properties. Wider, regional benefits include increased air quality, lower electricity demands (particularly in the summer), reductions in local air temperatures, and an improvement in the aesthetics of the area where the building is located. When used in conjunction with a system that collects and stores excess rainwater, green roofs can also reduce maintenance costs associated with standard roofs.
- *If installing a green roof is not possible, cover your roof with reflective material or solar panels*. Again, the color of a building's exterior can alter interior temperatures by ten-degrees or more. Why pay to offset unnecessary heat buildup with an equally unnecessarily large (and expensive) air conditioning system?
- *Incorporate good cross ventilation in the building*. Take advantage of side vents, wind scoops, skycourts, balconies, atriums, and low-power ceiling fans. Good air movement promotes temperature balance (which reduces the need for heating and cooling) and provides greater comfort. Even a tower building should allow its occupants to open their windows, if just a few inches, to promote ventilation.
- *Maximize the most of 'vertical landscaping'*. Trellises, flower boxes, planted ledges, balconies, and roof overhangs can all be used to cover a building of

any size with vegetation, which dramatically reduces solar damage, cools the building, helps the environment, and looks great.

- *Avoid the use of PVC and other energy-intensive, non-ecological construction materials*. Replace them with sustainable alternatives. For example, sewer pipes can be made of clay rather than plastic.

Building a Better Future

As one developer put it, once you learn a better way to build you don't go back. For more information about the planning and construction of efficient, energy-saving buildings, visit the *Advanced Buildings* website at www.advancedbuildings.org. Another option is to contact the *U.S. Green Building Council* (USGBC). The USGBC (www.usgbc.org) is a network of 10,000 construction leaders from every sector of the building industry who have made it their mission to transform the building industry. The USGBC has developed a rating and certification system titled *Leadership in Energy and Environmental Design* (LEED) to recognize the efficiency performance of buildings (as well as healthcare systems and labs) in five key areas: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. The purpose is 'to transform the way buildings and communities are designed, built, and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment to improve the quality of life.'

The proof, as they say, is in the pudding. The average LEED certified building uses 32-percent less electricity, consumes 30-percent to 50-percent less energy, draws 40-percent less potable water, enjoys a 70-percent savings on waste output, and saves 350 metric tons of carbon emissions every year. What more could a company want from a building in which it does business? .

Chapter 24
Maximizing Building Interiors

Some time ago, the owner of the 20,000 square foot (1,858 sq. meter) *Boulder Book Store* in Boulder, Colorado decided to upgraded his business with new energy-efficient lighting, super-insulated double-paned windows, and an efficient evaporative cooler that cooled the interior of his shop in the summer and heated it in the winter with a gas-fired heating chamber. As a result, the energy costs of the building dropped by almost $5,000 per year - an amount that enabled the improvements to pay for themselves in 36 months. Efficient toilets and faucet aerators (devices that reduce the flow of water) helped the business save even more money. Further cost savings were enjoyed from another aspect of the new windows which reduce ultraviolet rays from the sun and protect the shop's books from fading. Best of all, the improved interior lighting brightened the store's interior, which has led to increased customer browsing times (Source: Energy Star).

This story is by no means unique. Many efficiency improvements that can be made within a building are both simple and cost-effective and can end up saving an organization thousands of dollars or more. For example, assigning an office 'switch-off monitor' (a person whose job is to walk around an office or building ensuring that unused lights and equipment is turned off) has reduced the energy bills of some businesses by 20-percent. In the northern United States, a factory foreman labeled the light switches in the building where he worked so employees no longer turned on all the lights -- only the ones they needed. This simple act shaved $30,000 off the business's annual electricity bill. In another example, an ice storage plant in the south was re-programmed to produce ice overnight to take advantage of lower electricity rates. The resulting chilled water not only cost less to produce it was used to cool a nearby building during the day.

Multiplying Efficiency Savings

As relayed in Chapter 1, one of the more intriguing aspects of efficiency is that the savings it creates don't just add up, they tend to multiply. Take, for example, a parametric analysis of an office building in Florida, which revealed that:

- 30% of the building's annual cooling load was used to fight the heat produced by its lighting system (this is due to the fact that approximately 85-percent of a standard light bulb's energy consumption produces heat, not light),
- 20% was used to combat solar heat that streamed in from the windows,
- 15% was used to offset heat buildup from the roof, and,
- 13% was used to neutralize the heat generated by internal office equipment (i.e.: photocopiers, computers, printers, coffee makers, etc.) (Parker, et al, 1995).

In other words, 78-percent of the building's cooling needs were needed to offset wasteful inefficiencies. This is a common problem in buildings. One poorly designed system ends up fighting against that of another with the bill-payer funding both sides. For a small business, these costs can amount to significant money loss. In a major corporation they may account for two to four-percent of overall expenses. Either way, cost savings still multiply when waste is eliminated and efficiency becomes an over-riding objective. Consider, for example, the story of the *Fortune 500* company CEO who was informed that one of his sites was saving $3.50 per square foot (.09 sq. meter) per year in energy costs thanks to the introduction of efficient practices. For some time the CEO assumed that these savings only amounted to a small percentage of his total annual expenditures so he didn't think much about them – until it was explained that achieving similar results in his company's 90 million square feet (8.3 million sq. meters) of floor space would boost the company's earnings by 56-percent annually (Hawken, et al, 1999).

Suggestions for Improving the Efficiency of Building Interiors

How can a business reduce the unseen, unfelt, and unheard pileup of compounding waste constantly going on within it? An effective first step is to turn off all office equipment and machinery *at their source* when the items are not in use. This can cut five-percent to 40-percent off an energy bill because most electrical items still draw power when they're switched off. Even the battery charger for a mobile phone draws electricity when the phone is not hooked up to it. Additional suggestions include:

- *Replace all light bulbs with energy efficient lightbulbs* (also called *compact fluorescent lightbulbs* or CFL's). Energy efficient light bulbs save money in several ways: (1) they use less electricity, (2) they emit up to 85-percent less heat (which reduces a building's cooling needs), and, (3) they can last more than 25 times longer than standard bulbs (indeed, a recent study showed that 70-percent of energy-efficient bulbs actually last significantly longer than their manufacturers claim). For every CFL used, a business can save up to $30 in energy costs per year over the life of the bulb and every CFL bulb helps keep 100 pounds (45 kilograms) of CO2 emissions out of the air. Do keep in mind, however, that most current CFL's contain mercury so they must be disposed of properly. LED lights present another low-energy option. LED lights use minute amounts of electricity (and radiate almost no heat), however, they're more expensive than CFL bulbs. LED's also emit a narrow frequency of light (which may impede tasks requiring full-spectrum lighting) and they cast a focused beam of light rather than disperse brightness over a wide area. Furthermore, most LED's are currently capable of only emitting the equivalent of a 40-watt standard light bulb, which isn't enough for most work purposes. For outdoor, specialized, or decorative purposes, LED lights can be worth the extra cost. For other applications, they may require some thought – although do keep in mind that all the LED weak points mentioned here are rapidly being addressed. Lastly, note that *low voltage lights* are not energy efficient and CFL bulbs do not require more power to warm up (although they should be left on for at least 15 minutes after being turned on to reduce wear and tear of the inner mechanisms).

- *Replace old exit signs with* Energy Star *rated alternatives*. For every sign changed, $10 will be eliminated from the energy bill of the building where the sign is located and the bulb will last ten times longer than a standard bulb.
- *Put lighting systems on a timer and hook up exterior lights - as well as bathroom, closet, and storage area lighting - to motion detectors*. Motion detectors help keep lights off that don't need to be on. The city of Eindhoven, in the Netherlands, for example, is considering attaching motion detectors to its outside lighting – including its billboards - which is predicted to reduce the city's energy bills by 30-percent.
- *Replace old windows with energy-efficient upgrades*. More heat (or cooling) is lost through windows than any other single source, a situation described as comparable to throwing $10 bills out a window.
- *Increase the size and number of insulated windows and add skylights*. Letting in more natural light decreases the need for artificial lighting (and electricity) and increases human performance levels.
- *Insulate interior walls, ceilings, and wall spaces*. Extra insulation is always worth the cost.
- *Replace all office equipment with energy efficient alternatives*. Doing so not only reduces energy costs, it also drastically reduces the heat these devices emit. Remember, electrical equipment has two price tags: the first is the purchase price and the second represents lifetime energy cost. In the USA, look for the *Energy Star* label to help offset the latter - in Europe, look for the *Energy Star* label, the *Energy Saving Recommended* label, or a *TCO certification* (which is awarded by *TCO Development*). Electronic items that carry these labels have had their electricity requirements reduced by as much as 30-percent (or more). The 35,000 square feet *A-OK Auto Body Shop* in Philadelphia, Pennsylvania, for example, replaced its interior lighting system with efficient substitutes, installed motion detectors on its exterior lights and its bathroom lighting, placed timers on its water heaters and coffee pots, and added programmable thermostats to its climate control system. As a result, the business saw its energy bills decline $5,577 in one year. The cost of the improvements paid for themselves in 16 months. Further improvements included replacing an old refrigerator with an *Energy Star* rated model, upgrading an old air-conditioner to a cheaper more efficient one, and

installing new electric heaters that run on less electricity while producing more heat. Note that *A-OK*'s total energy savings not only saved it a small fortune, they also prevented 68,255 pounds (31,000 kilograms) of carbon emissions from entering the atmosphere (Source: *Energy Star*).

- *Remove paper towel dispensers from restrooms and replace them with* low-energy *blow dryers*. Making one ton of paper towels from recycled paper requires 7,000 gallons (26,498 liters) of water, 360 gallons (1,363 liters) of oil, and 158 million BTUs of energy. During this process 86-pounds (39 kilos) of pollutants are released into the atmosphere. Noting this waste, the university student union at *California State Northridge* decided to remove its paper towel dispensers and replace them with wall mounted, low-energy hand dryers, a move that eliminated $21,000 worth of annual paper towel costs (Buildings.com, 2006).
- *Seal all leaks in ducts and ventilation systems as well as around plumbing and wiring*. Duct system leakage can account for up to 30-percent or more of wasted energy. Proper duct sealing also keeps dust, mold, and mildew at bay. (Some experts recommend the use of self-sealing foams or mastic because, apparently, duct tape can be an ineffective way to seal duct leaks.)
- *Take advantage of under-floor heating*. Heat rises so an under-floor heating system is inherently more efficient than one that uses wall-mounted radiators or ceiling vents.
- *Take extra care to select non-toxic carpets (and carpet glue), paint, varnish and other safe interior decorations*. Fumes and particles from these materials can debilitate human health and performance.
- *Consider purchasing an evaporative cooler (or 'swamp cooler') for your cooling needs*. Evaporative coolers pull air over pads soaked in water, which uses a quarter of the energy of refrigerated air.
- *Invest in geothermal energy, a cost-effective heat pump, or an* Energy Star *rated furnace*. As mentioned in Chapter 23, geothermal energy uses underground temperature, which is relatively stable at 55 degrees Fahrenheit (14 degrees Celsius) to heat a building in the winter or cool it in the summer. Ground-source heat pumps use liquid natural gas in a closed-loop system that exchanges heat (or when reversed, coolness). In addition, ground-sourced

heat pumps require only a small amount of electricity to keep their compressors running.

- *Install low-energy ceiling fans*. By gradually circulating air through a building, slow-speed ceiling fans make the most of a heating and cooling system and can drastically reduce energy costs. A *Subway Sandwiches* shop in Norman, Oklahoma, for example, cut its annual energy costs by $20,000, in part, by installing ceiling fans in its kitchen. The shop also replaced its lighting with energy-efficient bulbs (which reduced the number of bulbs needed yet doubled the store's brightness), replaced old ice makers and water heaters with efficient models, then tinted the building's windows. (Source: *Energy Star*)
- *Use a programmable thermostat*. For every degree a thermostat is lowered, up to five-percent can be saved on the heating portion of an energy bill. Another good tip is to keep electrical equipment and lamps away from thermostats. The heat these items generate adversely affect temperature readings.
- *Wrap hot water heaters in an insulated blanket*. This not only saves money it can also prevent hundreds of pounds of carbon emissions from entering the atmosphere.
- *Where possible, fill workplaces with indoor plants and trees*. Large indoor gardens appear to have a remarkable effect in reducing employee fatigue and can be instrumental in increasing productivity.
- *Check to see if your business is eligible for energy efficient tax incentives*. Some governments offer tax breaks or tax credits for businesses that strive to increase the efficiency of the building in which they operate. Typically, tax credits are awarded for installing energy-saving technology and equipment, using hybrid vehicles, adopting efficient heating and cooling systems, switching to solar (or wind) energy systems – and/or for making efficient constructions or renovations.
- *Keep in mind that these suggestions are just a fraction of the energy-saving practices available to building operators and owners*. Involve your employees in finding more.

Optimizing Interiors by Maximizing Exteriors

The following building *exterior* improvement suggestions can make building *interiors* more energy efficient, more comfortable, less costly to operate, and more apt to rent or lease to new clients.

- *Again, note the color and texture of a building's exterior*. Dark colors absorb sunlight (and heat) and textured surfaces tend to be more heat absorbing. To prevent solar heat buildup, paint buildings a light color and make sure the finish is shiny and smooth.
- *Utilize natural storm water treatment*. Channeling rainwater runoff from a building into tanks (for later use) or natural swales lined with indigenous vegetation is not only eco-friendly it's also cost-effective when compared to an expensive network of underground pipes and treatment plants.
- *Cover parking areas with light-colored cement or other light-colored surfacing rather than asphalt*. This can literally reduce exterior air temperatures around a building by as much as five-degrees.
- *Better yet, install a porous parking lot*. Chunky, light-colored gravel that has had its finer particles removed allows rain and snow to be absorbed into the ground. When this simple idea was presented to administrators at the *Ford Motor Company* they refused to consider it. Eventually, however, they were persuaded to gravel a small test zone. Soon managers and employees from all over the *Ford* complex were going out of their way to park their cars on the test area because it contained no standing water or ice (or road salt), which kept the cars cleaner. *Ford* now wants to pave its entire Rouge plant site with porous material (Whitfield, 2003).
- *Avoid unshaded rock, cement, or asphalt landscaping on the south or west sides of a building*, which increase ambient temperatures and radiate heat long after the sun has set.
- *Surround buildings with as much indigenous vegetation as possible*. Not only will this decrease surrounding air temperatures and reduce landscaping water needs, it also reduces labor costs, fertilizer expenses, and landscaping waste (non-native plant species are often more labor, water, and cost

intensive). Trees are not only valuable 'carbon sucking tools', they're also an excellent source of shade and they're a great way to increase property values.

- *Ivy or grapevines grown in window boxes or on trellises* can shade the entire side of a building.

For More Information…

For more information on how your place of work can improve its overall energy efficiency and cut its energy bills, start with *Energy Star* (www.energystar.gov) - a no-cost, voluntary program run by the *U.S. Environmental Protection Agency*. In Europe, *Energy Star* can be visited at: www.eu-energystar.org. Alternatively, in the UK, seek out the *Energy Saving Recommended* (ESR) logo when buying electronics. The ESR endorses a wide range of products considered to be the most energy efficient available (the ESR program is managed by the *Energy Saving Trust*: www.energysavingtrust.org.uk). A third European label to look for is the *TCO Certification* (***T****janstemannens* ***C****entral****o****rganisation*) established by the *TCO Development* (www.tcodevelopment.com), which is run by the *Swedish Confederation of Professional Employees*.

Chapter 25

Saving Water

In the late 1990's, environmental researchers predicted that one-third of the world's population would lack access to clean water by the year 2025. This prediction came true 20 years early – an astonishing fact when one considers that we live on a planet covered mostly by water. Unfortunately, more than 97-percent of the Earth's water contains salt* and is not suitable for drinking or irrigation. The less than three-percent of what remains is either frozen at the poles, crystallized in glaciers, or is locked in aquifers and is too deep to retrieve. Only three-thousandths can be readily used by humans, but this small amount increasingly poses a potential hazard because it's rapidly becoming more polluted. Currently, around 50-percent of the world's diseases are caused by contaminated water, and water rights have been – and continue to be – a worldwide source of conflict. The efficient use of water, therefore (i.e.: treating it like the precious commodity it is), is a grave responsibility. The good news is that cutting water consumption in a business is not only the right thing to do, it also lowers operating costs and reduces water disposal expenses because most municipalities compute their sewer charges as a percentage of metered water use.

How Businesses Waste Water

Most businesses use water in the same inefficient ways they waste energy, raw materials, and equipment. Among these practices are:

- installing wasteful production systems that require more inputs than are needed,
- acting as if supplies are ubiquitous and renewable and don't need to be managed,
- using pristine supplies for purposes that don't require pristine inputs,

* Desalinating sea water is not a viable solution because it produces one-third potable water and two-thirds brackish, salted waste that cannot be easily reintroduced into the environment.

- not thinking in the long-term, and,
- in general, not making better use of what little is available.

(Source: see the websites listed at the end of this chapter)

How a Business can Save Water

Saving water is always worth the effort. Consider the following example, which was provided by a student of mine, a former meteorological officer with the U.S. Navy who calculated the amount of water a national defense contractor (*Sandia National Laboratories*) saved in a waste prevention program. Over a ten-year period, *Sandia* cut its water bill by $2,389,000. Moreover, nothing the company did to achieve such savings was highly technical or complex. The following guidelines sum up *Sandia*'s efforts as well as those of several other companies that have reaped the rewards of water-saving practices:

- *Educate employees and involve them in all water conservation practices*. It's everyone's job to save water so *make it* everyone's job to save water.
- *Fix all leaks and repair or replace inefficient control valves, pumps, and pipes*. Ten to 20-percent of a business's water loss usually comes from ignored leaks – which is tantamount to pouring money down the drain. A single tap left trickling in a washroom, for example, can cost up to $80 in water charges per year. A leaking toilet (particularly one with its valve stuck open) can cost up to $90,000 per year (T & L, 2007).
- *Install water flow fixtures* (aerators) *on all faucets, toilets, urinals, and showerheads*. This measure alone can reduce water requirements by 60-percent or more. Screw-on water flow reducers (also called aerators) cost just one or two dollars and can cut the amount of water that flows from a faucet by one-half or more. The remaining water is mixed with air and the result feels as though the tap is full on. Additional water saving devices can be installed in toilets (which are widely considered to be the greatest wasters of water in any building) and urinals. Toilet technology has advanced to such a degree that some toilets require no water for flushing. A university in California, for example, replaced its 13 male restrooms with waterless urinals and saved $15,000 on its annual water bill. Further east, an office building in Denver, Colorado switched its toilets, urinals, faucets, and showers with

water-saving replacements and saw its water bills plunge 80-percent (Proctor, 2006).

- *Install a closed-loop water system to reclaim and reuse industrial waste water*. *Sandia* was able to re-use the water it needed for many of its industrial processes thanks to a high efficiency reverse osmosis (HERO) system that reclaimed waste water. Other companies have used similar techniques to filter and re-use water from their industrial processes or air conditioning cooling towers, which can cut water bills by 90-percent or more.
- *Recycle 'grey water' and rain water*. Most industrial systems use expensive tap water (e.g.: drinking water) for most, if not all, of their production needs. The irony is that recycled water from sinks, showers, production processes, washing machines, and drinking fountains (also known as 'grey water') can often be used just as effectively. Even rainwater is of sufficient purity for most industrial processes and has the added benefit of being free. Harvested rainwater (from water collection tanks on rooftops or on the sides of a building) can be used for irrigation, landscaping, the flushing of toilets, and many other purposes.
- *Use pressurized air to perform functions previously done with water*. Pressurized air can be used to clean equipment, products, and packaging (e.g.: bottles and cans) as well as 'sweep' paved areas.

Additional tips to help conserve water include:

- *Designate a water efficiency coordinator*, support him or her, and constantly remind employees what your company is trying to achieve.
- *Locate the sources where water is used at your place of work* (washrooms, sinks, climate control systems, hoses, etc…) *and discuss and identify ways that water can be saved at each*.
- *Get employees in the habit of reporting all leaks and water losses immediately*. Train security guards and cleaning crew to identify, handle, or report water wastage when they're making their rounds.
- *Install motion detectors under taps, which operate when a hand is placed beneath them and immediately turn off afterwards*. Alternatively, install taps that automatically shut off after running a few seconds.

- *Don't use toilets as a garbage disposal*.
- *Shut off all cooling units when they're not needed*.
- *Optimize the blowdown or bleed-off controls* on boilers and cooling towers.
- *Minimize water used in cooling equipment* in accordance with the manufacturer's directions.
- *Turn hoses off at the faucet* rather than the nozzle.
- *Use drip irrigation methods for landscaping needs*. Drip irrigation involves laying a perforated water hose a few centimeters below the ground. When turned on, the holes emit water – one drop at a time – which is sufficient to keep plants hydrated. This type of system was used at a business I ran in the Middle East. We were located in the middle of a scorching desert, yet the grounds were surrounded year in and year out with flowers, fruit trees, and shrubbery. Potable bottled water cost twice as much as gasoline, so we used gray water (from a sewage treatment plant) in our drip irrigation system.
- *Never place watering or irrigation systems on a timer*. If you recall the last time you passed through a neighborhood in the rain and saw the water sprinklers on you'll understand why.
- For additional information about water conservation tips, contact your local water conservation board or environmental protection institute.

Efficient Wastewater Treatment

All places of work produce sewage, which, as unpleasant as it is to think about, poses an additional business expense. Firstly, capital expenses, such as the laying of pipes, are needed to treat sewage. If not, the costs of emptying a septic tank must be added to the equation. Secondly, monthly utility bills that involve metered water usage must be factored in.

There is, however, a way to eliminate these costs. Why not treat waste where it's produced instead of paying to have it transported and treated elsewhere? *Ecological engineering* (also known as *ecological sanitation* or *living machines*) is an emerging industry that treats raw sewage, including effluent, heavy metals, and other chemicals, economically and safely by pumping them through a series of open tanks filled with organic plant and animal life. Based on the science of estuaries – nature's own filtration system - each tank, which

averages 14-feet in depth (about four meters), contains a unique ecosystem designed to breakdown select toxins before passing them on to others further down the line. The result is odor free and can resemble a pristine garden complete with waterfalls, lily pads, and fishponds. Indeed, one ecological engineering company (*Living Technologies* in Burlington, Vermont) held a wine and cheese party at one of its 'living machine' locations and had to keep reminding the guests to keep their hands out of the water (Crawford, 1999).

Typically, it takes one to three days for sewage to pass through all the required tanks in a living machine system. The first tank is covered with a layer of soil and living grass. Odors and gases filter through the layer and are broken down into carbon dioxide and oxygen. Bacteria and plants work their magic in the remaining tanks. The only waste created is that from the plants, which feed off the system and have to be pruned regularly. In regions that experience harsh winters, tank systems can easily be positioned in a passive greenhouse-type structure or they can be built into, and compliment, the building they service. Conversely, a system can be arranged outside. Every system can be uniquely tailored to suit the volume and makeup of its waste. The end result is water of such high purity that it only requires a small amount of additional treatment to make it drinkable. Some companies even harvest and sell the methane gas their living-systems produce, as well as the flowers, fish, tomatoes, lettuce and other foods that thrive within – which means that 'living machine' systems can, under the right circumstances, be fashioned into economic money-spinners.

Like many efficient processes, the cost of a living machine not only pays for itself, it can also be a huge source of pride and admiration for employees. For example, *M&M Mars* in Brazil and Australia, the *Vermont Welcome Center* on U.S. Interstate 91, the *Sonora Mountain Brewery* in California, the *Body Shop* factory in Ontario, Canada, and the *National Audubon Society* in Florida have all boasted at one time or another about the beauty and efficiency of their wastewater treatment 'living-machines'.

So, Is It Worth It?

Given the fact that public sanitation and access to clean water are a growing concern in many parts of the world, ecological engineering – or, living wastewater treatment – can be a low-cost alternative to expensive and toxic

chemical water treatment facilities. These systems are also well suited for responsible, financially conscious businesses looking for ways to reduce their environmental footprint.

For More Information on How to Save Water…

For more information about how water can be saved at your place of work, contact your local water company for details. Many regional and national governments (particularly those in dry parts of the world) are keen to help fund water saving and water treatment business projects. Additional tips and suggestions, most of which come from regions where droughts have forced inhabitants to treat water as a precious commodity, are available at: www.bewaterwise.com; www.epa.gov/watersense; www.savewater.com.au; www.savingwater.org; www.sydneywater.com.au; and www.waterwise.org.uk.

Author's note: For an impressive overview of simple yet practical ways that the world's numerous coast lines (particularly in desert regions) are being converted to safe and productive green areas bursting with lush plants and wildlife, visit the Sea Water Foundation at www.seawaterfoundation.org .

Chapter 26
The Macro-Advantages of Micro-Power

Although oil has traded at over $147 a barrel, and may climb to $200 relatively soon, many experts in the field insist that the worst is yet to come. Here are the numbers. Last year, the world consumed 86 million barrels of oil a day (up from 78 million barrels in 2002) and every year consumption increases. Between 1995 and 2004, for example, demand grew by 3.9 million barrels per year in the USA alone (currently, America consumes 25-percent of the world's oil production). China and India still haven't caught up with that amount (China's demand grew by 2.8 million barrels annually during the same period), but there's no doubt that these two countries are securing additional amounts every year and need even more to continue their growth. The problem, as Jeroen van der Veer, CEO of *Royal Dutch Shell*, stated in a recent e-mail to his staff, is that '… after (the year) 2015, supplies of easy-to-access oil and gas will no longer keep up with demand.'

John Hess, Chairman of the *Hess Corporation* agrees. 'An oil crisis is coming in the next 10 years,' he says, 'it's not a matter of supply. It's not a matter of demand. It's both.' James Mulva, CEO of *ConocoPhillips*, is also worried. In November of 2007, he told a Wall Street conference, 'I don't think we're going to see the supply (of oil) going over 100 million barrels a day... Where is it going to come from?' Earlier, in October of 2007, Cristophe de Margerie, CEO of French oil company *Total S. A*., relayed that the production of even 100 million barrels of oil a day by the year 2030 'will be difficult' (Romm, 2008).

When the CEO's of the world's oil companies start issuing warnings - and with climate change resulting from the burning of fossil fuels posing an ever-increasing threat - perhaps there's no better time than now for astute businesses to consider alternative sources of energy. Micro-power involves equipping a building or group of buildings with an independent power source that either wholly or partially supplies needed energy. For example, the *Mauna Lani Bay*

Hotel on the Kona-Kohala coast of Hawaii turned its 10,000 square-foot (929 sq. meter) premises into a 100-kilowatt power station by retiling its roof with solar cells. In Aberdeen, Scotland the *Cults Primary School* set up a five-kilowatt wind turbine in May of 2007 that not only reduced its electricity bill, but also cut its annual carbon emissions by 12,418 pounds (5,633 kilos). Across the American state of Iowa, wind turbines now power ten schools either partially or completely. For example, the 53,000 square foot (4,924 sq. meter) elementary school in Spirit Lake, Iowa installed a 250-kilowatt wind turbine that provides an average of 350,000-kilowatt hours of electricity per year. Excess electricity, which can be fed into the local utility system, earned the school $25,000 in its first five years of operation (Greenpower, 2007). Meanwhile, several manufacturing companies – including a *McDonald's* restaurant in Chicago, Illinois - are currently benefiting from microturbine generators that trim thousands of dollars off energy bills every month.

Following is a brief explanation of seven major micro-power sources that eventually pay for themselves. And in any business, payback makes better sense than pay-more.

Wind Power

Many energy analysts claim that if they could do just one thing to alleviate the world's energy problems they would allow every form of energy to compete fairly without the intervention of governments and corporations. For example, Dr. David Toke of *Birmingham University* (UK) recently estimated that onshore wind power is now producing electricity at the equivalent oil price of $50-60 a barrel - and offshore wind power is pumping out energy at the equivalent of $70-80 per barrel. Keep in mind that Toke's estimates assume a guaranteed income flow of 15 to 20 years and do not take into account any of the government subsidies associated with coal and oil (Seager, 2007).

Whether for sailing or rolling a grindstone in a flourmill, wind power has been around for centuries. Today, Denmark derives over 20-percent of its electricity needs from wind turbines; Germany gets about ten-percent of its electricity from the wind; and every year Spain installs over 2,000 megawatts of wind turbine generators. Even the United States is getting in on the act. By the

end of 2007, American wind turbines pumped out 15,000 megawatts of energy (enough to power 4.5 million homes) and every year the number grows (as do the total number of jobs wind turbine servicing creates).

Wind turbines come in a variety of shapes and sizes and usually last around 20 years or longer if they're maintained correctly. The more traditional variety looks like a windmill, but other designs resemble the whisks of a giant egg beater and/or require an outside power source to start spinning. Size-wise, wind turbines range from huge three megawatt, 11-story towers (that can power up to 1,000 homes), to relatively modest one-megawatt turbines that can power 350 homes, to much smaller one to ten-kilowatt, roof-mounted turbines that can be purchased from specialized retailers and meet the needs of a single household.

Is Wind Power Right for Your Business?

The single most important factor in deciding whether or not a wind turbine will provide an adequate energy source for a business is to measure the force and duration of wind that is available. Some turbines are designed to operate at low wind speeds while others can withstand powerful gusts. A good site must have a minimum annual average wind speed of around 11 to 13 miles (18 to 21 kilometers) per hour. To determine the average wind speed in your area, contact a local airport or meteorological station. Installing a wind turbine also involves learning about a variety of factors including costs versus productivity, ice throw, net metering, rotor radius (the length and size of a turbine's blades is directly proportionate to the amount of energy it can produce) as well as the programs, laws, and incentives of local, state, and federal authorities. For example, some coal-producing regions either forbid or actively discourage the use of sustainable energy by insisting that electricity production must come from coal-fired utility plants. Additional considerations that should be researched before buying into wind power include:

1. *Determine whether or not a favorable agreement can be reached with the local utility company.* Some electrical producers do not tolerate competition and may refuse to buy the additional electricity a wind turbine produces. Others may refuse to supplement a building equipped with wind energy.

2. *Project feasibility concerns*. Will the noise, movement, and aesthetics of the proposed wind turbine be an issue for the local community? Is the site's geology suitable? Will endangered or protected species be jeopardized by the presence of a turbine? Will the turbulence (which is created by every wind turbine) effect nearby structures? Can zoning permits be obtained? These questions will need answers.
3. *Availability and maintenance concerns*. The availability of wind turbines, the reliability of their manufacturer, and the services of a professional who is familiar with their operation and maintenance is exceptionally valuable. Will a qualified professional be available to maintain and repair your wind turbine when it needs servicing?

Most users of wind power seem to agree that the benefits of wind turbines outweigh the disadvantages. A model created by the *National Renewable Energy Laboratory* (USA), for example, found that several locally owned wind turbine projects in Iowa generated significantly higher economic impact levels than projects of equal capacity owned by other investors. Additionally, in every case, the use of wind power was found to positively influence the entire community where the turbine was located, which led to increased community pride and cohesiveness. That being said, not all wind turbine stories have happy endings. In Poland, for example, a small village invested in a huge wind turbine that produced hundreds of kilowatts of extra power. Unfortunately, the regional power company would not buy the additional electricity and residents discovered that the cost of their over-sized purchase will take 20 years to recoup. If the locals had done their homework, they would have discovered that a smaller (and less expensive) wind turbine would have been more suitable and could have repaid its expenses within a few years.

For more information, visit the *American Wind Energy Association* website at: www.awea.org.

Solar Power

Solar power is often considered one of the most expensive sustainable energy options available. Generally speaking, this is true; it does cost three to four times more to produce power from solar cells than it does from conventional

sources. The good news, however, is that the cost of solar power drops almost every year because prices decrease about 18-percent every time production doubles. Power from the first solar cells, for example, cost about $200 per watt. Last year the price was $2.70 per watt. Electricity produced from solar power is now so competitive that in some cases it's actually cheaper to use solar cells than conventionally-produced electricity. Isolated street lamps, emergency phones on highways, and electrical systems in remote communities are cheaper to operate with solar power when one takes into account the cost of installing high voltage transmission lines (which usually amount to thousands of dollars per mile).

In situations where solar power costs are greater than conventionally produced electricity, going solar can still pay for itself in a relatively short period of time. Take the Times Square headquarters of *Conde Nast*, for example. Situated in a 48-story building in New York City, fourteen of the building's floors are covered with solar panels that added an additional five to ten-percent to the overall construction price tag. The half million dollars in energy savings the solar panels provide annually, however, paid for their cost within five years (Wee, 2001). Meanwhile, in Madrid, Spain, telecom company *Telefonica* installed Europe's largest solar power plant on its roof. At peak performance, the 16,000 solar panels generate three-megawatts of power, which means that the building is energy self-sufficient and also *makes* money by selling excess power.

Solar Cell Facts

- Solar cells do not require direct sunlight to operate. They function quite well under cloudy or rainy conditions. For maximum effect, however, they should be placed where direct sunlight will hit them (which is why some solar cells rotate to follow the path of the sun).
- Solar energy offers a one-time capital expense. Virtually no other costs accrue.
- Solar cells last a long time. Many solar cells produced in the 1970's still function to this day. Lab testing has shown that under the right conditions solar cells can last up to 40-years or more (although the energy output of most solar voltaics usually decreases over time).
- Most solar cells are made from silicon, which is very plentiful and does not have to be mined.

- Some solar cell applications are so thin they can be 'painted' onto foil or other materials, which makes them useful for a number of purposes. Solar voltaics can also be sewn into clothing, backpacks, bags, and briefcases to provide power for mobile phones, i-pods, laptops, and other portable electrical devices.
- Solar panels can be used on new and old buildings as roofing, or mounted vertically on exterior building walls, or used as sunshades or covers over windows, walkways, and carports.
- Solar cells reduce a business's impact on the environment, cut its electricity costs, and send a positive message to the public about the business's commitment to clean and sustainable practices.
- Most solar voltaics have efficiency variables of between five-percent and 17-percent. Specialized solar cells produced in the laboratory - as well as those used in space – can reach efficiency levels of 25-percent to 40-percent. The reason why solar voltaics seem so inefficient is because they are - about 30-percent of the energy a solar cell collects is converted into heat. Moreover, most solar cells cannot convert a broad spectrum of the sun's wavelengths into electricity. Improvements in technology, however, are making up for these shortcomings. Since sunlight is plentiful (and free) the amount of sunlight that solar voltaics 'waste' is not much of a concern.

Are Solar Voltaics Right For Your Business?

If your organization can afford to buy several years of its power in advance while awaiting a payback, then yes, solar power may be right for you. Note that energy from the sun can also be used to heat water (and buildings) as well as drive steam turbines. For example, as this book went to press, calculations for concentrated solar power, which uses mirrors to concentrate sunlight onto a fluid-filled container that heats up and produces enough steam to drive a turbine, is cost-equivalent to oil priced at $50 per barrel - or as low as $20 per barrel when the technology is scaled up (Seager, 2007). For more information about solar power visit: www.solarserver.de and click on the English translation icon at the top of the home page.

Microturbines

Microturbines are small energy-generators that can operate anywhere on virtually any combustible fuel (natural gas, kerosene, diesel, methane, propane, etc). Microturbines range in size from a hand held device that produces less than one-kilowatt of power to refrigerator-sized models that can pump out an impressive 500-kilowatts (enough to power 50 homes) per unit. Although microturbines are not particularly efficient on their own (their efficiency ratings range from 25% to 35%), when part of a complete *system* total efficiency can climb to 80-percent or more. This is because the largest byproduct of a microturbine is heat – and heat, when used wisely, can warm buildings, heat water, and benefit a variety of industrial processes. The use of ceramics and thermal barrier coatings (improved insulation), as well as advances in microturbine design and materials, can boost efficiency rates even higher. The *Chesapeake Building* on the *University of Maryland* campus, for example, uses an efficient system of microturbines for heating, cooling, and electricity production.

A microturbine operates much like a jet engine. The difference is that they produce electricity rather than thrust and they're much safer and quieter. In fact, they're quieter than gasoline powered reciprocating-engine generators. Moreover, microturbines can be used to power vehicles. Although the physics behind how a microturbine works are a bit complex, don't let this put you off. For the most part, microturbines are extremely simple to operate because they only have one moving part. This means that they don't need much maintenance.

Advantages of Microturbines

- Portability and a relatively small, lightweight size that requires little or no support structure.
- Versatility (microturbines can run on a number of different fuels – including waste fuels).
- Lower pollution levels (microturbines burn fuel very cleanly – in fact, they produce the lowest emissions of any fossil fuel combustion system).
- Microturbines have few moving parts, which means less can go wrong.
- Low noise and vibration levels.

- Maintenance levels are low (on average, maintenance is needed every 5,000 – 8,000 hours).
- Microturbines can generate electricity, heat, and hot water at the same time.

Disadvantages of Microturbines

- Slightly higher capital cost compared to standard energy generators.
- Microturbines consume 35-percent more fuel (although this is declining with the advent of new designs) than standard energy generators.
- Turning a microturbine repeatedly on and off can be problematic (i.e.: once they start running microturbines like to keep running). This problem is also being addressed.
- Because the technology is new, the reliability of microturbines is unknown and therefore their long-term operating costs are unknown (source: US Department of Energy).

Microturbines: The Bottom Line

The ability of microturbines to produce low-cost, on-site, reliable electricity at a high quality (without surges, dips, and other variations) makes them difficult to dismiss. Microturbines can easily and conveniently provide stand-by-power or boost present electrical power systems (particularly during peak demand times), as well as heat, and are available in housings of all sizes. With so many benefits - and advances being made virtually every day - there is little doubt that more will be heard about microturbines. For more information about microturbines visit: www.wbdg.org.

Fuel Cells

Without question, of all the clean-energy producing alternatives currently being talked about, fuel cells elicit the most excitement. Fuel cell technology dates back to 1839. That year, a scientist named William Grove mistakenly allowed a hydrolysis experiment to operate in reverse. To Grove's surprise, electron flows resulted when hydrogen and oxygen were allowed to *combine*.

Today, in high schools around the world, most students conduct an opposite experiment in which two separate metal-coated prongs are inserted into a container filled with water. Wires attached to each prong are then hooked up to the leads of a battery and the prongs become covered with tiny bubbles of separating hydrogen and oxygen. Fuel cells do this in reverse – usually using platinum covered membranes to combine *hydrogen* (the 'fuel' used in a fuel cell) with oxygen to create electricity (for an illustrative depiction of this process, visit: http://americanhistory.si.edu/fuelcells/basics.htm). Fuel cells require no combustion, have no moving parts, are silent, and are virtually pollution-free. Most important, since hydrogen is almost always found combined with other elements, its supply is cheap and plentiful. Some fuel cells run on the hydrogen found in sugar. Others use the hydrogen in the water produced by the cell itself. Hydrogen derived from traditional hydrocarbon sources (i.e.: coal, gasoline, methane, methanol, natural gas, or propane) can also be used as a fuel, although a small amount of carbon dioxide, sulfur, and other bits of matter from these sources is emitted as a result. Just as important, fuels cells can be made in all sizes, which makes them as versatile as they are clean. For example, they can be reduced to fit inside a portable music player - or be increased to the size of a refrigerator to power a 2,000 square foot (186 sq. meter) house, office, or apartment. Fuels cells are also reliable. Manned spacecraft and submarines have been using them for decades because such vehicles require power supplies that don't produce toxic waste emissions - and thirsty crews can drink the pure water emitted as a waste product.

Advantages of Fuel Cells

- 70-percent to 85-percent of the energy obtained from the fuel in a fuel cell can be converted into power and heat compared to coal or oil, which is around 35-percent.
- Fuel cells are inherently reliable, rugged, quiet, and versatile and they can be used to power almost anything from a hearing aid to an office building. Currently, fuel cells are being developed to power cars (every major automotive manufacturer in the world now has a fuel cell vehicle in development), buses, boats, trains, planes, consumer electronics, portable

power units, and wastewater treatment plants (where the methane produced by the wastewater is used as a fuel source).

- Since fuel cells are smaller than coal-fired furnaces, less land is required to set them up as compared to traditional power plants.
- The pure water emitted as a waste product from a fuel cell can always be put to good use.
- Recent breakthroughs in fuel cell technology have produced electricity from carbon and bacterial enzymes, which eliminates the need for precious metals (such as platinum).

Disadvantages of Fuel Cells

- At the moment, the price of electricity produced by fuel cells makes their technology somewhat prohibitive. Fuel cells large enough to power a home can cost thousands of dollars (resulting in a payback period of up to 15 years), which means that the electricity they produce costs around $1,500 to $6,000 per kW. As with solar power, however, prices are expected to fall dramatically as the ability to mass produce increases. Depending on the cost of the hydrogen source (such as natural gas), electricity from a two-kW fuel cell system could, in theory, provide power at eight to ten cents per kWh within the next decade or so.
- Long-term performance estimates for fuel cells have not yet been determined – although, to date, most fuel cells require maintenance overhauls every five years or so.

For more information visit: www.fuelcells.org or the *U.S. Fuel Cell Council* website at: www.usfcc.com.

Bio-Fuel

In the search for a plentiful energy source that doesn't require a major change in capital, combustible bio-fuels that mix gasoline with less expensive alcohol made from corn or sugarcane are seen by some as the way ahead. Yet with bio-fuels now selling for about $40 to $70 a barrel, they're competitive advantage also makes them just as controversial. Proponents of bio-fuels claim

they can help wean the world from fossil fuel addition. Critics say that they take too much energy to manufacture (for example, according to US government statistics, one gallon of gasoline is required to produce one gallon of ethanol), use up valuable land, lead to higher food prices and increased deforestation, and are tantamount to promoting starvation (see: 'The False Hope of Biofuels' by James Jordan & James Powell, *The Washington Post*, Sunday, July 2, 2006, pg. B07 – and – 'The Clean Energy Myth' by Michael Grunwald, *Time Magazine* [domestic], April 7, 2008). Most bio-fuels do require a great deal of energy to make, however, algae-based bio-fuel production (algae has an energy yield that is 30 times greater than palm oil) takes up very little land space, particularly when the algae is grown in specialized greenhouses. Algae production would also allow food crops to return to fields and could help lessen the impact of traditional bio-fuels on food prices. Additionally, algae-based bio-fuels would, in theory, be very competitive at $54 - $64 a barrel (Seager, 2007). For more information about bio-fuels, visit: http://journeytoforever.org/biofuel.html.

Geothermal Power

Harnessing steam or hot water produced from the earth's interior is a clean, reliable, and flexible energy alternative that is easy on the land, keeps fuel dollars at home, and requires less space to establish than almost any other type of power plant. People have been using water heated by the Earth's core for thousands of years, however, the first use of geothermal-produced electricity in the world was in 1904 at Larderello, Italy. Today, 21 countries around the globe use geothermal energy for generating electricity, heating buildings, and keeping sidewalks and roadways from freezing. Iceland, in particular, has been able to wean itself almost completely off imported oil by making geothermal power the main source of energy for all its electricity needs – a move that freed up so much of the country's capital that it went from being one of the poorest countries in its part of the world to one of the wealthiest (in terms of its size) in about a decade. Of course, much of the viability of geothermal power boils down to location. Some areas, due to their proximity to hot springs, make geothermal energy more cost effective than others. For more information about geothermal power visit the website of the *Geothermal Education Office*: www.geothermal.marin.org.

Micro-Hydro Power Stations

Micro-hydro stations use natural water flows from rivers and streams to produce hydroelectricity. The turbines they house are small so they blend into natural settings while producing enough electricity to power several hundred homes or businesses. Micro-hydro stations are particularly viable in areas where industrialists during the 18th and 19th centuries built now-unused weirs to turn water wheels that powered looms and other industrial machinery. To read more about micro-hydro stations see: www.rise.org.au/info/tech/hydro/small.html.

For More Information about Micro-Power…

With the rising cost of fossil fuels showing no signs of abatement, and carbon emissions placing increasing levels of stress on the environment, micro-power is an ever more appealing option. Indeed, a growing number of building owners and managers are wondering why they didn't take advantage of it in the first place. If your business is interested in climbing on board this phenomenon, do some homework. Are you seeking energy independence or do you want to include an outside provider in your energy mix? In the USA, there are over 600 utility companies in 37 states that offer clean, sustainable energy alternatives to their customers. Read the fine print on your energy bill to determine if your power company is one of them. For more information about sustainable micro-energy sources visit:

www.clean-energy-ideas.com or www.alternative-energy-news.info or www.eere.energy.gov/greenpower.

Meanwhile, as you look over your options, download the (free) booklet *The Lean and Energy Toolkit* from:

www.gov/lean/toolkit/LeanEnergyToolkit.pdf.

The material in this publication has been specifically designed to help businesses reduce their power needs.

Chapter 27
Reducing a Building's Waste by Decreasing Its Work-Load

Some efficiency practices are so obvious they're completely overlooked. For example, to make a workplace even more efficient why not reduce its overall size? Smaller workplaces usually need less heat and cooling, use less electricity, and require less water for day-to-day needs. Unfortunately, for a growing business (or one that employs a lot of people), a small premises may not be feasible - unless the concepts of *flextime* (giving employees the option of setting their own work hours) and *working from home* (performing most, if not all, work responsibilities at home) are taken into account. Such work systems allow employees to work at home two or three days a week and report to a standard workplace during less busy days or times - or work entirely from home. Either way, the result is that company work areas are less crowded and less demand is placed on them.

Types of jobs that best suit home-working and flextime work practices include consulting and professional services, writing, editing, translation, research, and customer sales and service. In the USA, *JetBlue Airways* runs part of its sales booking system with a host of retirees that work part-time from their homes. The CEO of the company calls this practice 'homesourcing' and says he learned it at another job where it increased employee loyalty, resulted in higher productivity, and decreased turnover (Friedman, 2006). It also reduces the company's need for more work areas. In Chicago, the professional services firm *Deloitte & Touche* has been using employee flextime for over a decade. In fact, 80-percent of its most valued employees have stayed with the company because of the flexible hours it gives them (Mand, 2004).

The Advantages of Flextime and Working from Home

According to the *Families and Work Institute*, around 43-percent of U. S. employees have access to flextime, which is up from 29-percent in 1992. There's a reason for this increase. Allowing responsible employees to choose their own work hours contributes to increased productivity, reduces stress levels, dramatically increases employee retention, and lowers the high cost of employee recruitment and training. Flextime also has wider implications in that it lowers the transportation costs of employees - as well as regional carbon emissions. A software developer in Seattle, Washington, for example, created a program showing how the daily commutes of the over 80,000 employees employed by *Boeing* totaled 85 circumnavigations of the earth (Mullins, 2007). Additional benefits of flextime and working from home include:

For the Business

- Bigger premises are not needed so high utility costs associated with having large numbers of onsite employees are avoided.
- A wider pool of job applicants can be attracted and employed (i.e.: disabled people, people with home care responsibilities, people who live far away, etc…).
- Sales and service personnel can be based closer to clients.

For the Employee

- The time and costs of commuting to work can be reduced or eliminated.
- Self-scheduling can increase motivation.
- Personal responsibilities and work responsibilities can be more easily integrated.

Disadvantages of Flextime or Working from Home

Having employees work from home is not an option that suits every business, nor will it optimize the character and work habits of every employee. Flextime and working from home require above-average amounts of self-discipline and personal responsibility. Just as important, some employees can't handle the isolation that working from home demands. Poorly managed at-home

workers may also receive confusing or conflicting goals, standards, and expectations from their superiors. For these reasons, employees who work away from their colleagues may require specialized training or counseling in areas such as time management, motivation, communication, technology, and self-sufficiency. Other problem areas include:

For Employees

- Ostracism – particularly if charges of favoritism are leveled at employees that work from home. Resentment can build amongst employees that have to adhere to a more traditional work setup.
- A possible reduction in the development, social skills, and upgrading of work-at-home employees can develop due to absences from the company's central place of work.
- Employees that work on their own may feel a loss of team spirit.

For the Business

- It can sometimes be difficult to manage and monitor the performance of home-workers.
- Allowing a chosen few to work from home may set a precedent that others will want to enjoy.
- A possible deterioration in the skill and work quality of the home-worker may develop.
- Employee isolation can lead to a possible reduction in company loyalty.
- Training costs and times can increase.
- Communications costs may rise.
- An increased risk of security or information leaks can develop.

Setting Rules and Guidelines

As with any business issue, many of the disadvantages of flextime or homeworking can be avoided if prepared for in advance. To get the most from employees that utilize homeworking or flextime, keep the following suggestions in mind:

1. *Check liability requirements, insurance needs, and health & safety obligations*. Before considering flextime or home-working options, carry out a risk assessment. The business's insurance policy must cover: at-home employees, the equipment they use, and the way they use it. In addition, the employee's personal or homeowner's insurance policy must be compatible with a work-at-home option because the tax status and insurance requirements of home-workers often change when they work from their residence. Some neighborhoods or buildings actually restrict home-working. Check with local zoning ordinances.
2. *Pick the right people*. Be certain at-home candidates can handle the isolation and additional responsibility that working from home demands. If possible, start them off with small at-home projects and work up.
3. *Educate employees who cannot work-from-home*. Don't allow employees to feel marginalized or mistreated.
4. *Draw up a set of rules and guidelines and have your work-at-home employees agree to it*. State the hours they need to be available (or the amount of work that is required) and any additional responsibilities.
5. *Determine the type, amount, and cost of equipment your at-home employee will need*. Lots of businesses that employ home-workers say that they initially tried to save money by skimping on necessary equipment, which caused more problems and created more headaches than necessary. At-home equipment needs can include communication devices (a dedicated mobile phone, *Blackberry*, or *Trio*), a dedicated phone or fax line (to keep the business's communications separate from the employee's personal communications), a personal computer or laptop with all the necessary hardware, stationary and office supplies, a work station (desk, chair, shelving, storage space), and so on.
6. *Train your at-home employees first before setting them off on their own*. Make sure your people have good time-management skills, report-writing skills, and job-specific skills and they know what is expected of them. Also, be certain they can operate all the equipment for which they will be held responsible.
7. *Set up a sufficient monitoring program*. Assign a manager to regularly assess the performance of at-home workers. Set goals and deadlines, keep an eye on

how well their targets are being met, and provide prompt feedback whenever possible. Remember that the effectiveness of home-workers should be measured in terms of work quality and output rather than the hours they keep.

8. *Provide a support network.* A feeling of isolation with participating employees is probably the number one reason why work-at-home programs fail. To offset this feeling, involve home-workers in as many meetings as possible without cutting into their work time or diminishing their reasons for working at home. Schedule two-way feedback sessions and arrange for them to pay regular visits to your workplace. Include at-home employees in training sessions, company functions, and after hour get-togethers. Let them know that they can turn to you (or someone else) when they need help or if things go wrong. Don't fall victim to an out-of sight-out-of mind attitude and don't give up and call your employees back at the first sign of trouble.

Getting the Most from Working at Home (an Insider's View)

Quite a few people that spend a lot of time working from home (I'm one of them) advise that a separate area be designated for work purposes. This is done for psychological reasons as well as the need for a quiet area conducive to working without interruption. A home work area should be a sacred spot that can be left behind without it being invaded by a spouse looking for scrap paper, kids searching for trouble, or the dog looking for a place to nap. It should also be easy to walk away from at the end of the day. The temptation to do just a little more work before eating or going to bed is a real life-drainer (trust me on this). If work duties are not organized and kept apart from domestic responsibilities it's easy to feel as if one is drowning in work. To avoid this sensation, establish a schedule that conforms to the hours when your employer needs you and when you perform best. Then plan your week accordingly. Many work-at-home professionals find that their responsibilities are best accomplished in manageable allotments of time (e.g.: e-mail answered by 10am, proposals made before twelve o'clock, letters written by 2pm, etc…). Next, factor in time for getting out, visiting clients, going to the gym, eating, doing research, reading, spending time with a partner or children, and/or just switching off. Stick to your schedule for at least a month so it becomes established. The following suggestions should also be considered:

- *Make sure that local ordinance laws allow a sign to be posted if at-home work responsibilities require one* (e.g.: if clients will be coming to your home). If you post a sign without first checking to make sure it's legal, you may not only be forced to take the sign down, a hefty fine may have to be paid as well.
- *Don't let working from home hinder the necessity of networking*. Get to know people in your industry and socialize with them whenever possible by making and scheduling time to do so.
- *Don't let procrastination take over your home-working life*. Set and stick to deadlines even when you don't need them.
- *Request feedback on a regular basis*. Feedback helps identify your weaknesses, helps keeps you motivated, and will improve your skills and productivity.
- *Work is often a direct reflection of one's habits and appearance*. When working from home, get up at a set time every morning and shower and dress yourself in a professional manner. Don't put off personal hygiene and don't walk around half the day in your pajamas – your work will reflect it.
- *Don't think of working from home as a way of 'passing the efficiency buck' from the company to an employee*. Ensure that the place where employees work is as efficient as it can be. Most of the methods and suggestions that increase the efficiency of a commercial building are equally as applicable in a home.

Bibliography

Bayside, 'Energy Efficient Office', www.bayside.vic.au/environment_energy_efficient_office.html, 2006.

CNN, 'Q & A: Ken Yeang Interview', http://edition.cnn.com/2007/TECH/science/07/16/yeang.qa/index.html, 2007.

Copper Development Association, 'One Wire Size Up Means Big Savings', www.copper.org, 1996.

Crawford, Caroline, 'Good Things are Growing at Living Technologies Inc.', *Business People – Vermont*, May 1999.

Deal, T & Kennedy, A., *Corporate Cultures*, Penguin Books, New York, 1988.

Energy Star, www.energystar.gov

Edwards, L., & Torcellini, P, 'A Literature Review of the Effects of Light on Building Occupants' (a technical report sponsored by the National Renewable Energy Laboratory), NREL/TP-55-30769, July 2002.

Friedman, Thomas L., *The World is Flat*, Penguin Books Ltd., London, 2006.

Greenpower, www.greenpower.govs.org/wind/Spirit%20%Lake%20case%20study.html (accessed March 2007).

Grunwald, Michael,' The Clean Energy Myth', *Time Magazine* (domestic issue), cover story, April 7. 2008.

Harrison, R., 'How to Describe Your Organization', *Harvard Business Review*, September-October 1972.

Hawken, Paul & Lovins, Amory & Lovins, Hunter, *Natural Capitalism*, Little, Brown and Company, Boston, 1999.

Hesselbein, F., & Goldsmith, M., & Beckhard, R., *The Organization of the Future*, Jossey-Bass, San Francisco, 1997, pp. 61-62.

Laudal, Terry, 'The Deeper benefits of Going Green: More than Just Buildings', *GreenBiz.com*, (accessed October 2007).

Mand, Adrienne, 'More Companies Allow Employees Flextime', www.abcnews.go.com/Business/print?id=89786, May 10, 2004.

Masters, Coco, '13. Let Employees Work Close to Home', from 'Fifty Ways to Reduce Global Warming' (*Time* magazine on line), www.time.com/time/printout/0,8816,1603086,00.html, March 26, 2007.

NRDC, 'Building Green Increases Employee Satisfaction and Productivity', www.nrdc.org, (accessed June 2007).

Odell, Anne Moore, 'Top Execs are Embracing Corporate Responsibility', *www.greenbiz.com*, www.greenbiz.com/news/printer.cfm?NewsID=35955, accessed January 2008.

O'Reilly, C, & Chatman, J., & Caldwell, D., 'People and Organizational Culture: A Profile Comparison Approach to Assessing Person-Organization Fit', *Academy of Management Journal*, Sept. 1991, pp. 487-516.

Ottman, Jacquelyn, 'At Patagonia, a Deep-Seated Commitment to Environmentalism', *www.greenbiz.com*, www.greenbiz.com/news/printer.cfm?NewsID=18496, accessed January 2008.

Parker, D. & Fairey, P. & McIlaine, J., 'Energy Efficient Office Building design for a Hot and Humid Climate: Florida's New Energy Center', sponsored by The Florida Energy Office, 1995.

Proctor, Cathy, 'Building Owners are Flush with Big Drop in Water Bill', *The Denver Business Journal*, July 7, 2006.

RMI (the Rocky Mountain Institute). Examples shown are courtesy of the organization.

Romm, Joseph, 'Peak Oil? Consider it Solved', *Salon.com*, www.salon.com, March 28, 2008.

Schein, Edgar, *Organizational Culture and Leadership*, Jossey-Bass, 1985.

Schein, Edgar, 'Organizational Culture', *American Psychologist*, vol. 45, 1990, pp. 109-117.

Seager, Ashley, 'Alternative Fuels: Now It's a New Game and Clean Energy is No Longer a Dream', *The Guardian* (London), November 7 2007, pg. 26.

T & L, Water Efficiency in the Textile and Leather Industry', www.accepta.com/industry_water_treatment (accessed March 2007).

Time magazine, www.time.com/time/health/article/0,8599,1603747,00.html (accessed March 31, 2007).

Wee, Heesun, 'Buildings with Built-In Energy Savings', *Business Week Online*, www.businessweek.com, August 27 2001.

Whitfield, Kermit, 'Green by Design: On Cars – Manufactured Products', *Look Smart*, Gardner Publications, 2003,

PRODUCT

A product is anything that can be offered to consumers for their acquisition, use, or consumption that satisfies a want or need (e.g.: physical objects, services, persons, places, organizations, and/or ideas). Because of the vast quantities of materials and energy that most products require for their making, not to mention the huge amounts of waste they produce while they're being manufactured, making products more efficient (and more efficiently) is crucial to reducing the costs of running a business. To be sure, redesigning products and the methods used to make them is one of the more time-consuming and arduous of the efficiency processes, however, many practitioners attest that it can also prove to be the most financially rewarding.

Chapter 28

The Hidden History of Products

Ever wondered what's involved in the making of a Styrofoam cup or a pair of blue jeans or even one serving of a hamburger, fries, and a soda? Most of us are unaware of the genealogy of the products we use as well as the trail of waste, pollution, and inefficiency these products leave behind. For example, take a look at the making of a typical aluminum can for the UK soft drink industry (provided here courtesy of the *Lean Enterprise Institute*).

To make aluminum, bauxite is needed. This reddish, clay-like ore is mined in Australia, Jamaica, or Guinea and is then transported to a local chemical reduction plant (or a smelter). One ton of bauxite is needed to produce a half-ton of aluminum oxide. When a sufficient amount of aluminum oxide has been collected it's taken from the smelter, loaded onto a ship, and sent to Sweden or Norway (a journey of one month across two oceans). Next, the aluminum oxide is dissolved in a salt solution and zapped with powerful electric currents that purify it (electricity is cheap in these countries, which is why the process is done there). Making a pound (about half a kilogram) of aluminum from aluminum oxide, which amounts to 34 beverage cans, requires 7.5 kilowatt-hours of electricity – or enough energy to power a home or small business for a single day. The electrical process reduces the aluminum oxide by half before what's left is shaped into ingots and trucked to a different part of Sweden or perhaps Germany. The ingots are then heated in ovens and pressed into thin sheets that are rolled and trucked to another country where they're rolled and pressed again. Following these procedures, the aluminum sheets are shipped to the UK where they're punched and formed into cans.

Next, the cans are washed, dried, primed, and painted. After a thin lacquer has been applied, the cans are flanged and sprayed with a protective film that prevents them from corroding. The empty containers are then sent to a bottler where they're washed again and filled with a beverage. The beverage

contains sugar harvested from beet fields in France (or cane fields in the tropics) as well as phosphorous from mines in Idaho (in Idaho, the 24-hour phosphorous mining process consumes, in one day, an amount of electricity equal to that required for the daily needs of a city of 100,000 people). After the beverage has been made it's squirted into the aluminum cans, which are then sealed at a rate of 1,500 cans per minute. The cans are next inserted into cardboard packaging (derived from trees cut down in Canada, Sweden, or Siberia) and loaded onto pallets. More shipping ensues as the cartons are transported to supermarkets and vendors across the UK. On average, the finished product is purchased within three or four days and consumed within a week. Drinking the beverage takes a few minutes and throwing the can away takes a few seconds. All in all, the entire process takes about 319 days. Small wonder that even a one-percent reduction in the aluminum needed to make a beverage can is enough to save manufacturers $20 million a year – or that recycling just one aluminum can saves enough energy to power a television set for three hours.

Plastics are another material used to package soft drinks, yet bottles made from plastic create their own unique waste trail that is just as hard to ignore. The total mass of a typical one-liter plastic container, for example, is just under one-ounce (about 25 grams) and is made from non-recycled polyethylene teraphthalate (PET). The making of one-pound (about half a kilogram) of PET requires a little over 14-pounds (6.5 kilograms) of oil, 648-pounds (294 kilograms) of water, and emits eight-pounds (3.7 kilograms) of greenhouse gas emissions. This means that every one-liter PET bottle requires over a third of a pound (162 grams) of oil and over 15-pounds (7 liters) of water to produce - while emitting around a quarter of a pound (100 grams) of greenhouse gas emissions (which is as much as the average car produces driving a third of a mile or half a kilometer). Keep these figures in mind when taking into account that Americans throw away approximately 2.5 million plastic bottles an *hour*.

Shipping and distributing soft drinks (or water) merely increases the trail of waste. Transportation emissions are measured in grams (in units of CO2 equivalencies) per metric ton, per kilometer. Container ships emit about 17-grams of CO2 per ton, per kilometer. Trains release 56-grams per ton, per kilometer; trucks spew out 102-grams per ton, per kilometer; and jet aircraft emit 570-grams per ton, per kilometer. When the costs of packaging and marketing, as

well as a profit margin, are factored in, a one-liter container of bottled water can end up costing two to five times more than a similar amount of gasoline – or 50,000-percent more than tap water (which is ironic when one considers that many brands get their product straight from municipal taps.) Put another way, Americans spend five times more on bottled water per annum than it would cost to eradicate the waterborne illnesses that lead to the deaths of 1.8 million children every year (Paster, 2008)

Ecological Rucksack

The proper term for the amount of waste a product generates as it winds its way through its production (and lifecycle) is called *ecological rucksack* -- and almost every product carries a far greater load than meets the eye. For example, according to Friederick Schmidt-Bleek of the *Goethe Institute*, an ordinary cotton T-shirt carries an ecological rucksack of approximately 10,106 pounds (4,584 kilos). How? First, the processes behind the growing of the cotton must be taken into account including the manufacture, transportation, and distribution of fertilizers, herbicides, and pesticides. Irrigation equipment (and water usage), farm machinery, and gasoline – as well as the processes behind these items - must also be factored in. Next come the steps involved in turning the cotton fibers into thread. Weaving, dyeing, packaging the completed product, and transporting it to retail outlets results in the creation of even more waste. Additional factors to consider include after-sale practices such as the efficiency of the washing machine the customer uses, the use of hot or cold water (hot water uses more energy), whether the shirt is air dried or put in a tumble dryer, and so on. Every process produces some form of waste.

To be sure, the waste estimation of a product is dependant upon how far back its materials can be traced, which makes any study highly subjective. Estimates claim, however, that a semiconductor chip leaves behind 100,000 times its weight in waste during its manufacturing process and the making of a laptop computer produces 4,000 times its weight in waste. The production of platinum creates 250,000 units of waste for every unit of precious metal created and every gold ring leaves behind approximately 400,000 times its weight in waste.

A bus, over its lifetime, consumes about 8,818,4000 pounds (4 million kilograms) of oil and cleaning solvents, 11,096,400 gallons (42 million liters) of

water and 1,719,588 pounds (780,000 kilograms) of air. Simple, everyday products are equally as materials-hungry and produce similar amounts of waste. For example, the manufacture of one ton of paper requires the destruction of 20 trees and enough electricity to power the average home for six months. Two-quarts (1.88 liters) of gasoline are needed to produce one-quart of orange juice. And one serving of a hamburger, fries, and a soft drink requires 6,357-quarts (7,000 liters) of water. With statistics like these, it easy to see how raw material use in the United States multiplied 17 times between 1900 and 1989 while the country's population multiplied only three times.

Why is Waste (and Its Costs) so Difficult to See?

Mention the amounts of waste most products leave behind and many people roll their eyes under the assumption that the numbers are being exaggerated to prove a point. 'How can a quart of orange juice require two-quarts of gasoline to produce?' a student once asked me, 'that means orange juice should cost at least twice as much as gas.'

What he and others aren't considering is that mass production, bulk raw material costs, and mass transportation help lower the costs of making a product, all of which does a good job of hiding waste. I'll use a common city bus ticket to illustrate this point. In most parts of the world, a $1 or $2 bus ticket enables a passenger to get on a city bus and either get off at the first stop or stay on until the bus reaches the end of its route. Although the lengthier journey requires more fuel and produces more waste, that fact is not reflected in the price of the bus ticket (which is low and remains constant). Ironically, it's this logic that many skeptics use to try and prove that product waste is not an issue. In other words, since the price of the bus ticket remains the same, they reason that the bus can't possibly be using more fuel during its longer journey or be producing more waste. Understanding mass production economics is the key to rectifying this misconception. The general rule is that when production volume doubles, the price of whatever product is being produced tends to drop 10-percent to 30-percent. Put another way, by selling more bus tickets, the costs of raw materials and waste spread out and seemingly disappear.

Hidden Poisons

Just as worrisome as the trail of waste most products leave behind are the amounts of toxins that are found in – or are used to make - everyday products. The average television, for example, contains 4,000 toxic chemicals (200 of which emit hazardous fumes when the TV is turned on) and many buildings are insulated with formaldehyde-laden particleboard that heavily pollutes indoor air. The average PC consumes ten times its weight in hazardous chemicals *and* fossil fuels to complete its production (in India and China alone, about 70-percent of arsenic, lead, cadmium, chromium, cobalt, mercury and other heavy-metal pollutants come from electronic waste created just by computer manufacturers). If that isn't enough, of the over 8,000 chemicals used to dye clothes and fabric, less than .004 percent are actually considered *non-toxic*. Even glues and paints contain solvents that steadily pollute the air long after they're dry.

Don't Forget the Packaging

Compounding the problem is the amount of packaging used to protect and transport the products we use. By 2010, the amount of paper, glass, and plastic the world throws away is estimated to increase from 40-percent to 60-percent compared to that produced in the 1990's (Resource Cities, 2000). Of these, the greatest scourge is probably the plastic bag. Plastic bags are the single most ubiquitous consumer item on earth (Mieszkowski, 2007). Every year, Americans throw away around 100 billion of them, which is the equivalent of dumping nearly 12 million barrels of oil. To add insult to injury, the majority of these bags contain lead in their coloring. Yet only one-percent of the world's trillions of plastic bags ever see a recycling plant (plastic bags are notoriously difficult to recycle because they're so flimsy). Most are destined to spend centuries in landfill sites, in tree branches, on fences, in storm drains, or in waterways where they eventually end up in the ocean. There are now some 46,000 pieces of plastic from bags, plastic bottles, and other forms of packaging, floating in every square mile (2.6 sq. kilometers) of every ocean. According to the *Blue Ocean Society for Marine Conservation*, more than a million birds and 100,000 marine mammals die every year from eating or entangling in this plastic. Today, a swirling mass of plastic twice the size of Texas is growing in the Pacific

Ocean. Locked in a great vortex of ocean currents, this mass contains six times as much plastic as it does living organisms. When one takes into account the number of creatures that can live in a single drop of water that's saying a lot.

Ten Ways to Minimize Product Waste

The key to reducing ecological rucksack is *product waste minimization*, a design and production process that goes far beyond the examples of a carpenter carefully examining a piece of wood before it's cut to ensure that all its pieces will be useable afterwards – or a dressmaker arranging pattern pieces on a length of fabric to reduce wasted cloth. True waste minimization takes into account the waste created during the entire production of a product while reducing the product's potential to create waste during and after its use. Although most of the steps involved in product waste minimization are described in greater detail throughout this book, following are what they look like when they're condensed into ten simplified guidelines:

1. *Carefully design the product beforehand so that its resources can be optimized and re-used in a closed-loop system*. In the past, product design was mostly based on three aspects: appearance, function, and financial profit. Today's products need to add two more conditions to this equation:

    - The first is to *make the most of the nutrients that create the product*. As Chapter 14 relayed, most products contain two types of raw materials: (1) technical 'nutrients', and, (2) 'biological 'nutrients'. Technical nutrients are synthetic or mineral and can remain in a closed-loop system of recovery and reuse. Biological nutrients are biodegradable and should be returned to the environment where they can be broken down safely and organically. The '*gDiaper*', for example, came into being after its inventors learned that approximately 38,000 traditional 'disposable' diapers go into landfill sites in the USA every minute and each takes 500 years to decompose. *gDiapers* are therefore made from biodegradable 'nutrients' that are put together using environmentally friendly production methods. This means that unlike their wasteful counterparts,

gDiapers contain no elemental chlorine, no oil-based plastics, no perfumes, and no smell. In fact they're so benign that they can be flushed down a toilet or be composted in a garden after use.

- A second way to minimize product waste is to *reduce the complexity and/or number of components the product has*: As basic as it sounds, making a product less complicated often reduces waste, labor, and manufacturing costs. For example, in the USA a toilet valve was redesigned by its manufacturer and ended up weighing seven times less, went from 14 parts to one molded part, and had its production costs reduced by 80-percent. In another example a windshield wiper was re-engineered by its maker from 49 parts to one and could therefore be manufactured at a lower cost despite the fact that the new product was made from more expensive carbon fiber (Hawken, et al, 1999).

2. *Design products so they can be easily disassembled after use*. One of the more important aspects of product waste minimization is called 'designing for disassembly' (Beitz, 1993), which allows a product to be quickly taken apart at the end of its life for recycling or remanufacture (see Chapters 30 and 31). Designing for disassembly involves:

   - enabling the removal of the product's parts without damaging them (including the quick removal of all fasteners and connectors),
   - clarifying and simplifying the parts classification process (thereby making it easier to determine which parts can be reused, remanufactured, or recycled),
   - maximizing all reuse, remanufacturing, or recycling processes, and,
   - ensuring the processes that sort, separate, and purify disassembled parts do not create waste.

3. *Reduce the hazardous makeup of the product*. Lower or eliminate the toxicity of a product's raw materials or parts by replacing them with non-toxic alternatives. As mentioned in Chapter 7, reducing toxin use helps eliminate the (often unconsidered) expenses induced by hazardous materials. These costs include:

- specialized handling and packaging requirements,
- specialized transport needs,
- health and safety costs,
- specialized equipment expenses,
- employee training expenses, and,
- disposal costs.

For example, in Poland, a street light manufacturer discovered a way to replace the methylene chloride used to make its products with an environmentally safe alternative and saw its costs plummet. In another example, the *Hollywood Memorial Hospital* in Hollywood, Florida replaced the hazardous mercury-based batteries in its portable cardiac monitoring equipment with environmentally friendly zinc-air batteries. Even though the new batteries cost 15 cents more, because they last significantly longer they end up reducing costs by more than 25-percent and they lowered the hospital's mercury waste by 342-pounds (155 kilograms) annually. In Sweden, chemist Mats Nilsson discovered a flame retardant chemical that's both harmless to humans and safe for the environment[*]. Currently, the most widely used flame retardant in the world (bromide) is lethal, yet the danger is seen as a price worth paying for reducing the flammability of clothing. Derived from grapes and citrus fruits, Nilsson's alternative can be used in applications from mattresses to high-tech goods to kid's clothes and is set to revolutionize the flame retardant industry while reducing bromide levels around the world (World Challenge, 2006).

4. *Switch to non-hazardous manufacturing methods*. Manufacturing processes dependant on hazardous chemicals, heavy metals, or combustion are usually more expensive than they appear. For example, the *GlaxoSmithKline* pharmaceutical company in Verona, Italy reduced the environmental impact

[*] Nilsson's work is a good example of *'biomimicry'* (replacing toxic or hazardous production processes with safe, sustainable, and biodegradable alternatives). Carpets, chemicals, clothing, medicines, motor oils, and plastics are just some of the products that can now be created by biological organisms in a safe and environmentally sustainable manner (Venter, 2007). Everyday, astute manufacturers are seeking additional clean and inexpensive ways to recreate what nature does on it own.

of manufacturing a chemical being tested to treat chemotherapy-induced nausea and vomiting. Originally, the method for making the chemical relied upon subfreezing temperatures (which required huge amounts of energy) and produced significant amounts of waste. The improved process removed a number of hazardous substances from the production of the chemical, reduced the need for extremely low temperatures (which saved energy), reduced waste by 75-percent, and lowered the cost of raw materials by 50-percent (GSK, 2003). In another example, a laboratory in the United States that manufactured biological slides for microscopes used a toxic solution made from mercury to prepare its specimens. Try as they did, the laboratory could not find an alternative for the mercury solution until one day one of the lab workers jokingly suggested using the soft drink he had just purchased (*7-Up*). It worked. Since *7-Up* is safer and cheaper than mercury it also helped the lab reduce its chemical, hazardous training, and disposal costs. (For more about 'clean production', see Chapter 34)

5. *Reduce the amount of energy required to make the product and use sustainable energy sources*. Examples for reducing energy requirements in production processes include:

   - using energy-efficient equipment (see Chapters 34 and 35),
   - using remanufactured material in the product's makeup (see Chapter 31), and,
   - using sustainable energy supplies (i.e.: wind or solar energy) and/or micro-power to supplement the powering of production equipment (see Chapter 26).

6. *Use clean technologies whenever possible*. Many products (and their production process) can be made more efficient by teaming them with new technologies. Examples include containers that safely and effectively store liquids yet are still biodegradable; the '*Solatube*', which eliminates the need for interior daylighting by capturing outside light and redirecting it into buildings; transmitting news and information over the Internet instead of printing it (university courses also benefit from this practice, which eliminates the need for students to travel to a classroom); and the *eCube*, a

device the size of a hockey puck that attaches to a refrigerator's temperature sensor (the *eCube* prevents the wasteful turning on of the cooling unit every time the refrigerator door is opened, which can reduce energy requirements by up to 30-percent).

7. *Use sustainable re-manufactured, recycled, or scrap materials to manufacture products*. Closed-loop practices allow the original raw materials, energy, and manpower of a product to be used again. For example, in 2004, the *3M* company reformulated a brand of carrier tape so it could be manufactured entirely from the waste materials of other products. The new product, which is made of 100-percent recycled material, not only costs less to make, it also reduced the plant's waste by 120 tons in the first year of production. Similar examples of using recyclable material include efficient-minded paper companies that return damaged rolls to their production lines, plastics manufacturers that take off-cuts and re-incorporate them into their machining processes, and the *Nike Corporation*, which now makes the upper parts of several of its athletic shoes using previously discarded scraps and off-cuts. (See Chapters 30 and 31 for more information)

8. *Improve quality control and process monitoring in all production processes.* By increasing the frequency of production inspections (as well as the number of inspection points) *and* displaying real-time production information, most production problems can be identified, stopped, and corrected at an early stage before waste becomes a problem. (See Chapters 34–38 for more information on this subject) For example, American retail giant *JCPenney*'s installed a computer program that shows ongoing electricity use in several of its stores in 15 minute intervals. Any spike in power usage is immediately investigated by employees to determine if the increase is necessary.

9. *Find ways to have products returned to their place of manufacture so they can be disassembled, harvested, and used to make new products*. By rewarding customers for returning used products, a steady supply of (free) raw materials is maintained and relationships with customers are strengthened (see Chapter 31).

10. *Reduce packaging requirements, use recyclable packaging material, or find ways to eliminate packaging altogether*. According to one study, 98-percent of secondary packaging is redundant (Puder, 1992) and what's left can usually be reduced. Less packaging saves money in two ways: it reduces production expenses and it reduces waste disposal costs (see Chapter 29). A *Pollution Prevention Pays* team at *3M*, for example, redesigned the packaging of *Post-It* notes by eliminating cardboard back cards and blister covers from every unit. The result saves the company over $350,000 annually and eliminates 35 tons of waste every year.

Product Waste Minimization: A Case Study

A good way to show how the above-mentioned ten waste minimization steps can lower costs, reduce waste, and lead to the development of a superior product, is by examining the re-creation of the automobile. Automobiles are exceptionally complex products with huge ecological rucksacks. In the United States alone, cars consume eight million barrels of oil every day and produce one-fourth of the country's greenhouse gases. In addition, most automotive vehicles contain around 15,000 parts, which generate seven billion pounds of unrecycled scrap and waste every year. The internal combustion engine adds yet another facet of inefficiency to the mix simply because it's one of the most inefficient devices ever built. So how inefficient is the overall product? Most of the energy generated by a car's fuel is lost in the engine, the drivetrain, powering accessories, or in idling. Of the one-eighth that reaches the wheels, over half heats the tires on the road as well as the air the car pushes aside as it moves. Only six-percent of the original fuel energy accelerates the car. Since 95-percent of the mass being accelerated is the car, not the driver, one-percent of the fuel energy is left to move the driver (Fussman, 2006).

With these inefficiencies in mind, engineers at the *Rocky Mountain Institute* designed a newer, cleaner, and more efficient product that takes advantage of product waste minimization concepts. Their first step was to identify the four most egregious inefficiencies in automobiles, which are:

1. *Weight*. Most cars are heavier then they need to be (the average car is about 20 times heavier than its driver). Two main reasons for this are that cars are

made from steel (which is heavy) and car engines are about ten times larger than normal driving requires.

2. *The internal combustion engine*. No matter how it's looked at, the internal combustion engine is exceptionally inefficient no matter what fuel it uses.
3. *Air resistance* (also called *aerodynamic drag*) accounts for about a third of energy consumption. Roughly six to seven tons of air must be pushed aside for a car to travel one mile (1.6 kilometers).
4. *Rolling resistance* or the resistance created by a tire on a road, accounts for another third of a car's energy consumption.

Curiously, the way most automotive manufacturers choose to solve these four inefficiencies is to build a more powerful car. The downside of this practice is that powerful cars need bigger engines and bigger engines consume more fuel. When more fuel is consumed a bigger fuel tank is needed. A bigger engine and a heavier fuel tank means that a larger and heavier physical support structure is required as well as a more powerful braking system and a larger, heavier drive train and, well, you get the idea. Every addition piles ever more weight onto the car thereby further impacting its fuel efficiency. Therefore, for a car to become more efficient, its weight must be reduced.

Since most of a car's mass comes from the steel that makes up its body, a good way to reduce overall weight would be to find an alternative that weighs less than steel yet still offers the safety and protection that steel provides. Fortunately, such an alternative exists in the form of carbon fiber. Composites made with carbon fiber are ultra-light and ultra-strong and can be embedded in moldable plastics. The result absorbs twelve times as much crash energy per pound as steel. In fact, ten pounds (4.5 kilograms) of carbon fiber and plastic can absorb the crash energy of a 1,200 pound (544 kilograms) car hitting a wall at 50 miles (80 kilometers) per hour. What's more, carbon fiber reinforced plastics have an almost infinite lifetime and are completely recyclable. Unfortunately, carbon fiber appears to have one major setback - it costs more per pound than steel – about twelve times more.

The problem with this line of thinking is that it doesn't take into account the cost of *making* a car. Carbon fiber may cost more per pound than steel, but automobiles are not sold by the pound, they're sold by the car - and only about 15-percent of the cost of a car part pays for the steel from which it is made. The

rest is needed to cut, pound, weld, and finish the steel. In addition, of the over 200 to 400 parts needed to build a car, most require four machine-tool dies to manufacture – and automotive machine-tool dies cost, on average, around $1 million a piece. Furthermore, most cars need around 1,000 engineers working two years (or more) to design and construct their manufacturing processes, and typically, more than $1 billion worth of automated dies, welders, and hoists are required for every car and its largest parts (note: these capital investments are a main reason why automakers don't switch to new production methods [the term for this is 'stranded capital']).

Carbon fiber composite production, on the other hand, is much cheaper. An autobody made from carbon fiber can be fashioned from only five to 20 composite parts using low-pressure dies that cut tooling costs by up to 90-percent. Additional savings are derived from the fact that carbon fiber parts can be lifted and handled without expensive hoists - *and* they can be fit together using super-strong glues or resins thereby eliminating welding machines. Carbon fiber composites can also be impregnated with color *before* they're placed in a mold. This is important because finishing and painting the myriad parts of a steel car is the costliest, most difficult, and most polluting step in automobile making – accounting for one-fourth to one-half of the total finished expense of painted steel body parts. Carbon fiber composites not only eliminate this costly and dangerous process, the rust-free, chip-resistant, and nearly undentable body of a carbon fiber car lasts for decades and can be recycled after use. Furthermore, by making a car with carbon fiber, the overall weight of the car is reduced by over one-half -- not just because the body of the car is lighter, but also because a lighter car doesn't need as big a braking system, or as big an engine, or as big a fuel tank, or as big an internal support system[*], which ultimately reduces the vehicle's fuel requirements.

Now for the engine. Using new technologies, a more efficient hybrid engine - or electric engine - can be installed that's powered by rechargeable

[*] The customary method Detroit auto-makers have used to manufacture an electric car is to take a standard steel automobile, weigh down the already heavy body with a hundreds of pounds of batteries, and replace the combustion engine with a large electric motor. The result is heavier and more inefficient, which helps support the claim that electric cars aren't viable and enables the manufacturer to avoid the time, effort, and expense of 'stranding' billions of dollars worth of combustion engine capital in order to invest in something better.

batteries (or, perhaps in the near future, by fuel cells). Electric motors are efficient, durable (they only have one moving part), and are exceptionally powerful. For example, an electric motor the size of a fist can deliver up to ten horsepower. Electric motors are also lightweight and versatile and can be attached directly to each of a car's wheels, thereby eliminating the drivetrain.

With the drivetrain gone the car is lighter and better streamlined, which reduces aerodynamic drag and increases fuel efficiency. Add efficient tires that reduce rolling resistance (which have been on the market for years) and the overall product becomes even more efficient. What's more, the cost of setting up a manufacturing site for a car built from carbon fiber is estimated to be equal to that of building a soft drink bottling plant. Using lean-thinking production methods, a carbon fiber car could then be ordered directly from a local factory, made with local labor, and be delivered to a customer within a few days.

This is not theory. The *Rocky Mountain Institute*'s 'Hypercar' has been in existence since 1994 and the details have been placed on the Internet so that no single car manufacturer can patent the concept. Originally designed as a vehicle powered by a hybrid engine, it can also be converted to electric or fuel cell technology. In 2004, *Hypercar Inc*. changed its name to *Fiberforge* (www.fiberforge.com) to better reflect the company's new direction and its goal of lowering the cost of high-volume advanced composite structures.

Several manufacturers are taking note. After countless financial losses based on short-term thinking, companies like *General Motors* (GM) appear to finally be thinking long-term. For example, *GM* has dramatically reduced the weight of its *AUTOnomy* concept car by shaping the car's batteries (or fuel cells) to form a chassis. This means the vehicle's tires attach directly to the chassis via four small, light-weight, yet powerful electric motors that make a drivetrain obsolete. The result allows the top two-thirds of the car to be removed and replaced with relative ease. Need a pickup truck for the weekend? Drive to a nearby dealer, remove the upper part of the vehicle, and replace it with a pickup truck body. Need a sedan or an SUV? Do the same.

With product waste minimization, the possibilities are limitless.

It's Not Just Cars; Almost Every Product Can Benefit from Waste Minimization

Many companies that benefit from waste minimization agree that efficiency begins in the product design stage. By recognizing the most inefficient (or hazardous) aspects of a product and applying the 'ten ways to minimize product waste', it's possible to make almost any product better *and* less expensive. Further examples of well-designed products that are making money, producing less waste, delivering superior performance, and complying with increasing environmental regulations include:

- *Clorox* recently unveiled its first new brand in 20 years (*Green Works*), the initial launch of which includes five cleaning products that are at least 99-percent natural: an all-purpose cleaner, a toilet bowl cleaner, a dilutable cleaner, and a bathroom cleaner. The company subsequently won a rare endorsement from the *Sierra Club* for its efforts.
- *Unilever* developed a three-times concentrated laundry detergent in a smaller package that saves the company six million pounds of plastic per year and reduces the amount of diesel fuel for transport by one-third.
- The *Nitech* company, a battery manufacturer, replaced its disposable batteries with rechargeable batteries and developed a new product line.
- The *Hoover* washing machine company created a new range of washing machines that reduce energy, water, and detergent consumption. The new designs won several awards and have dramatically increased profits.
- *Frigidaire* improved its refrigerators by reducing chemical levels, improving the efficiency of its motors, improving compressor design, developing better seals and gaskets, and designing smaller refrigerator doors (which helps keep cold air in). Increased profits followed.
- *Stelrad Ideal* (*Caradon Heating*) improved its line of domestic boilers by using flue heat to supplement the heat produced by the boiler's gas burner – thereby boosting the efficiency of its product to over 95-percent.
- The *Atmosol* company developed safe aerosol propellants.
- *SC Johnson Wax* made a pledge to develop product packaging from 100-percent recycled materials. The change saved the company much money and generated lots of welcome attention in the press.

- The *Trannon* furniture company developed a whole new range of sustainable products from locally-grown forestry thinnings and coppiced wood. As a result, *Trannon* won several awards.
- *Pax* designed a new line of air gun pellets (under the brand name *Prometheus*), all of which are lead free. Since 80-percent of *Prometheus* pellets are sold to farmers in Indonesia for pest control, this has greatly reduced the amount of lead in paddy fields (approximately 1.5 billion lead pellets are sold annually in the UK alone – and much of that lead seeps into the food chain). What's more, *Pax* uses the waste plastic from the production of its pellets to make its packaging (Smith, et al, 1996).
- In paper-manufacturing companies across the United States, chlorine and chlorine dioxide (two extremely hazardous substances used for bleaching) are being replaced with safer alternatives to not only make paper manufacturing safer, but also to make (paper-making) facilities less appealing targets for terrorists. (In the USA there are 74 papermaking facilities that use and store around four million pounds of chlorine and chlorine dioxide. According to the *Environmental Protection Agency*, this practice endangers 5.7 million people in 23 states). (USPIRG, 2007)

Good Product Design is Only the Beginning

Whatever a business is making, says Andrew Shapiro (the founder of *GreenOrder* – an environmental business strategy group), if a green dimension can be added to it there's a good chance that it can't be made cheaper in another country (Friedman, 2007).

Good product design, however, is only the beginning. For efficient products to become wasteful packaging requirements must also be reduced…

Author's Note: Although the '10 Ways to Minimize Product Waste' was comprised from my own research, a colleague pointed out that the ***Industrial Design Society of America*** came up with something similar (and better) 16 years earlier – long before waste reduction had entered my vocabulary. Credit must therefore be given to the IDSA and its pioneering work in this field.

Chapter 29
Minimizing Packaging

Packaging comes in many shapes and forms: tubes, boxes, bags, cans, foam pellets, shrink wrap, paper, and so on. The primary purpose of packaging is to protect a product and keep it fresh. Additional benefits include enhancing a product's attractiveness and providing protection from tampering. The three most common types of packaging include:

- *Primary* packaging, which is the wrapping or container handled by the consumer. 70-percent of primary packaging is used for food and drink.
- *Secondary* packaging includes larger cases, boxes, or bags used to group goods for distribution, ease of carrying, or display in shops.
- *Transit* packaging refers to pallets, boards, plastic wrap, and containers used to collate products into larger loads for shipping.

Despite the benefits that packaging provides, many products are egregiously over-packaged. This is particularly annoying to customers because they're the ones who have to pay to throw it away. *Wal-Mart*, for example, recently unveiled a packaging 'scorecard' to its suppliers demanding the reduction of all packaging by at least five-percent over the next few years (*Wal-Mart* discovered that up to 20-percent of its garbage was directly attributed to packaging). By issuing a waste-reduction edict to its 60,000 suppliers, *Wal-Mart* expects to reduce solid waste by 25-percent and shave $3.4 billion off its operation costs. Similarly, *Hewlett-Packard* announced in March of 2007 that it was reducing the amount of packaging surrounding its printer cartridges - a move estimated to not only significantly reduce production costs, but also eliminate carbon emissions equal to that produced by 35,000 cars.

The new improved milk jug provides yet another packaging improvement example. Milk jugs across America are now more square, which lowers packaging expenses by 10 to 20 cents per jug. Square containers also store 50-percent more milk per cubic foot so more milk can be put on trucks thereby

reducing trips and fuel costs. *Sam's Club* (a division of *Wal-Mart*) predicts that the new jugs allow for 224 containers to be placed in cooler units (the previous number was 80) and will eliminate over 11,000 milk truck journeys annually.

Reducing the Costs and Waste of Extraneous Packaging

Since packaging is responsible for a substantial amount of waste, and waste is always a sign of wasted money, reducing the amount of material that surrounds a product, without reducing the integrity of the product itself, is a good way for a business to quickly decrease its expenses. Tried and tested suggestions to achieve this goal include:

- *Use the least amount of packaging possible* (*or better yet, none at all*). Some estimates claim that up to 98-percent of secondary packing (i.e.: a box outside a box, a bag outside a bag…) and a significant amount of primary packaging can be reduced without any perceived decrease in the quality of the product or its package. In Australia, for example, several small business manufacturers have been able to save up to $30,000 a year by reducing the packaging surrounding their products (Fielding, 2004). In the USA, the *State Farm Insurance Company* in Bloomington, Illinois saved $23,100 in annual packaging costs simply by eliminating unnecessary shrink-wrap from the booklets it distributes (*Waste Prevention Pays Off*, 1993).
- *Redesign packaging to reduce material use*. Sometimes a small change in the design of a package can significantly reduce the cost of raw materials. For example, *Anheuser-Busch* reduced its aluminum usage by 21 million pounds (9.5 million kilos) per year by shaving an eighth of an inch (.3 centimeters) off the rims of its beer cans. In 1989, the *Digital Equipment Corporation* in Maynard, Massachusetts made it a high priority to reduce packaging materials in all aspects of its business and subsequently redesigned the amount of packaging used to ship metal computer cabinets. As a result, the company saved $300,000 in one year. Furthermore, by using bakery racks on wheels in place of disposable packaging to transport sheet metal parts from one area of a plant to another, the company saved an additional $200,000 annually (*Waste Prevention Pays Off*, 1993).

- *Reuse packaging materials and containers whenever possible*. Extending the life of packaging materials saves money. The *3M* corporation's plant in Valley, Nebraska, for example, worked with a supplier to produce returnable packaging that reduced shipping waste by eight tons and saved over $1,500 per shipment in packaging and disposal costs. Other companies have begun similar policies by asking customers if they mind having their purchases placed in used packaging (apparently, most customers don't mind a bit). Some CEO's consider this practice to be so financially advantageous, that they see re-useable packaging as akin to being given money by suppliers.
- *Repair and re-use heavy-duty shipping materials*. This is particularly true with pallet shipments. For example, like many large companies, *Wilton Industries* in the USA paid over $100,000 every year for approximately 14,000 new pallets. Now, however, the company saves $64,400 annually by repairing and reusing damaged pallets and avoiding unnecessary pallet disposal costs.
- *Use recycled materials from sustainable, renewable sources or alternative materials* (such as wheat straw) *whenever possible for packaging*. With the third largest emitter of global pollution in the world being the pulp and paper industry the benefits of this practice cannot be overstated.
- *Maximize the amount of material shipped on pallets and in vehicles*. This practice alone has saved many companies millions of dollars a year in shipping costs. For example, *3M Inc.*'s St. Ouen L'Aumone facility in France developed a new stacking system that allowed more materials to be packed onto transport vehicles. The new system carries twice the load of the previous system, reduces the number of daily truckloads by 40-percent, saves 12,500 gallons (47,316 liters) of fuel, and cut transportation costs $110,000 per year.
- *Use cardboard edges on the corners of large items* (*or those shipped in bulk*) *and shrink wrap what remains rather than boxing each item separately*. This practice saves furniture maker *Herman Miller, Inc.* (of Zeeland, Michigan) $250,000 every year in packaging costs with just one of its products.
- *Use thinner, stronger, and more opaque paper for paper packaging needs*.
- *Replace cardboard boxes with more durable, reusable containers.* This is especially advantageous for warehouses or interdepartmental shipments. In

Cottage Grove, Minnesota, a *3M* facility designed collapsible, reusable steel crates robust enough to stack on top of one another. As a result, the company avoided producing 315 tons of solid waste and saved $101,800 in the first year alone.

- *Ask suppliers to accept returnable containers and packaging materials*. Automotive giant *General Motors* did this and slashed between $390 million and $520 million from its supply chain costs.
- *Sell unused packaging waste to a recycler*. Contact your local waste disposal company or public works department for details.
- *Work out a shipping system that reduces the time it takes to package and send items*. Generally speaking, the more time it takes to package and ship products the more it costs.

It's Not Just Good Business, It's the Law

How much packaging delivers true customer satisfaction? Knowing the answer to this question can lead to a substantial reduction in packaging costs as well as the elimination of extraneous materials that nobody wants or needs. If you're still not convinced, think of it this way: local, state, and federal governments around the world are now passing laws making it mandatory to return products and packaging (particularly those that are easily recycled or that contain toxic substances in their makeup) to their point of origin after use. Other governmental bodies are banning hazardous products as well as recyclable products such as paper and plastic from landfill sites in a bid to force businesses to use these materials more economically. Failure to comply can result in hefty fines or even jail time. The day may soon come when all products - and their packaging - will be tagged with a toll free telephone number or a bar code (or perhaps the personal information of the purchaser) so that it can be identified and picked up at the end of its useful life for reuse, remanufacturing, or recycling.

Chapter 30

The Benefits of Reuse and Recycling

Of all the waste reduction options available, the easiest and most cost effective is to reuse a product (or its components) as many times as possible. *Stewart's Shops* in the northeastern United States, for example, has been using refillable glass soda bottles and plastic milk bottle containers in its over 200 stores for more than 40 years. *Stewart's* milk bottles are reused around 50 times before they're replaced (which saves the company five cents per bottle). The company's soda bottles are reused about 20 times, thereby saving 14 cents per bottle. With sales of more than twelve million bottles annually, these savings add up. One program in particular that *Stewart*'s is involved with sells milk in refillable bottles to a local school. Since the bottles are reused 100 times before being replaced, the school's waste has been reduced by 700,000 milk cartons per year, which dramatically lowered the school's disposal and purchasing costs.

In a similar product reuse story, the *Ashbury Park Press* in Neptune, New Jersey changed its machine-cleaning procedures by switching from disposable rags to reusable cloth rags. Even though the reusable cloth rags must be laundered, the company still enjoys an annual cost savings of $36,400. Further west, in Minnesota, the *Itasca County Road and Bridge Department* replaced the disposable air filters in its garages with reusable filters. The switchover means that a bit of extra labor is needed to clean the reusable filters, but fewer filter purchases and reduced disposal expenses amount to thousands of dollars in savings every year (Source: *Waste Prevention Pays Off*, 1993).

When Extending the Life of a Product, Quality Counts

The ability to extend the life of a product is reliant upon quality – and, as most people are aware, quality usually costs more. The good news is that the extra cost of quality almost always results in the prolonged use of products - and the longer a product is used the less expensive it becomes (as the old adage says,

'if you buy cheap, you buy twice'). Take, for example, the decision made by local authorities in Itasca County, Minnesota. County buyers chose to purchase only one brand of high quality chainsaw instead of a multitude of cheaper chainsaws. The more expensive purchases were approved after county officials factored in the savings from the longer product life of quality chainsaws combined with the ease with which the quality chainsaws could be repaired. Furthermore, when it came time to make repairs, the county saved even more money because parts from the higher quality saws could be used as repair replacements (something that couldn't be done with the cheaper saws). This practice not only helped extend the life of the remaining saws (thereby reducing the number of new saws needed) it also reduced the disposal costs associated with throwing away a used chainsaw.

Product Life Extension

Reusing products and their materials is a win-win situation for all involved. From a customer's standpoint, reusing a product decreases waste, reduces disposal costs, and lowers the expense of purchasing replacements. From a manufacturer's view, if the parts that comprise a product are reused in other applications (see Chapter 31), similar savings can occur. At some point, however, a product or its parts may undergo too much wear and tear and be deemed unsuitable in a reuse application. This does not mean that the product or its parts have reached the end of their useful life. In many cases, they can be broken down into their base materials or components in order to be used again for the same or other applications - a practice referred to as *recycling*.

An Introduction to Recycling

Recycling is a 'closed-loop' process in which used products are collected, cleaned, shredded, melted down, or otherwise reduced to recover their basic materials. What remains is then used as a total or partial replacement to create new products. Virtually anything from building materials to metals to chemicals to paper to plastic to fabrics or food and cloth - and in some cases, unused medicine - can be recycled. Even substances at a molecular level can be tagged with nanotech markers for later reclamation and recycling.

Recycling – which should ideally be considered only *after* a successful waste reduction program is underway - almost always makes financial sense because it recaptures the value of raw materials as well as the energy and manpower that went into converting them into basic product materials (see Chapter 13, FIGURE 13-1). In some cases as much as 70-percent or more of this value can be reclaimed. During this process pollution and energy costs (and other extraneous costs) can be reduced too, as the following examples illustrate:

- Making paper from recycled materials uses 70-percent less energy and produces 73-percent less air pollution compared with making paper from virgin raw materials.
- Recycling a plastic bottle saves enough energy to power a 60-watt light bulb for three hours.
- 25-30 plastic one-liter plastic bottles can be recycled into one fleece jacket.
- A recycled glass bottle saves the amount of energy needed to power a computer for 25 minutes.
- Manufacturing aluminum from scrap requires up to 95-percent less energy than producing it from scratch (and enough aluminum is thrown away every three months in the USA to replace the entire American commercial airline fleet.).
- In Britain, it's been estimated that if all the aluminum beverage cans in the UK were recycled instead of thrown away, the country would need 14 million fewer garbage cans (*The Recycling Guide*, 2007).

In addition, recycling has been shown to visibly demonstrate a strong commitment to environmental values, which can be a powerful way for a company to attract the attention of employees and consumers.

Recycling and Job Growth

Some time ago, I had dinner with an environmentalist who was adamant that recycling wasn't worth the effort. The facts, however, suggest otherwise – particularly when it comes to job creation. According to a *White House Task Force* study, recycling activities prior to 1998 employed more than 2.5 percent of the USA's manufacturing workers – which amounts to one million jobs and more than $100 billion in revenues. Two years after this study was published,

recycling was credited with producing 1.1 million jobs and grossing over $236 billion in revenues. Indirectly, it has been estimated that recycling creates an additional 1.4 million jobs and over $173 billion in receipts (source: US Recycling Economic Information Study). For example, according to the *Institute for Local Self-Reliance*, the United States grew 2.1 percent per year between 1967 and 2000 while the recycling industry enjoyed, on average, an 8.3 percent increase in employment and a 12.7 percent increase in sales per year (ILSR, 2007). This means that for every 10,000 tons of waste that's recycled, around 36 new jobs are created. Compare that to incinerating the same amount of waste, which creates one job.

The Complexities of Recycling

Despite all the good news, recycling is not without its costs and complexities. Some materials cannot be endlessly recycled because they weaken or degrade during the recycling process, which means that part or all of the original value of the material, energy, labor, and other manufacturing inputs that went into making the product is lost or destroyed. Additional labor, energy, and manufacturing capital may therefore be needed to make reparations; otherwise the material may have to eventually be sent to landfill (a process called 'downcycling'). Other materials can be 'upcycled', which allows for an increased use of biomaterials within them that permit continuous, sustainable recycling. Still other materials (such as those used to make carpets), actually *improve* after recycling for reasons that puzzle scientists.

A good way to illustrate the versatility, strength, and weakness of recycling is with plastic. Most plastics can't be converted back into their original state (oil) so they have to be used for other purposes. Some plastics, such as those made from HDPE, can be recycled again and again. Others either aren't recyclable at all or require a percentage of non-recycled material added to them in order to maintain an acceptable level of quality during reclamation. Following are the seven most prevalent types of plastics along with examples as to how they're commonly used before and after recycling:

1. Type one plastics, *polyethylene teraphthalate* (PET or PETE), are clear and tough and resistant to heat. PET plastics are commonly used to make food

and drink containers (indeed, the clarity of PET bottles is generally considered to have greatly added to the explosion of bottled water sales) or products manufactured in injection molds. When recycled, PET plastic shreds are in high demand because they can be endlessly converted into recyclable fibers (also known as *polyester*) for clothing, carpeting, fiberfill, and geo-textiles.

2. Type two plastics are stiff and tough and are made from *high-density polyethylene* (HDPE). Because HDPE plastics have good chemical resistance, they make excellent opaque containers for household and industrial chemicals such as detergents and bleach as well as juice and milk bottles and containers for cosmetics and shampoo. When recycled, HDPE plastics make good landfill liners, fencing material, flower pots, plastic lumber, recycling bins, buckets, motor oil containers, garden edging, dog houses, and benches.
3. Category three plastic (*polyvinyl chloride* or *vinyl*) is commonly referred to as PVC and is used to make food containers, medical tubing, wire and cable insulation, clear packaging (cling film), plastic pipes (for plumbing and construction), gutters, floor tiles, carpet backing, and window frames. When recycled, PVC can be refashioned into traffic cones, flooring, garden hoses, and mobile home skirting.
4. Category four plastics, *low density polyethylenes* (LDPE), due to their ease of processing, their transparency, and their strength, are used to make garbage bags, dry cleaning bags, shopping bags, squeezable bottles, food storage containers, and flexible lids. After recycling, LDPE's are often reconstituted into floor tiles, shipping envelopes, furniture, paneling, and plastic lumber.
5. Type five plastic, *polypropylene* (PP), is resistant to heat, chemicals, grease, and oil and is therefore used to make food containers such as margarine tubs, microwaveable trays, packaging material, medicine bottles, aerosol caps, and drinking straws. Recycled PP can be fashioned into ice scrapers, rakes, sheeting, traffic signal lights, automobile battery cases, brooms, and oil funnels.
6. *Polystyrene* (PS) forms the sixth category of plastic. Polystyrene is quite versatile and can be made into a hard, brittle plastic for compact disc jackets, combs, pens, plastic tableware, aspirin bottles, etc. Polystyrene can also be

injected with air (foamed) and molded into Styrofoam packing, grocery store meat trays, clamshell containers (used in fast food restaurants), and egg cartons. When recycled, polystyrene can be converted into foam packaging, foam plates, thermometer casings, light switch plates, vents, and desk trays.

7. The seventh category of plastic includes plastics that do not fall into the previous six categories. One example is *malamine*, a plastic used to make plastic cups and plates. Category seven plastics are often mixed with resins and used in multi-layer configurations. Applications include large reusable water bottles, citrus juice bottles, food containers, and *Tupperware*. When recycled, seventh category plastics can be used to make plastic lumber and plastic bottles.

From these examples it's obvious to see that the closed-loop attributes of plastic make it economical for producers and consumers alike. A hospital in Poland, for example, regularly purchased 36,000 polyethylene bottles every year for infusion liquids. After use, the discarded bottles represented an additional expense because they had to be picked-up, transported, and disposed at a landfill site. Fortunately, the *Clean Business Network*, a regional organization dedicated to waste minimization, helped the hospital find a plastics recycling company that collects bottles and distributes them as a raw material for other business. The hospital now receives a small monthly payment for its plastic bottles rather than a disposal bill.

Even Industrial Waste Can Be Recycled

Almost any substance, no matter how toxic or filthy, can be recycled. This is particularly true for hazardous substances like industrial waste that would otherwise require expensive, specialized disposal methods. Most industrial waste contains potent properties, which means it can probably be used in similar (or other) applications that require a large amount of material strength. Foundry sand used in metal casting, for example, can be recycled into sub-base filling for road construction, road embankments, and structural fill. Coal waste (ash, boiler slag, fly ash, flue deposits, and desulferized material) can improve the strength and durability of concrete and manufactured wallboard. Material from construction and demolition sites (including shingles, scrap wood, and drywall) can be

recycled into asphalt paving, re-milled lumber, wallboard, and concrete (source: EPA 530-F-07-008). Even paint and old tires can be made into high quality caulks and flooring.

The point is that almost any waste product can be recycled and put to good use if one keeps in mind that materials need not be limited to similar applications. In India, for example, discarded plastic bottles and bags are being shredded, melted, and added to roadway asphalt to improve the integrity, water resistance, and durability of paved roads. Apparently, roads embedded with melted plastic last three times longer than conventional roads.

If Recycling has So Many Advantages, Why do Businesses Ignore It?

In an earlier chapter it was revealed that a typical aluminum can manufactured for the UK soft drink market takes 319 days to produce and leaves behind a huge amount of waste and pollution. Meanwhile, the world has more scrap aluminum than it knows what to do with, making aluminum from scrap uses up to 95-percent less energy (and produces significantly less pollutants) than making it from scratch, and unemployment is a real problem. 'So let me get this straight,' a student of mine once remarked, 'reusing or recycling the products and materials we throw away can (he held up a finger to emphasize each point): (1) drastically cut a company's energy needs, (2) lower raw material costs, (3) reduce climate-change problems, (4) employ more people and, (5) lower production costs up to 70-percent or more, and yet most of the world's businesses don't recycle?'

This wry observation helps explain why pressure is mounting to increase recycling legislation. Economists claim that if the possibilities of cutting costs and increasing profits exist with recycling, companies operating in a free market will eventually find these savings whether or not government intervenes. Yet for countries stricken with rising unemployment and rising waste and pollution levels, the question many people are increasingly asking is 'when?'

Is Everything Recyclable?

Unfortunately, no. Some substances used in the medical and livestock industries, for example, are unsuitable for recycling (indeed, a number of scientists believe that the mad cow disease outbreaks in the UK began when infected sheep carcasses were ground up and recycled as cattle feed). Clearly, there is no substitute for preliminary research, common sense, and basic safety that errs on the side of caution when it comes to recycling.

What If There isn't a Recycling Center Near My Business?

Consider the old story about a shoe company that sent two salespeople into the heart of Africa in the early 1900's to explore the possibilities of opening up a new market. After several weeks, the first representative wired back: 'Situation hopeless. No one here wears shoes'. The following day, the second representative wired: 'Fantastic Opportunity. No one here wears shoes'. The moral of the story is that if you live in an area where there's no recycling center (or if only limited facilities are available), perhaps a business opportunity exists. Apart from that, try looking further a field (see also, Chapter 33).

For More Information

For additional facts about recycling and its financial benefits, read the book *WASTEnomics: Turning Waste Liabilities into Assets* by Ken Tang and Jacob Yeoh and contact your local waste disposal company or public works department for the names of nearby recycling centers. Also visit: www.euwid.de and click on the appropriate language translation icon. '*Euwid*' is a German-based organization that publishes newsletters and trade journals in German, English, and French. Many waste specialists keep abreast of the latest recycling developments using information posted on this site.
Alternatively, visit the *Recycled Products Purchasing Cooperative* website at: www.recycledproducts.org or try: www.nfib.com/object/IO_28768.html (a US recycling site for small businesses). In the UK, go to: www.defra.gov.uk/environmental/waste/business/regulation/index.htm.

Chapter 31
Remanufacturing

In many ways, remanufacturing combines the best of reuse and recycling. To the uninitiated, remanufacturing is a three-step process where: (1) a used product is disassembled, (2) its parts are cleaned and repaired, and, (3) the parts are reassembled to a sound working condition. The term 'sound working condition' is key because in some areas of the world, reassembled products made from used parts are considered new and come with the same guarantees and warranties as products made from virgin raw materials. Conversely, in other regions, remanufactured (or *refurbished*) products must be labeled as such by law even if they carry the same warranties.

A Case Study

In 1972, *Caterpillar Inc*, a manufacturer of heavy earth-moving and construction equipment, was chosen by the *Ford Motor Company* to supply diesel engines for a new *Ford* delivery van. *Ford*'s decision surprised a number of people. At the time, the *Cummins Diesel Company* was expected to win the *Ford* contract because it dominated the diesel engine business partially by keeping its costs down through the remanufacturing of used engines. *Caterpillar* knew that to remain competitive and retain its relationship with *Ford*, it too had would have to keep its costs down and increase its knowledge base – perhaps in the same way *Cummins* did. So after careful analysis *Caterpillar* decided to open up a remanufacturing plant in Bettendorf, Iowa, close to its Peoria headquarters. The idea was to test the waters of this new venture and see where remanufacturing would lead.

Ten years later, convinced that it was moving in the right direction, *Caterpillar* relocated its growing remanufacturing activities to Corinth, Mississippi and set-up shop in an abandoned factory building. Land was cheaper in this part of the country and the location was more central to the majority of

Caterpillar's customers as well as a proliferation of road networks. Three years passed before a second *Caterpillar* remanufacturing operation was opened up across town (Stahel, 1995). Success met with success and soon thereafter the company began operating a third facility in nearby Prentiss, Mississippi. Today, *Caterpillar*'s Sawyer plant in Corinth receives worn engines and assemblies from all over the country - mostly from dealers who send the company around 160 tons of used equipment (about 17 truckloads) every day. The items *Caterpillar* finds suitable for remanufacturing include engines, fuel pumps, injectors, oil coolers, cylinder packs, and hydraulic assemblies - each of which must be exhaustively taken apart by hand. On average it takes two workers a half-day of hard work to reduce one engine to its components. Every piece, including the tiniest screw, is saved because employees have been taught that anything placed in the trash is money thrown away (Business Week, 2006). The numerous pieces are then cleaned.

Almost every part that *Caterpillar* tries to salvage is embedded with grease, oil, carbon build-up, paint, or rust. A mixture of baking soda with ten-percent alumina grit is needed to remove these contaminants. Afterwards, the scrubbed parts are sent away for inspection and sorting and the waste used to clean the parts is collected and used as a reagent in the neutralization of acidic liquid waste – a process that renders both liquids non-hazardous and has reduced the company's annual liquid waste from nine million pounds (over 4 million kilos) to 4.5 million pounds (just over 2 million kilos) (Assembly Mag, 2003). Of course, not everything is recoverable. The parts and materials that aren't suitable for remanufacturing are passed on to the company's foundry in Mapleton, Illinois, where they're melted down and recast. In 1999, *Caterpillar*'s foundry recycled 235,526 pounds (106,835 kilos) of aluminum alloy; 16,865,767 pounds (7,650,312 kilos) of cast iron; and 5,680,509 pounds (2,576,679 kilos) of steel.

It hasn't all been smooth sailing. One of the difficulties inherent in remanufacturing is maintaining a steady stream of used equipment. Without prior preparation it's quite possible to receive several truckloads of used products one week and then nothing for several weeks afterwards. *Caterpillar* eliminates this problem by offering its customers incentives that make them unwitting suppliers in the remanufacturing process. For example, when a customer needs a new part or a new piece of equipment, he or she is first asked to submit the old one. When

an old part is handed in the customer is rewarded with a new part at up to half its full price. If the customer does not hand in the old part, the full price is charged.

Additional lessons have also been learned. By designing and producing higher quality parts in advance, *Caterpillar* has discovered that it can get two or three lives out of its products. Manufacturing a component with another one-sixteenth inch layer of metal on it may cost more to create, but the company knows that this investment will ultimately yield more profits because the improved product can be remanufactured. For example, *Caterpillar* estimates that it can remanufacture a good engine three times before it simply can't be used again – a practice, which produces such substantial profit margins that more than $1 billion worth of sales were reported in 2005 at *Caterpillar*'s Corinth operation alone (Business Week, 2006). Since its inception, this number has grown at least 15-percent annually.

Further savings are derived at *Caterpillar* from the company's commitment to reuse and recycle common work materials to add to its remanufacturing processes. For example, the wood pallets on which most equipment arrives are regularly inspected, repaired, and reused. When they can no longer be fixed they're sold to a packaging company as boiler fuel. Similar waste reduction systems are in place to reduce office paper, aluminum cans, computer equipment, and cardboard packaging. Today, 96-percent of the waste stream at *Caterpillar*'s Corinth plant is either reused or recycled – making the program so successful that it's sparked off similar programs in local schools, government offices, and 15 nearby industries (All Business, 2000).

Remanufacturing: The Basics

For all the dirty work involved, the costs of revitalizing a previously manufactured product are often 60-percent to 70-percent less than creating the product from scratch. This is because remanufacturing conserves the original energy, materials, labor, and manufacturing effort that exist in every product.

Generally speaking, in most manufacturing processes 70-percent of the cost of producing a product from scratch is needed for materials and 30-percent pays for labor. Remanufacturing tries to recover the 70-percent of material costs invested in the original product. By recapturing pre-existing value,

remanufactured products cost about half as much to make as new products made from scratch.

How much energy and materials can be exhumed from a remanufactured product? According to studies undertaken at the *Fraunhofer Institute* in Stuttgart, Germany, the energy savings derived from remanufacturing worldwide equal the electricity generated by five nuclear plants or 10,744,000 barrels of crude oil carried by a fleet of 233 oil tankers. In addition, the amount of raw materials saved would fill 155,000 railroad cars and form a train 1,100 miles (1,770 kilometers) long. By avoiding these expenses, remanufacturing allows companies the choice of offering lower cost product ranges to customers while enticing new buyers into markets where the price of introducing new products is seen as prohibitively high (Lund & Hauser, 2003). Refurbished (i.e.: remanufactured) computers, for example, particularly laptops and PC's, are renowned for offering exceptional value-for-money.

The Economic Advantages of Remanufacturing

Over 70,000 firms in the United States, most of which employ 20 people or less, are involved in remanufacturing. Because these firms are virtually unknown, remanufacturing is often called the 'invisible industry'. Together, these businesses accumulate over $50 billion in annual sales and directly employ over half-a-million workers. If all the people *indirectly* employed by remanufacturing were added to the latter figure (e.g.: suppliers, distributors, retailers, installers, service providers, etc…) it has been estimated that the total number of people involved would be in the millions. Evidence has shown that most remanufacturing firms also do well during times of recession and that no end to the industry's growth is in sight. According to researchers Robert Lund and William Hauser, the total financial value of products that could be remanufactured is around $1.4 trillion. With only $50 billion worth of goods currently being remanufactured, this suggests that the potential of the remanufacturing industry has yet to be fully tapped.

Despite the positive outlook, however, the remanufacturing is virtually ignored by most businesspeople, which is why Ron Giuntini, Executive Director of the *Remanufacturing Institute* says that 'remanufacturing is the stealth business

model'. Those who study the remanufacturing industry say this invisibility is due to the wide dispersion of remanufacturers, the diversity of products they breathe new life into, and the small size of the majority of players. With the profit margins of remanufactured goods as high as 40-percent, however, one can only wonder why more businesses aren't taking advantage of this practice.

The Challenges Involved with Remanufacturing

As with any product process, remanufacturing is not a panacea nor is it suitable for every product, market, or business operation. Traditionally, it has proven difficult to remanufacture the following:

- Products that regularly undergo rapid technological changes.
- Products that take advantage of current or fleeting trends ('Industrial design is a field that was specifically invented to convince people that the washing machine, the car, or the refrigerator they had was out of fashion,' says efficiency pioneer Walter Stahel, 'and fashion is something that can't be remanufactured.')
- Products specifically designed to thwart attempts to disassemble and rebuild them (an act of protectionism to prevent firms from remanufacturing another business's products).
- Products that are sold at such a low cost that it's cheaper to buy a new version.
- Markets where consumers consider the term 'remanufactured' or 'refurbished' to be synonymous with low quality.

Getting Started in the Remanufacturing Business

Despite the gains that can be obtained from remanufacturing, the commitment to establish a remanufacturing setup should not be taken lightly. First and foremost a study should be taken of the market potential for the proposed remanufactured product and the company involved should be certain that it will not be competing against itself and its other products. A sound marketing plan must also be established to inform new and current customers that remanufactured products are just as durable as new products made from virgin

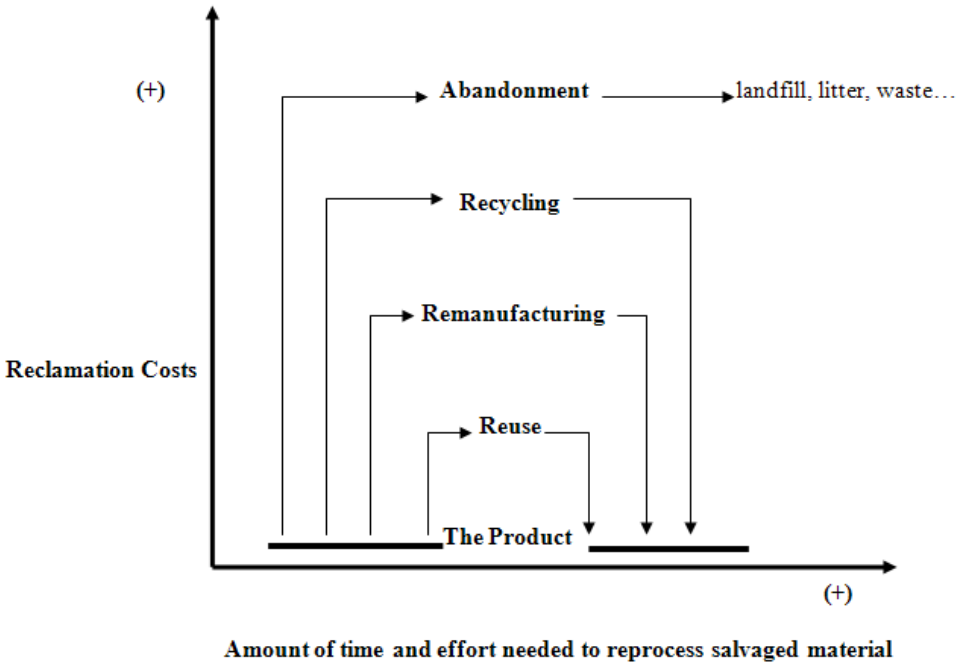
raw materials. Additionally, employees will need to be educated and trained so they firmly believe that what many of them used to call garbage is seen as 'assets in transition'. Equally as important is that the company must have the means to locate, recover, and transport its used products and have the resources and ability to disassemble, clean, sort, and inspect them for remanufacturing (a.k.a.: reverse logistics). For this reason many companies partaking in remanufacturing practices find it advantageous to have their disassembly-process employees communicate openly and often with their product designers. This allows for a wealth of information to be accumulated as to how long-life improvements can be made in original products. In addition, tools and equipment may have to be purchased or developed to quality-test remanufactured parts before they're used again. Lastly, a plan for properly disposing unusable parts (as well as any chemical agents or materials used in the remanufacturing process) must also be developed and implemented (Ferrer & Whybark, 2000).

Reuse, Recycling, and Remanufacturing: An Overview

All consumer products begin their lifecycles with a dependence on the natural environment. Equally as true is that converting natural materials into basic manufacturing materials takes time, effort, and money. The next stage, turning basic materials into finished products adds even more costs to the mix. Ensuring that materials, labor, and other investments are fed back into a manufacturing system for re-creation or supplementation is a proven way to save energy, labor, and material investments in both stages.

FIGURE 31-1 illustrates the costs and time involved in reuse, recycling, and remanufacturing. The further away from the original product the reclamation process lies, the more the manufacturer's investment in raw materials and other inputs is lost and the greater the costs are to the manufacturer. Similarly, the wider the base of each 'closed loop' practice, the more time, effort and expense is involved in collecting and reprocessing reclaimed material:

FIGURE 31-1



(The left side of 'the **Product**' represents the point when a product leaves its manufacturer. The right side represents its re-introduction into a closed-loop manufacturing system.)

Chapter 32
Finding the Right Manufacturers and Suppliers

Like it or not, if the supplier a business is buying from isn't efficient then neither is the business that's doing the buying. In other words, when purchasing raw materials or components 'a business is what it eats'. Put another way, any business that relies upon outside product components, made-to-order packaging materials, or ready-for-sale merchandise must ensure that whatever it's being provided with is being produced (and delivered) efficiently – anything less and the organization is paying for waste. It's therefore essential to find a supplier that's willing to work *with* its customers to identify and reduce waste and costs. For example, *Arcata Graphics*, a book printing company in Baltimore, Maryland asked its suppliers to use shipping pallets of a specific size and construction so that the company could reuse them for book deliveries. The suppliers agreed and *Arcata* now saves $200,000 a year on new pallet costs (*Waste Prevention Pays Off*, 1993).

Since finding an efficient supplier is often a lengthy and arduous task, many experienced professionals suggest being careful and methodical. Rushing a search almost always leads to future headaches. In Poland, for example, a biscuit production company discovered that the poor quality of flour it received from its suppliers resulted in up to 38-percent of the flour being wasted during processing. By locating a supplier that delivered ethically-sourced higher quality flour, the company was able to trim its overall waste by 40-percent, which amounted to savings of approximately $25,000 per year.

Locating Efficient Suppliers, Manufacturers, and Distributors

The following suggestions were submitted by a number of business owners surveyed for *The Entrepreneur's Guide to Building a Successful Business*

(Scott, 2008). Keep them in mind when tracking down reputable manufacturers to ensure that waste is eliminated:

1. Before beginning a search, write down and define *exactly* what you need. If your product, its components, and/or its packaging are unique, ask for them to be made as close in size and shape to your production requirements as possible. This will save money. For example, aircraft manufacturer *Pratt & Whitney* asked its suppliers to cast the metal it wanted in the shape of an engine blade (rather than a block of metal that had to be whittled down into an engine blade) and saved 90-percent of its metal costs. Similarly, a paper packaging company in the USA asked its supplier to mold its materials into a specific shape before they were shipped, thereby eliminating the costs of later cutting and shaping.
2. Determine the minimum standard production run for the products or components you need. Most manufacturers only produce large quantities of whatever it is they make so it's quite possible to end up with 500 of one component from one supplier and 1,000 of another from another. Prepare for this discrepancy.
3. Learn the six-digit NAICS code (**N**orth **A**merican **I**ndustrial **C**lassification **S**ystem) of the product you need. Every product and service category in Canada, Mexico, and the USA has an NAICS number assigned to it (the European version of this system is called the *Classification of Products by Activity* or CPA). Finding this number at www.census.gov/naics will help locate suppliers, manufacturers, and retailers. Names and contact details of suppliers are also classified under directories published by *Standard and Poors*, *Dun & Bradstreet*, and other reference sources.
4. Begin your search. The most reputable business names usually come from referrals, but if a referral is not forthcoming check out the following websites, which are dedicated to finding and evaluating efficient suppliers:
    - www.eco-friendly.com (also known as 'the Green Pages')
    - www.thegreenguide.com (published by *National Geographic*)
    - www.eco-labels.com (published by the *Consumers Union*)
    - www.climatecounts.org (evaluates companies that claim to be green)
    - www.ecomall.com (a huge site with links to just about everything that's green)

- www.greenhome.com (an online retail outlet with a rigorous product approval policy that showcases green consumer products)
- www.environmentalhome.com (a source for green building materials)
- www.ecoworld.com (a resource site that showcases earth-friendly products and clean technology practices)

5. Start asking questions. If a manufacturer or supplier won't answer your questions then you're speaking with the wrong one. Questions that need to be answered include:
    - Are you licensed?
    - Do your materials and work practices meet state and federal requirements?
    - Are the materials you work with fire resistant, non-toxic, eco-friendly, etc?
    - Do you have a sustainability or waste reduction program? If so, how is it measured and enforced - and who is accountable for it?
    - What efforts have you made to reduce waste and become more efficient and sustainable?
    - Do you guarantee your work?
    - How willing are you to understand and meet our sustainability and waste reduction specifications?
    - Will you supply me with credit references?
    - Can you produce a prototype or sample? If not, why not?
    - Can my order be made in an environmentally-friendly manner?
    - How much must I order and how much will it cost? (note: if the manufacturer has to outsource an order, consider contacting the outsourcer directly. Most manufacturers charge a handling fee for work that is contracted out.)
    - What are your payment terms?
    - While you manufacture my order will you charge for storage?
    - Do you work with a reliable shipper? Do they provide any discounts?
    - How can my production costs be lowered? (Many manufacturers will recommend different assembly procedures, alternative materials, or a whole host of cheaper options if asked.)

- How long will the order take to manufacture?
- How long will it take to ship the order?
- Will the order be insured?

6. Manufacturers, suppliers, and distributors often use technical terms and industry specifications that are unfamiliar to the layperson. Don't be intimidated. Learn the lingo as you go.
7. Don't be swayed by friendly salespeople or the fact that a supplier or distributor is conveniently located in your vicinity. Although ordering from local companies can reduce shipping costs (and pollutants), efficient habits, professionalism, reputation, and good service may be more important than proximity. If possible, visit a prospective supplier candidate and speak to him or her in person. Ask for a tour of the supplier's operation and learn how the company performs. A lot will be learned this way and the interest you show *will* be seen as flattering.
8. Write down all the names of the best companies you find in preferential order. Check their credit references via the *Better Business Bureau* (in the USA), the *Better Payment Practice Group* (in the UK), *Dun & Bradstreet* (in the USA) or a local bank to ensure that they're not in financial trouble. If references are unobtainable, be wary.
9. Contact preferred candidates and start negotiating for lower prices, better delivery times, and better conditions. If you don't ask for these specifics, you'll never get them.
10. Once an agreement has been reached, get everything in writing.

Ignorance is No Excuse

Chapter 21 (which introduced 'greenwashing') relayed the example of a marketing company that sent researchers into six national retail businesses to gather data from 'green' products and discovered that of the 1,018 that were examined only one turned out to be truly green. Ironically, ten years earlier, the American *Federal Trade Commission* issued two reports designed to help consumers navigate through a minefield of misleading green claims. Recommendations in these reports stated that:

- all environmental claims should be substantive,

- all environmental claims should be supported by competent and reliable scientific evidence,
- all environmental claims should be specific in nature; not general, vague, incomplete or overly broad, and,
- environmental claims relating to the disposability or potential recovery of a recyclable product should be made in a way that clearly shows where a recycling service is available.

For the most part, what the FTC is saying is that if there's no proof to back up a claim (usually in the form of a green certification awarded by an outside authority), don't believe it.

Keeping Honest and Reliable Manufacturers and Suppliers

Once an honest and reliable manufacturer or supplier has been found, move heaven and earth to cultivate and maintain a good relationship with him or her. The last thing you need is for your search to start all over again. A good relationship with a supplier can also keep your business updated with the latest trends, services, and ideas – and that can translate into savings. Following are a few suggestions for creating (and reaping) a long-lasting relationship with a reputable supplier or manufacture:

- Pay on time. Paying on time builds goodwill and often allows for enhanced credit lines (which may come in handy in the future).
- Ask for advice, suggestions, and opinions. Most knowledgeable manufacturers and suppliers (and distributors) have a lot of good ideas and are only too pleased to share them. Use this information to your advantage.
- Be generous with deadlines and avoid unreasonable demands.
- Show loyalty. If a competing supplier offers a lower price or a greener option, allow your current supplier the chance to make the same deal before switching to the alternative.
- If problems are encountered with an order, report them immediately in a calm and rational manner. Don't brush aside small discrepancies. Little problems can fester and grow into bruising conflicts.

- In short, act with your suppliers the same way you would like your customers to treat you.

Additional Advice from Business Owners

- Keep an eye out for small businesses in your search for suppliers. Because of their size, small businesses often react faster and provide more personalized service than large companies.
- Meet with your suppliers and share your knowledge and desire to be more efficient and less wasteful.
- Don't let low prices be your only concern. Every supplier and distributor is entitled to a profit and overall quality, consistency, and reliability are usually more important than the saving of a few pennies.
- Take the time to sit down, speak with, and listen to, salespeople. Not all salespeople are bad and they just might be able to help you with what you're looking for.
- Communicate with the people you do business with. Once you've found good contacts, regularly remind them of how much you enjoy their business by providing them with feedback. Only then can you expect the same in return.
- Never stop looking for new manufacturers, new companies on the scene, new innovators, new ideas, and new directions to go.
- If an efficient, eco-friendly supplier or manufacturer can't be found, consider the void as an opportunity to produce whatever it is you're searching for.

Bibliography

All Business, 'Green Can Mean Different Things', www.allbusiness.com, (Mississippi Business Journal), April 17, 2000.

Assembly Mag, 'Caterpillar Earns Green by Being Green', www.assemblymag.com, March 1, 2003.

Beitz, W., 'Designing for Ease of Recycling', *Journal of Engineering Design*, Vol. 4, No 1, 1993, pp. 11-23.

Business Week, 'Everything Old is New Again', www.businessweek.com, September 25, 2006.

EPA 530-F-07-088, 'Industrial Materials Recycling: Managing Resources for Tomorrow', RCC Fact Sheet, Jan. 2007.

Ferrer, Geraldo & Whybark, D. Clay, 'From Garbage to Goods: Successful Remanufacturing Systems and Skills', *Business Horizons*, November 2000.

Fielding, Zoe, 'Manufacturers Accountable for Product Waste,' *Manufacturers' Monthly*, April 6 2004.

Fussman, Carl, 'Going and Going – Without any Oil', *Discover* magazine, Vol. 27, No. 2, February 2006.

GSK (GlaxoSmithKline), 'Eliminating Waste from Our Chemical Production Processes' (case study analyzed and written in 2003), www.gsk.com, information accessed November 2007

Hawken, Paul, & Lovins, Amory & Lovins, Hunter, *Natural Capital*, Little, Brown and Company, Boston, 1999.

ILSR (the Institute for Local Self-Reliance), 'Waste to Wealth – Recycling Means Business', www.ilsr.org/recycling/recyclingmeansbusiness.html, accessed June 2007.

Lean Enterprise Institute, www.lean.org

Liedtke, C, 'The Material Intensity of Paper and Board Production in Western Europe', *Fresenius Environmental Bulletin*, August 1993.

Lund, Robert & William Hauser, 'The Remanufacturing Industry: Anatomy of a Giant', Department of Manufacturing Engineering, Boston University, 2003.

Mieszkowski, Katherine, 'Plastic Bags are Killing Us', *Salon.com*, www.salon.com, August 10 2007.

O'Connor, Amy, 'Undoing the Damage: William McDonough has Designs on the World', *Vegetarian Times*, Oct. 1996.

Paster, Pablo, 'What's So Bad About Bottled Water, Anyway?', *Salon.com*, www.salon.com, Jan 14, 2008.

Puder, F., *The German Packaging Decree, Multi-Trip System Decree, and the Consequences of the EC Packaging Directive*, (submitted to the Milieudefensie Sustainable Packaging Conference), Dept. of Waste Economics, Umweltbundesamt, Berlin, 1992.

Recycling Guide, www.recycling-guide.org

Resource Cities, 'Did You Know? Waste Production is Increasing', http://resourcecities.acrplus.org/waste_resources/waste_did.htm, (accessed August 2007).

Remanufacturing Institute, www.reman.org

Schmidt-Bleek, Frederick, Der Okologische Rucksack, *Hirzel Verlag*, 2004.

Scott, Jonathan T., *The Entrepreneur's Guide to Building a Successful Business*, Management Education Services (Panama Coty, Florida), 2008.

Smith, Mark & Roy, Robin & Potter, Stephen, 'The Commercial Impacts of Green Product Development', The Open University Design Innovation Group, DIG – 05, July 1996.

Stahel, Walter, The Product Life Institute, www.product-life.org (Caterpillar Case Study, 1995).

TerraChoice, 'The Six Sins of Greenwashing: A Study of Environmental Claims in North American Consumer Markets', TerraChoice Marketing Inc., www.terrachoice.com/files/6_sins.pdf, November, 2007.

Venter, Craig, 'A DNA-Driven World', The Richard Dimbleby Lecture, December 2007.

'Waste Prevention Pays Off: Companies Cut Waste in the Workplace', EPA/530-K-920-005, November 1993.

World Challenge, 'Fireproof Juice', www.theworldchallenge.co.uk/fireproof.php, 2006.

PRODUCTION

Production constitutes the mechanical, biological, or chemical processes used to transform materials or information into products or services. Offices, factories, farms, and restaurants all rely upon equipment and machinery in one form or another to turn resources into goods and services and since many of these tools (and their processes) can waste as much (or more) than they produce, they present a prime target for efficiency. (End-of-production factors such as transport and shipping are also included in this section.)

Chapter 33

Choosing an Efficient Production Location

Of the many ways to reduce the costs of operating a production facility, perhaps the most basic is to choose a good location. Most industrial parks are located outside city boundaries to take advantage of major transportation routes and keep pollutants, trucks, and traffic away from city inhabitants. Under the right circumstances, however, a good location can also lower production costs by using industrial waste streams as revenue streams.

The term 'industrial ecology' was coined in 1989 by Robert Frosch and Nicolas Gallopoulus to describe the growing practice of bringing manufacturing and service facilities together in a symbiotic manner. Industrial ecology involves arranging businesses in a select way so that their wastewater, emissions, wastes, and other outputs can be used as raw materials by other businesses. The advantages can include a reduction in raw material costs, low waste disposal expenses, and reduced energy requirements. For example, in a process called 'energy cascading', excess energy from one company (usually in the form of residual heat or steam) can provide heating, cooling, or system pressure for another. Additional benefits associated with eco-industrial setups include a reduction in pollutants, a decrease in company regulatory burdens, and lower demands on municipal infrastructures. Nearby cities and towns benefit too, thanks to enhanced business and job development, increased tax revenues, and reduced environmental concerns and health costs. The city of Londonderry, New Hampshire, for example, became interested in eco-industrial parks after spending ten years and $13 million of taxpayer money cleaning up three toxic waste sites.

Building a Closed-Loop Eco-Industrial Park

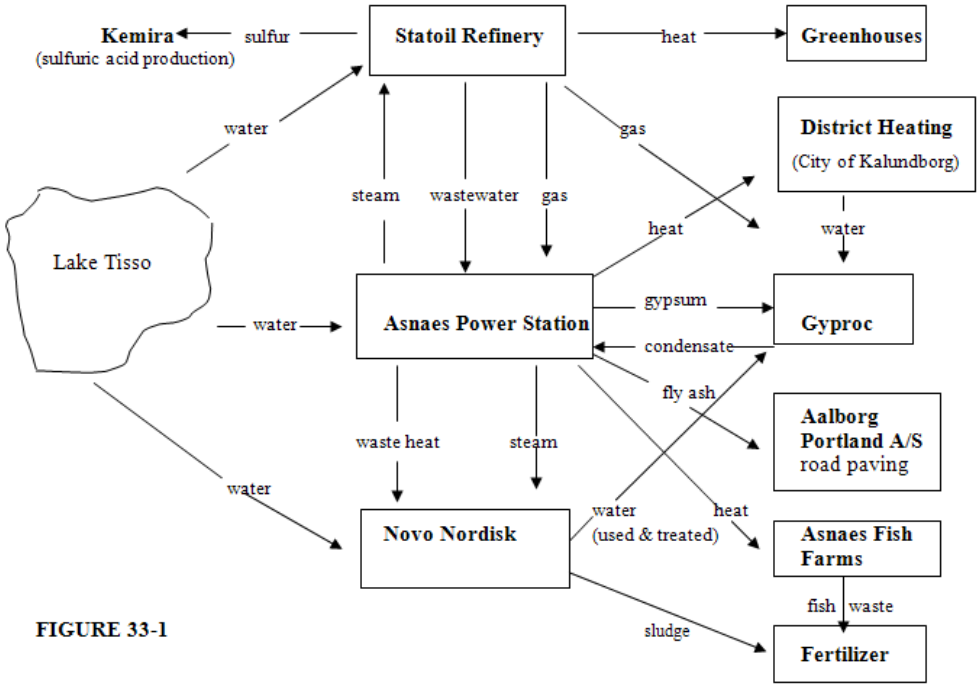
Most eco-industrial park projects start by estimating the material, water, and energy needs of interested businesses. A network flow strategy is then devised to examine synergistic links between existing or interested companies (see Figure 33-1). Afterwards, active recruiting takes place to entice businesses whose production processes will help fill any gaps. According to industrial ecology planners, the most common characteristics of a successful eco-industrial park include:

1. Establishing material, water, and energy flows that can be used as raw materials to build sustainable or semi-sustainable closed-loop systems (material flows can include heat, steam, fly ash, sulfur, sludge, gypsum, steam, paper and plastic packaging, metal scrap, wood pallets, machine oil, and so on).
2. Placing companies in close proximity to minimize transportation and material transfer costs.
3. Establishing strong informal ties between plant managers and promoting free exchanges of information (which helps participating companies work toward a more collaborative work environment).
4. Helping with the minor retrofitting of existing infrastructure (carrying out modifications to the involved companies so their outputs can be more easily shared).
5. Maintaining 'anchor tenants' (usually in the form of a wastewater treatment facility or an energy producer) whose continued presence and outputs make industrial symbiosis practical (Hollander & Lowitt, 2000).

How Successful are Eco-Industrial Parks?

A study of eco-industrial parks in Denmark (Kalundborg), Texas (Brownsville and Pasadena), New Hampshire (Londonderry), and Mexico (Matamaros), revealed that the annual economic benefit enjoyed by participating companies in an industrial ecology arrangement is as high as $8 million, with an annual return on investment reaching 59-percent. In addition, reductions in millions of pounds worth of materials, waste, and emissions were also identified as well as significant decreases in the need for natural resources such as water

(Hollander & Lowitt, 2000). The longevity of the Harjavalta industrial area in Finland, however, best demonstrates the amount of success an eco-industrial park can enjoy. After World War II, Finland suffered from severe energy shortages



Exchange of waste products at the Kalundborg Eco-Industrial Park (Denmark) (Adapted from: Debert Eco-Industrial Park, 2005)

that forced Finish copper company *Outokumpu* to resort to 'autogenous smelting' (or 'flash' smelting) in which the heat produced by oxidizing metal is used to maintain smelting processes. *Outokumpu*'s flash smelter, which was the world's first, started operations in Harjavalta in 1949. Over the years, the Harjavalta site has expanded to include over a dozen major firms that rely on each other to compliment various production processes. Sulfur, sulfuric acid, slag, heavy metals, and wastewater are just a few of the waste outputs used as resources. Today, almost 60 years after it began, the Harjavalta site employs over 1,000 people and incorporates the services of more than 100 subcontractors on a regular basis (Jyrki & Tuomo, 2004). Eco-industrial parks, it seems, have staying power.

Another Example of Waste Exchange: Auctioning Waste

Exchanging waste with other businesses isn't the only way an organization can profit from industrial outputs. Used product exchange programs in the form of auctions can also lower costs, reduce waste, and increase profits. The *Bath Iron Works* company in Bath, Maine, for example, holds quarterly sealed bid auctions as well as annual auctions conducted by an auctioneer. The items the company puts under the hammer are no longer needed by the business, but they still have plenty of use left in them. Machinery, nuts and bolts, tools, factory equipment, and material recovered from old buildings are typical examples of items that would have been destined for landfill, but instead earn the company upwards of $98,000 in one afternoon of bidding.

The moral of the story is that with a bit of forethought and planning, waste does not have to be seen as a problem, but can be used instead as a valuable asset in a fully integrative 'clean production' system...

Chapter 34
Clean Production

To scientists, the word 'production' is a misnomer. In scientific terms there is no phenomenon called production, only transformation (Hawken, et al, 1999). *Banskia Food Products Pty Ltd*, a multi-million dollar company in the Sydney, Australia suburb of Moorebank, is a case in point. *Banskia*'s 30 employees process and package apples for the baking and catering industry. Not long ago, at the beginning of each production cycle, the company used to use a substantial amount of fresh water for washing the company's main raw material (apples). Afterward, the floors of the production areas became littered with apple cores and peelings that were then washed into drains using the excess juice derived from apple parts blanched in heated tanks. Recognizing that a sizeable amount of money was literally being washed away due to wastage and other inefficiencies, the company asked an independent environmental management team to come in and investigate its efficiency options. As *Banskia* saw it, it was time to transform waste into profits.

A thorough investigation revealed that a significant portion of the company's raw materials was indeed being wasted at every stage of operation due to a poorly designed plant layout, the inability of certain production stages to cope with the smooth flow of production, and inefficient conveyors and dicing machines. In addition, far too much juice, rich in sugar and fine apple particles, was being flushed away. Steps were subsequently taken to collect and concentrate the excess juice, together with waste peelings and cores, for use as a sugar supplement in sauces and jams. Annual returns from this practice alone amounted to between $6,000 and $10,000. Next, a new conveyer and a more efficient dicer were obtained that reduced product loss (and cleaning requirements) and helped to generate a three-percent increase in product yield. Further measures the company adopted included collecting and bailing cardboard and other waste packaging for recycling (a practice that eliminated between $3,000 to $4,000 in rubbish disposal costs) and the conversion of recovered apple peels into powder for use in baking, confectionery, and as a pectin replacement

(this project was the result of a waste stream analysis done in conjunction with the *University of Western Sydney*). *Banskia* has since used the knowledge and impetus gained from its efficiency successes to further clean up its production processes by identifying additional profit-making and cost-cutting practices including: lagging steam pipes to save energy, seeking better electricity and gas rates, and utilizing cleaner, more efficient, labeling and purchasing processes (EMIAA, 1998).

Clean Production Defined

'Clean Production' or 'Cleaner Production' is often defined as an integrated preventive strategy used in the production of products and services to increase efficiency and reduce risks to humans and the environment. According to the *United Nations Environmental Protection* division, clean production is neither a legal nor a scientific definition to be dissected, analyzed, or subjected to theoretical disputes. Rather, it is a broad term that encompasses what many different people, countries, and organizations refer to as 'eco-efficiency', 'waste minimization', 'pollution prevention', or 'green productivity' (UNEP, 2007).

In many countries, at organizations both large and small, clean production methods encouraged by national environmental agencies, regional conservation groups, and university departments are reducing business operating costs, improving profitability, increasing worker safety, and reducing negative environmental impacts. Far from being expensive, most companies are surprised at the cost reductions achievable through the adoption of clean production techniques and the minimal capital expenditure required to obtain worthwhile gains. Fast capital payback periods are also common. Furthermore, by utilizing clean production methods, waste handling charges are being cut, raw material use is being lowered, and business insurance premiums are being slashed (Smallbiz, 2007). For example, the *Cleaner Production Challenge* (CPC) conservation program, a voluntary resource program that helps the metal finishing and printed circuit board manufacturing industries in the American state of Washington, has helped 40 businesses reduce wastewater by 67-percent and sludge by 40-percent. In the process, *CPC* has helped its clients gain more control over their production, produce less waste, and greatly improve compliance with local environmental

laws. A key to the success of the program has been the willingness of industry leaders to share their techniques with other agencies and companies (WSDE, 2007). Good news, it seems, is contagious.

Putting Together a Clean Production Line

For the most part, cleaner production starts with lean production systems (see Chapter 12). *Chaku-Chaku* (Japanese for *Load-Load*), for example, is a single-piece production system designed to eliminate waste, improve product quality, reduce production setup times, lower inventory costs, and reduce floor space requirements. Central to its success is the creation of a *dedicated* production line consisting of *dedicated* machines or tools that perform only one or two steps in the sequence of making a part or product. As Peter Zelinski, editor of *Modern Machine Shop Magazine* points out, usually there are only two ways to produce a machine part or product. The first is to purchase an expensive machine tool capable of multiple functions. The second is to identify every step involved in transforming a raw material into a finished component and to create a separate, simplified machine or workstation for each transformational step. The steps must then be arranged in a close-knit series of workstations so operators can move unfinished parts or products from one station to another as they're being produced.

Although the first method sounds faster (and less complicated) than the second, it's not always the case. Big, multi-function machines can cost much more when compared to a series of smaller machines that perform the same function. In addition, big machines all-too-often waste the time of workers because they usually have to be programmed and calibrated for each function they perform. Production bottlenecks are also a concern with large multi-functional machines, especially if the numerous operations they perform have to be scheduled or performed in a single cycle (most multi-functional machines can only perform one function at a time). Moreover, an entire production operation can grind to a halt when a large, multi-functional machine tool is shut down for repairs (in addition, maintenance costs for large machines are also higher than those of smaller machines). These factors are what the *Boeing Corporation* took into consideration when it replaced several giant, multi-function machine tools at

a number of its production sites with a series of smaller, simplified machines that performed the same functions of big machines for a fraction of the cost. For example, a contoured composite part used on 777 aircraft was previously machined on a $1 million grinder capable of performing five different functions (four of which could not be used when the machine was in operation). *Boeing* replaced this machine tool with a one-function grinder specifically designed to do only what was required. The cost of the smaller machine? $50,000. Elsewhere, *Boeing* engineers discovered that one of its landing gear support assemblies involved, literally, a one-mile (1.6 kilometers) long production process. Determined to eliminate this waste, the engineers consolidated assembly operations into a series of close-knit procedures, thereby reducing the part's travel distance by 80-percent. In the process, a large machine costing more than $1 million was replaced with a $15,000 alternative and a large 'oven' used for curing was replaced with a smaller one that matched the part's size and shape and cost one-percent that of the larger oven's price tag (the smaller oven also uses less than one-percent of the electricity of the larger oven). Further production achievements from the improved setup at *Boeing* included reducing the various stages required to manufacture metal parts from five days to 25 minutes.

Before Chaku-Chaku, employees used to have to travel to separate locations all around the production shop to drill and grind components to a desirable shape. Now *Boeing*'s production procedures are performed on smaller, more numerous, but dedicated machines placed in close proximity - thereby saving much time and money (Zelinski, 2007).

Putting Chaku-Chaku into Practice

The first rule in setting up a lean and efficient production line is 'don't overbuy'. Overbuying includes: (1) purchasing equipment that will only be used once or twice, (2) buying machinery that produces or performs far more than what is needed, and, (3) taking on board anything that requires more investment in time, input, and money (i.e.: energy) than what is obtained in return. To help avoid these pitfalls, the following questions should be asked before purchasing any piece of machinery or equipment:

- *Is this machine or item really necessary*? Big isn't necessarily better. Big machines, particularly when placed in a production line composed of smaller machinery, can cost a lot more in terms of time, money, and energy - and result in extra capacity that will never be needed. Before buying large machinery, do some research and find out if smaller, more efficient machinery is more economically feasible.
- *Is the full life-cycle cost of the machine being considered rather than its purchase price*? Buying a cheaper machine or piece of equipment is not always the bargain it seems. Inefficient, energy-hungry machines can consume their initial purchasing cost in energy per week. When buying equipment or machinery, remember that there are always two price tags. The first reveals the machine's purchase cost. The second includes how much the machine will cost to operate in the long-term (see Chapter 35, *Motors and Pumps*).
- *Make certain that it's possible to accurately measure - in real time - what the machine produces and consumes in terms of materials and energy*. Although this suggestion is mentioned in the *Product* section it's worth repeating. Deficient (or zero) measurement makes it difficult, if not impossible, to determine how much a machine costs. Don't be caught in the dark. If a business can't measure what its machines are consuming and producing *while it's happening* than whatever the machine is doing can't be improved upon. Too many production systems contain monitoring procedures that measure what occurred *after* the manufacturing process has been completed. This means that a mistake or malfunction can repeat itself countless times before someone realizes what has happened. The result is that the system has to be shut down, machines have to be recalibrated, and the resulting sub-quality products or materials have to be collected and dealt with. Real-time monitoring helps avoid this scenario because it provides instant feedback - and the more control workers have over a production line the less waste is produced. Yes, real-time monitoring usually requires an initial investment in equipment - as well as the subsequent training of employees - but the results are often worth it. For example, as Chapter 1 relayed, efficiency advocate Sakichi Toyoda innovated his company's power-driven weaving looms in 1897 with real-time-monitoring measures that automatically shut the

machines off when a thread broke, thereby preventing the wasting of good thread and the making of defective cloth. The money this idea saved was substantial enough to create the *Tomen Corporation* (a large Japanese general trading company) and the *Toyota Motor Corporation*.

Additional Suggestions for Reducing Production Waste

- *Establish and support an in-house employee training and sharing program*. The more people that are involved in a waste-reduction program, the more cost savings will be enjoyed. More often than not, employees hold the answers to most waste reduction and efficiency questions. Coax these answers out of them with motivational management and teamwork techniques (see Chapters 6-11).
- *Seek outside help when needed*. If answers from inside the business aren't forthcoming, seek assistance from a local environmental agency, a dedicated government program, or an interested university. Many times the services these institutions offer are either free or minimally priced. The *School of Chemical Engineering* at the *South China University of Technology* in Guangzhou, China, for example, developed a cleaner production process for producing sodium chlorite by reducing sodium chlorate with hydrogen peroxide. The result? Waste acids were dramatically reduced and the byproduct (sodium sulfate) can now be minimized and reclaimed (Yu, et al, 2004). This discovery has saved several companies in the chemical industry the time and expense of figuring it out on their own. (Note: many government agencies will gladly provide funding for production improvements if the improvements reduce water or energy needs and/or minimize waste.)
- *Replace toxic or hazardous substances with nontoxic raw materials*. As mentioned in Chapter 28, using safe and sustainable raw materials reduces raw materials costs, lowers the expense and danger of handling toxic substances, and reduces waste disposal costs while avoiding resource depletion and environment destruction. For example, in the USA, a *3M* plant saved $120,000 in capital investment - and $15,000 annually (while receiving a lot of positive press) - by replacing the toxic solvents it used with water-based alternatives.

- *Reduce the energy requirements of machines and equipment*. Clean production requires that every piece of equipment and machinery be inherently efficient before production starts. Whether production requires a photocopier, a million-dollar machine tool, a coffee maker, or a vast configuration of motors and pumps, everything should run on as little energy as possible. Contrary to popular belief, when it comes to machines and equipment no one has yet proven a correlation between price and efficiency (i.e.: items needing less power to operate do not necessarily cost more than their energy-consuming counterparts). Before buying any piece of equipment or machinery read the label to determine the amount of power it consumes and compare its efficiency rating with other models.
- *Keep equipment and machinery running at optimal levels*. Good maintenance not only involves operating most equipment and machinery at peak levels (anything less and the full potential of the machine is being wasted), it also requires keeping these items in optimal condition with scheduled inspections and maintenance. Regular, scheduled machine maintenance may not be glamorous or exciting, yet it nevertheless saves money in four ways: (1) it prevents possible breakdowns, (2) it reduces additional costs resulting from broken equipment, (3) it extends the life of the machine, and, (4) it lowers energy costs (well maintained machines almost always use less power). To ensure that equipment and machinery is operating at optimal levels:
    - conduct (and record) frequent inspections,
    - ensure that all moving machine parts are properly lubricated,
    - clean equipment and machinery on a regular basis,
    - replace worn or damaged parts as soon as they are discovered,
    - ensure that drive belts, couplings, chains, and bearings are adjusted and in good condition,
    - keep equipment or machinery well ventilated, and,
    - replace old and/or outdated equipment with more efficient models.

- *Mix only the volume of materials needed to fill an order*. This guideline is a classic building block of *Lean Thinking*. Knowing how much of a product is needed *before* it's produced can greatly reduce raw material costs, energy expenses, and the costs of labor and storage. A good example of this is seen in the publishing industry with 'print-on-demand' technology. In the past, the number of books a publisher printed was based mostly on guesswork and undue optimism, which often resulted in piles of unsold books that had to be collected and pulped. Today, specialized printing machines can print the electronically stored text of a book (like this one) in less than a minute, which means that only the number of books ordered is ever printed. This practice also allows publishers to keep titles 'in print' indefinitely at little or no cost.
- *Collect all recoverable materials and outputs for re-use*. This includes steam and water as well as oil, solvents, chemicals, cleaning liquids, and material scraps. If you can't find another business that needs these materials, figure out how your organization can use them at a profit. *3M*'s *Traffic Safety Systems Division*, for example, used its scraps and outputs to devise a new reflective product for signs that uses less energy, reduces process and design waste by 65-percent, and emits fewer toxins during production. As *3M* sees it, anything not built into a product is waste – and therefore a cost - and is thus a sign of poor quality. In another example, a small modification to the production process of a Polish metalworking plant allowed scrap metal to be incorporated straight back into the system, which led to a 30-percent reduction of raw materials and annual cost savings amounting to $70,500. In Germany, a paper manufacturer virtually eliminated its massive water needs by filtering its base supply and re-using it in a closed-loop system. And across the Atlantic, an American jewelry-making business saved nearly $300,000 in capital costs and more than $115,000 in operating costs per year by moving to a closed-loop system that recycled and reused its jewelry-plating outputs.
- *Recover waste heat from kilns, ovens, and other high temperature machines*. Waste heat from furnaces and boilers, exhaust, compressors, and hot-liquid blow-downs can be collected and used in other processes. In the USA, for example, most power stations convert 34-percent of their fuel into electricity. The remainder, 66-percent, escapes as waste heat. Denmark, on the other

hand, converts 61-percent of its electrical-plant fuel for useful purposes by, in part, recapturing waste heat through efficient furnace design.

- *Insulate boilers and furnaces with ceramic fibers or other super-efficient materials*. Even with efficient flue technology, more than 23-percent of the heat a furnace generates can go up its smokestack while up to 40-percent can dissipate through the furnace's walls. To minimize heat loss, focus on where it occurs most. As one factory worker told me, 'If you can't place your hand on the exterior wall of a furnace because it's too hot, you're burning money.'
- *Explore and discuss alternative practices to reduce energy requirements*. A *Kraft Foods* plant in Campbell, New York, for example, reduced its natural gas needs by over 13-percent per year by improving boiler efficiency, reducing steam demand via the installation of direct-contact water heaters, and using lower grade fuel oil for backup purposes to obtain a more favorable utility rate (Energy Matters, 2007).

Clean Production and Water Reduction

Water, as we learned earlier, often carries two costs. First, the water itself has to be paid for. Second, discarded water (if it's piped in by a municipal wastewater system) accrues expenses because most municipalities compute their sewage fees as a percentage of metered water use. Examples of water-saving practices used in clean industrial production systems include:

- *Install closed-loop compressor cooling systems*. Using fresh municipal water (tap water) once, then flushing it away, is both costly and a waste of good water. Close your company's wastewater loop by reusing what was previously discarded (e.g.: filter what has been used and re-route it back into the production system). For example, *Simon Fraser University* in Burnaby, British Columbia, installed a closed system to reduce domestic water use and saw its water bills fall by $35,000 in one year (EIT, 2002).
- *Consider waterless alternatives in production lines*. *Pacific Coca-Cola* reduced its rinse water needs 79-percent by substituting compressed air instead of water to clean out the insides of its cans before filling (Hawken, et al, 1999). In another example, St. Leonards, in Australia, the owners of

Spectrum Printing invested in a waterless printing process rarely used by other printers. Apart from saving water, the process also saves 40-percent of waste paper and eliminates the need for isopropyl alcohol, which halts the discharge of volatile organic compounds as well as the costs associated with their disposal (White, 2007).

- *Consider using gray water* (*or rainwater*) *in production processes*. If high-grade tap water is not needed for production purposes (and in many processes it's not) consider substituting it with collected rainwater or water gathered from other sources. *Vam Organic Chemicals Ltd*. in Gajraula, India, for example, uses spent water for dust control and incorporates effluent into its distilling operation. Combined with a system that recycles sealed water in a vacuum pump, the net savings amounted to $33,330 per year in fresh water costs.
- *Invest in water-saving practices and technologies*. The *Godfrey Hirst* carpet manufacturing plant in Geelong, Australia, has been saving the equivalent of 38 olympic-sized swimming pools of water annually after it modified its production system to include in-line drying practices, which eliminated an entire washing and vacuuming stage. In addition, the company upgraded a fluoro-chemical application process and invested in the production of solution-dyed nylon products that do not require dyeing or drying (Savewater, 2007). Further east, two textile dyeing companies in Korea (*Colorland* and *WS Dyetech Ltd*.) substituted water-intensive alkaline fabric scouring with more efficient enzymatic scouring and saved eight to ten tons of water per ton of fabric production (while eliminating the need for caustic soda). If 200 other dyeing companies across Korea adopted the same practice, it's been estimated that the industry's total annual water use rate would fall by 3,200,000 tons - a cost savings of $2,133,333 (Korean NCPC, 2007).

Reducing Chemical Use and Toxic Substances in Company Laboratories

According to the American EPA, up to 40-percent of the hazardous waste generated by laboratories comes from unused chemicals. The first step in reducing this waste is to be prudent with purchasing. Order chemicals in small

quantities and only order what is required. Contrary to 'bulk buying' practices that make large purchases more economical, buying more chemicals than needed often ends up costing more due to the high disposal expenses of unused remains. Smaller quantity purchasing also lowers the risk of spills, exposure, and accidents while reducing storage requirements. Additional suggestions for reducing chemical use include:

- Use older chemicals first before opening new containers.
- Use chemicals that are available in your stockroom before buying alternatives.
- Whenever possible, change the chemicals used in manufacturing processes to water-based alternatives.
- Scale down the size of chemical reactions with micro-scale use.
- Conduct reactions in one chemical vessel rather than several. This practice can significantly reduce the need for purification and cleaning.
- Use detergents rather than chromic acid solutions to clean glassware.
- Collect, recycle, and reuse recoverable solvents (such as silver or mercury).
- Collect residues, vapors, and toxins emitted or produced from chemical exchange systems and determine if they can be used for other purposes. In an eco-industrial arrangement (Chapter 33), chemical waste – even in small amounts - can be sold or given to other businesses that need it in their production processes thereby providing an additional source of revenue while reducing disposal expenses.

For more information about reducing chemical use, contact the *National Roundtable of State Pollution Prevention Programs*, a division of the American EPA, which is administered by WRITAR (the *Waste Reduction Institute for Training and Application Research*).

The Bottom Line

Controlling production waste is all-too-often an after-the-fact endeavor that asks 'How can we deal with our waste?' Instead, the question(s) should be 'Why are we generating this waste and what alternatives are there?' Seen in this

manner, clean production does not create obstacles to production and growth. On the contrary, clean, sustainable, closed-loop production practices reduce costs, conserve raw materials (including energy and water), help eliminate toxins and hazardous materials (and their expense), and reduce negative impacts on the environment. For more information about cleaner production, visit www.cleanproduction.org.

Chapter 35

Motors and Pumps: Improving the Single Greatest Energy Wasters in Business

Motors are ubiquitous. Virtually every business contains at least one. Some have thousands. Motors are used to drive almost everything from pumps, conveyers, refrigeration equipment, air compressors, and fans to a host of other operations too numerous to mention. In the process, they can consume up to 60-percent (or more) of a company's fuel costs, which translates to around 40-percent of the world's electricity or roughly 75-percent of all industrial electricity. In fact, motors use up so much electricity that the amount they consume over their lifetime *always* costs more than the price of the motors themselves (some motors actually consume, in electricity costs, the amount of their purchase price every *week*). A new electric motor purchased for $1,500, for example, can cost as much as $13,000 a year to run and a typical 100 horsepower AC induction motor purchased for $5,000 will use as much as $35,000 worth of electricity in a year. Compare these figures to an older model 100 horsepower motor running continuously at full load (as many motors are designed to do), which can cost $70,000 a year to operate – or an older 20 horsepower motor, which can consume up to $14,000 worth of electricity annually.

Even with electricity rates as low as four-cents per Kilowatt-hour, most 20 horsepower motors (running continuously) use up to $6,000 worth of electricity annually. That's about six times the purchase price of the motor. Diesel or gasoline motors can be even more costly. For example, if diesel prices were to fall to $0.85 a gallon (3.78 liters), a 75 horsepower motor would still cost $6,400 a year to operate (the cost would be the same if electricity prices rose to 7.5 cents per Kilowatt-hour).

Determining the True Costs of a Motor

A general assumption held by engineers and mechanics in many industries is that efficient motors are more expensive than their inefficient counterparts because heavier copper wire, thinner core laminations, higher-grade

steel, and higher-grade bearings cost more. In the long-run, however, motors designed to be more efficient almost always end up costing less. Equally as important is that contrary to what many people believe, most motors do not become more efficient when they are given less of a load to perform. Most motors need to run at or near their designed power rating (usually 75 to 100-percent of their full load rating) in order for them to operate at optimal efficiency.

No matter how it's looked at, the overall financial impact a motor will have on a business's revenues should be considered long before a purchase is made. To calculate the amount of money a motor will consume (in electricity) over its lifetime, it's first necessary to find out the local cost of electricity per Kilowatt-hour. The efficiency rating and amount of time the motor will be in operation are also needed. For example, the normal lifespan of a typical 100 horsepower motor is around 40,000 hours or about five years of continuous operation (although a well-maintained motor can last much longer).

Let's assume that electricity costs are $0.05 per Kilowatt-hour, the motor in question will run 24 hours a day, seven days a week at full load, and that it's rated as 94-percent efficient. The formula for determining the amount of electricity that the motor will consume over five years of operation is:

(100 horsepower **x** .746 kW/hp **x** 40,000 hours **x** $.05 kW-hour) / .94 efficiency = *$158,723 electricity costs*

Comparing Efficiency Ratings

Another way to compare the amount of money a motor can cost to operate is to take the difference in efficiency points (expressed as a percentage) from the efficiency rating of two similar horsepower motors and to multiply the difference by the amount of horsepower. If electricity costs $0.05 per Kilowatt-hour, multiply the first sum by $50 to obtain the overall electricity costs of the motor in question.

For example, the difference between a 96-percent efficient 100 horsepower motor and a 92-percent efficient 100 horsepower motor is four percentage points. Four times 100 horsepower is 400. Assuming that electricity cost five cents per Kilowatt-hour, multiply 400 by $50. The total ($20,000) shows how much extra will have to be paid in electricity over the life of the

motor (assuming the motor is used in continuous operation). FIGURE 35-1 (below) shows the savings that are possible with efficient motors if the cost of a Kilowatt-hour of electricity is four cents.

The following table estimates the annual value (in US dollars) of a one-point efficiency gain based on a motor operating 8,000 hours at full load with the cost of a Kilowatt-hour at $0.04:

Horsepower	Annual Savings
5	$17
10	$32
20	$61
50	$142
100	$278
200	$537

Figure 35-1

Reducing the Costs of Operating Electric Motors

The golden rule in reducing the cost of running a motor is to ensure that it's the right-size motor for the job. Many businesses run motors that are too big for the task required under the assumption that the additional horsepower may be needed in the future. More often than not, this is expensive, costly, and unnecessary. Over-sized (and therefore under-loaded) motors waste energy and cost more to run. In many cases running two smaller energy-efficient motors can actually cost less than operating one over-sized motor.

A second method to reduce the cost of running a motor is to obtain price quotes from distributors before buying. Motors rarely sell at full list price and discounts from 20-percent to 60-percent can often be obtained through negotiation. Additional money-saving efficiency practices include:

- Teach your staff to read, hear, feel, or smell the signs of motor inefficiency. Smoke, changes in sound, heat, or vibration levels - or strange smells - can indicate that a motor is not operating correctly. Learning to fix problems promptly will help reduce both energy and equipment costs.
- Check the tension of drive belts. About a third of all motors in the industrial and commercial sectors use belt drives as a means of transferring their energy to another device. Increased friction resulting from misaligned, loose, or too-tight belts increases a motor's energy consumption and reduces the life of the belt. Keep in mind that *synchronous belts* (also known as toothed, positive-drive, or high-torque drive belts) are more efficient than *cogged belts* (slotted belts), which, in turn, are more efficient than *V-belts* (standard, trapezoid-shaped belts).
- Where appropriate, use variable speed drives (VSD) instead of energy-draining magnetic clutches, fan dampeners, belts, pulleys, or throttle valves to control the speed and torque of a motor. VSD's control the frequency and voltage of electricity supplied to a motor, which allows the motor to operate at maximum capacity for every task required.
- Monitor the power supply of motors with an eye toward eliminating voltage unbalance (e.g.: power surges or drops). Voltage unbalance (which can nullify a motor manufacturer's warranty) greatly degrades motor performance by causing overheating, mechanical stress, torque pulsation, and premature failure.
- Inspect motors for signs of bearing failures (usually indicated through increased vibration), which account for nearly half of all motor failures. If left unchecked, failed bearings can do irreparable damage to a motor.
- Ensure that motors shafts are aligned appropriately. Misalignment can produce excessive noise, vibration, and temperature increases and impede the efficient transmission of power from the motor to whatever it's driving. The result is shortened operating life.

- Have defunct motors professionally repaired or remanufactured (the professional term for this is called a 'rewind'). Like any piece of equipment or machinery, all electric motors wear out at the end of their product life. If the motor is highly efficient, it may be more cost-effective to have it rewound rather than replaced. Make sure an experienced and licensed professional conducts the repair. Poor rewinds often result in a loss of efficiency as well as reduced motor life.
- Further information about motors and their efficiency can be found at the following websites:

  www.motor.doe.gov (run by the *U. S. Department of Energy*) - click on the section titled: *The Motor Challenge Program*.

  www.ease.org (the *Electrical Apparatus Association*) - displays guidelines on motor repair practices.

  www.eere.energy.gov/industry/bestpractices (the *U.S. Department of Energy* and its *Energy Efficiency and Renewable Energy* sector) - reveals many resources and training to achieve industrial energy efficiency.

  www.motorsmatter.org contains information and advice on most matters pertaining to motors.

  www.nema.org (the *National Electric Manufacturers Association*) - an organization that sets standards for motors and their efficiency.

Reducing the Cost of Pumps and Pumping

Up to 20-percent of the world's motors are used for pumping purposes and most of what they pump is water. Water and wastewater pumps consume over 50 billion Kilowatt-hours of electricity in the USA every year (about $4 billion worth of power) – and most of the energy they consume is used to fight against the friction created when water is forced through narrow pipes, around bends, and up steep inclines.

Just as with motors, most pumps are bigger and more powerful than they need to be because in many cases production designers did not know what the exact pumping requirements were when the pumping system was being planned. The result is that valves and other devices are later installed to create intentional friction to reduce output to manageable levels. Obviously, this is not an efficient

practice – particularly when the annual expense of running an oversized pump can cost several times more than the price of the pump itself. In some cases, over-sized pumps can be balanced by trimming the impeller or replacing it with one of a smaller diameter (an impeller, which is similar to a propeller, transfers energy from a motor to the fluid being pumped inside a tube or pipe by directing, increasing, and pressurizing the flow of liquid inside). For a pump operating at less than ten-percent of its designated flow rate, trimming an impeller can reduce electrical consumption by as much as 25-percent.

Improving Pump Efficiency

Thinking ahead is probably the best way to avoid the costs associated with buying an oversized pump. Try to envision the entire pumping system beforehand with an eye toward maximizing efficiency -- then seek a pump that is compatible with its operation while thinking about how the entire system can be made more efficient. For example, the authors of the book *Natural Capital* describe how several years ago the Interface carpet company in Shanghai built a factory where the production process required 14 pumps totaling 95-horsepower. By redesigning the layout of the entire system, however, the main engineer, a man named Jan Schilham, was able to cut costs, improve efficiency, and reduce the overall pumping power needed by 92-percent. Schilham's design incorporated two very simple changes from which almost any pumping system can benefit. First, fatter pipes were used. By using fatter pipes less friction is created when fluid moves through them. In fact, by increasing the diameter of a pipe by 50-percent, friction can be reduced by 86-percent. The result is that less pumping energy is needed, which means that smaller, more economical pumps can be used. Traditionally, engineering students are taught that the extra cost of fatter pipes does not justify the cost of the pumping energy saved. Unfortunately, this is a 'top down' argument that does not take into account the savings that are made from the lower cost of a smaller pump, the lower costs of a smaller motor, and the reduced costs involved with fewer motor controls and fewer electrical components.

Schilham's second money-saving idea was to lay out the pipes first and install the pumps afterward – which is exactly the reverse of how most people

construct a pumping system. Most engineers install pumps and motors in a convenient or arbitrary spot and then attach pipes to them. The pipes then have to be bent, turned, raised and twisted so their contents can be directed from one point to another. Unfortunately, each bend and turn, as well as the number of valves added, increases friction, which requires a larger pump and increases the amount of pipe needed. Conversely, the straighter the pipe, the fewer pipes are needed and the less friction is created. When fewer pipes are needed less insulating material is required to cover them, which also lowers costs. Furthermore, by using plastic or epoxy-coated steel pipes, friction can be reduced by another 40-percent, resulting in a proportionate savings in pumping expenses that can eliminate up to 95-percent of the costs of pumping (Lovins, et al, 1999).

Additional Cost and Energy Saving Suggestions for Pumps

Pumps don't just push fluids, they're also used to direct pressurized air from one spot to another. Whatever substance is being pumped (air or fluid), the following suggestions can help reduce the waste and costs involved:

- *Eliminate leaks in compressed air lines and valves*. Up to 20-percent of the work output of a compressor is sometimes needed to make up for losses from air leaks. A *General Motors* assembly plant in Flint, Michigan, for example, reduced its energy needs by around eight-percent after, in part, decommissioning unused air supply systems and ensuring that those that remained worked properly (Energy Matters, 2007).
- *Eliminate leaks in steam pipes and fittings*. A leak in a steam line can result in higher steam production requirements to compensate for what is lost. In addition, leaking condensate return lines bring back less condensate to their boiler, thereby forcing the boiler to use more energy to heat-up replacement water. In 2006, an *Eastman Kodak* manufacturing plant in Rochester, New York reduced its annual natural gas needs by 11-percent after improving and modifying its feed-water heat recovery system – a move that was accomplished at virtually no cost (Energy Matters, 2007).
- *Insulate pipes and heating equipment to reduce heat loss*. All pipes that transfer heated fluids or gases from one process to another should be well insulated.

- *Consider using Industrial Heat Pumps* (IHP's). IHP's use heat from heat-producing processes to supplement other industrial heating processes, in preheating procedures, or for heating the factory itself.

For more information about getting the most from pumps and pumping, visit: www.plantservices.com.

Alternatively, browse the pump section of the *Industrial Efficiency Alliance* website at: www.industrialefficiencyalliance.org

Author note: One of the world's leading pioneers in the in the field of efficiency, sustainability, and waste reduction is Amory Lovins, co-founder of the *Rocky Mountain Institute* and a leading researcher and solution-finder in industrial ecology. Dr. Lovins was one of the first to recognize and expose motors and pumps as major energy-wasters and he is a tireless champion in finding solutions to help wean the world off its oil addiction. .

Chapter 36
Reducing Waste at the Office

According to the *U.S. Green Building Council*, American offices, on a daily basis, consume 42-percent of the country's energy and 65-percent of the country's electricity. Every day, offices also produce 50-percent of the nation's ozone-depleting chlorofluorocarbons and 40-percent of the country's greenhouse gas emissions while consuming 30-percent of its raw materials and five billion gallons of potable water (12-percent of the nation's supply). Needless to say, these are staggering sums when one takes into account that offices occupy only 12-percent of America's land (Laudal, 2007).

The good news is that an office 'production line' is not much different than an industrial production line in that offices rely on tools, machines, and other production processes that can be made less wasteful. Arranging an office production line in a lean, integrated manner (see Chapter 12) is therefore instrumental in reducing both waste and costs.

Getting Started

To begin an office efficiency drive, gather your employees together and explain what needs to be done and why. Displaying a process map (see Chapter 6) illustrating the inputs and outputs that flow around and through the office is a good way to kick-start the process (a waste-reduction edict from management will probably be interpreted as little more than penny-pinching). On the map, the amount of electricity every workstation or item of equipment consumes will need to be underscored (perhaps with facts and figures relaying their CO2 emissions). The amount and cost of materials the office swallows up (e.g.: office supplies, paper, light bulbs, water…) as well as how much waste (garbage) is created and the *types* of waste being generated should also be highlighted. As Chapters 7 – 11 reveal, proper training and a few incentives will probably be required before employees will take action. Likewise, the measuring of progress will be needed

to ensure everyone knows that: (1) the company is serious about waste reduction and, (2) the efforts employees make (or don't make) are being monitored.

Basic Office Waste-Reduction Suggestions

Transportation and the Lowering of CO2 Emissions

Some offices start their waste-reduction programs by suggesting that staff transport themselves to work more efficiently. This may not alter the office's bottom line (and office managers may be told that it's none of their business), but transportation practices are a good place as any to begin making changes. Encouraging employees to use public transportation can significantly reduce the ecological rucksack and carbon footprint of an office. Additional waste-reduction suggestions include:

- *Encourage employees to walk or bike to work* (to encourage the latter, ensure that employees have a safe place to put their bicycles).
- *Begin a car-pooling program*. Find out who lives on whose route to work and promote cooperation.
- *Initiate a company vehicle inspection program*. Ensure that all company vehicles are both efficient and well maintained. Encourage employees to be equally as vigilant and diligent with their vehicles.
- *Determine if or how employees can work from home* (see Chapter 27) or, work out an alternative schedule that allows employees to stagger their schedules so they can work at home part-time.
- *Encourage conference calls and/or videoconferencing instead of traveling to meetings*.
- *Share office space and equipment rather than purchasing separate items for every employee*.

Making the Most of Office Furnishings, Computers, and Equipment

- *Ensure all office electrical equipment (even coffee makers) is energy efficient* (look for the *Energy Star* label). An *Energy Star* rated medium-sized copying machine, for example, can cut $50 or more off an annual energy bill.

- *Buy remanufactured, energy-efficient computers, copiers, fax machines, etc… instead of new models whenever possible*. Most experts agree that remanufactured or refurbished electronics provide excellent value for money.
- *Use laptops in place of desktop computers*. Laptops generally use less electricity. (Remember to unplug the power cord when the laptop is not in use.)
- *Turn equipment off when it's not needed.* Computers, when left on, can rack up $75 in energy costs per unit, per year.
- *Unplug* all *electrical items when not in use*. Most electrical equipment continues to draw power when it's turned off. Even an empty mobile phone charger draws electricity if it's plugged in. Cutting off electrical power *at its source* rather than simply switching off equipment can cut electricity bills by as much as 40-percent. Pay particular attention to ensure that this is done during the weekends (vending machines should be a prime target).
- *Enable the power management features on desktop computers (and monitors) to switch off when not in use*. This can save up to $55 per monitor and $45 per computer annually.
- *Use smaller computer monitors*. As a rule, a monitor that is two inches (5 centimeters) smaller than a larger model can reduce electricity consumption by as much as 30-percent.
- *Don't use screen savers*. Contrary to popular belief, screen savers consume lots of energy. Instead, switch the screen saver mode to 'blank screen' or 'none'.
- *Buy used or remanufactured office furniture*. Few people can tell the difference.
- *Invest in high quality equipment rather than cheap, shorter-life versions*.

General Energy Reduction

- *Insulate the office building inside and out* (paying particular attention to heat and cooling loss from doors, windows, and walls). Improved insulation can save $800 or more a year in energy costs (see Chapters 23 and 24).

- *Determine if your local power company provides sustainable energy alternatives*. Some electricity providers invest in wind, solar, or tidal energy and provide these options to their customers so they can cut CO2 emissions.
- *Set the office thermostat a few degrees lower in the winter and a few degrees higher in the summer*. A two-percent decrease during the day can cut energy bills by two-and-a-half percent.
- *Don't heat or cool an unoccupied office (particularly during the evenings and weekends)*. Setting the thermostat back ten degrees at night can cut 15-percent off energy bills.
- *Perform periodic maintenance of HVAC equipment* (Heating, Ventilation, and Air Conditioning). Good maintenance can reduce heating bills by five-percent and cut electrical bills by two-percent.
- *Replace all office light bulbs with energy efficient alternatives*. This not only saves money, the resulting drop in electricity reduces greenhouse gas emissions. If all Europeans changed their standard light bulbs to energy efficient bulbs the resulting drop in carbon emissions would be equivalent to taking 70-percent of the continent's cars off the road.
- *Turn off all lights when not needed* (installing motion detectors can eliminate this problem). Keeping off unnecessary lights not only saves the money needed to power light bulbs, it also lowers cooling costs – and can shave up to 18-percent off an office energy bill.
- *Turn off ventilation systems in unoccupied areas*. This practice alone can lower HVAC costs by $300 annually.
- *Pay bills electronically*. If everybody in the USA paid his or her bills online, the nation's paper waste would be reduced by 1.6 tons and greenhouse gas emissions would be cut by 2.1 million tons per year.

Reducing Paper Consumption

Making paper is big business. Roughly three-percent of world industrial production is spent on the creation of paper. This equates to around 900 million trees being cut down annually. Paper manufacturing also uses more water than any other industry (98 tons of water are needed to produce one ton of paper). In

addition, paper manufacturing releases the fourth most pollutants and is considered the third most energy intensive industry on Earth (Hawken, et al, 1998). Yet only ten-percent of the world's paper is ever utilized in the long term. Most is used and thrown away shortly after it's bought. It's been estimated that the average office worker uses one sheet of paper every twelve minutes and that the world now consumes more than five times the amount of paper it did in 1950 (that amount is increasing). Indeed, discarded paper accounts for so much waste (as much as 70-percent of office waste) that some governments have passed legislation banning it from landfill sites in a bid to promote recycling. The city government of Seattle, Washington, for example, concluded that a one-percent reduction in its $288,218 annual paper bill (which amounts to 73,902,000 sheets of paper) will save thousands of dollars in paper costs; 62 trees; 64,606 gallons (244,553 liters) of water; 300 pounds (136 kilograms) of water pollutants; 7,074 pounds (3,208 kilograms) of solid waste; 20,500 pounds (9,298 kilograms) of greenhouse gases and other pollutants; and 123,662 BTU's of energy.

Saving Paper Can Improve Business Operations

Reducing the amount of paper a business uses not only saves money, it can also greatly improve communication, which has been shown to increase both the quantity and quality of work life. For example, the Brazilian company *Semco*, streamlined its operations years ago by, in part, reducing paperwork. Upset with the fact that employees rarely talked to one another, company CEO Ricardo Semler decreed that all interoffice memos could be no more than one page in length. Employees therefore had no choice but to communicate with each other over the phone or face to face. As a result of this increased personal interaction, more work got done. In Australia, a business turn-around specialist once told me that virtually his entire secret to saving bankrupt companies was to 'forbid the writing of memos altogether' (for the same reason). *Oticon Inc*., a hearing aid manufacturer in Denmark famously cut a hole in the roof of its multi-story headquarters straight through the ceiling of the employee cafeteria and into a main collection site. A Plexiglas tube was then inserted into the void and all discarded paper was to taken up to the roof and thrown down the tube – a powerful and continuous message directed at employees, which proclaimed that

paper waste would no longer be tolerated. Paper consumption in the company subsequently decreased by 50-percent and the business enjoyed a dramatic increase in productivity.

Suggestions for Reducing Paper Use

- Establish a company mandate that demands paper use is reduced (then enforce the rule).
- Shorten the number of forms and papers customers must fill out (they'll love you for it).
- Store your business data (including employee manuals, policies, etc…) in an electronic format.
- Distribute memos via e-mail or display them on a single sheet of paper in a central location.
- Use both sides of a sheet of paper and set photocopiers to do the same. This practice alone can cut 10-percent to 40-percent off paper costs. For example, *Seagate Technology Inc*., a computer disk drive manufacturing company in Scoots Valley, California, reduced its annual paper needs by four million sheets this way, thereby cutting its paper bill by $45,300.
- Set wider margins on documents so more words can be placed on each page.
- Use smaller font sizes so more text can be put on a single page.
- Use chlorine free, recycled paper for all paper needs. Recycled paper uses 60-percent less energy in its manufacturing than virgin paper. Every ton of recycled paper also saves 4,000 kilowatt-hours of electricity, 7,000 gallons (26,497 liters) of water, and 17 trees (most trees have the capacity to filter up to 60 pounds (27 kilos) of pollutants from the air).
- When printing or photocopying, adhere to the following: (1) always print in 'draft' mode, (2) avoid color printing whenever possible, and, (3) buy recycled toner and ink. Each of these practices saves ink.
- If recycled paper is unavailable, use paper made from sustainable sources such as ecologically treated bamboo or hemp.
- Place a paper recycling receptacle in a conspicuous place, encourage its use, and schedule a designated employee or cleaning crew member to arrange regular collection.

- Shred unwanted paper and use it as packing material.
- Reuse paper, envelopes, and boxes whenever possible. The *Washington Suburban Sanitary Commission*, a public water and sewer utility in Maryland, decided to replace its billing envelopes with send-and-return envelopes that could be used for both billing and receiving payments. As a result, 1,660 cubic feet (47 cubic meters) of warehouse space immediately became available because fewer envelopes require less storage space. Additionally, the cost of envelope purchases was reduced by $55,000.
- Replace paper towel dispensers in washrooms with *energy-efficient* air dryers.

Office Water Reduction Measures

With offices using up to 12-percent or more of a nation's potable water every day, much can done to reduce consumption without making sacrifices. For example:

- Install faucet aerators (low-flow devices) on all taps.
- Replace toilets and urinals with low-water or water-free models.
- Offer filtered tap water to employees rather than delivered bottled water – or use water straight from the tap. In many regions local tap water is actually better than bottled water in terms of cleanliness and quality.

Miscellaneous Tips

- Ask office cleaning crew staff to use non-toxic cleaning products.
- Buy office supplies in bulk (which can save on packaging).
- Encourage the planting of trees or other indigenous foliage outside the office building to offset its carbon footprint.

Remember, offices are an integral part of business production and are just as important as every other work or production area when it comes to reducing waste and maximizing efficiency.

Chapter 37
Transportation and Waste

Until all engines, fuel sources, and vehicles become cleaner, leaner, and more efficient, the only viable way for most businesses to reduce the waste produced by these tools is to optimize them as much as possible. Efficient driving can save a business with a multitude of vehicles millions of dollars a year. For example, the *United Parcel Service* (UPS) began a policy in 2004 to reduce the number of left turns made by its drivers. Having its vehicles stop and idle at traffic lights while waiting to turn against oncoming traffic was literally costing *UPS* millions of dollars in fuel losses so a software program was devised that mapped a customized route for each driver to minimize left turns. This practice not only saved the company a huge amount of money, it also reduced approximately 1,000 metric tons of CO2 emissions emitted by its fleet during the first few years of trials (Sayre, 2007).

Getting Started with Vehicle Efficiency

To make a vehicle more efficient, it's necessary to first measure and record the amount of fuel it consumes. Determining the efficiency rating of a vehicle, as well as how much pollution it produces per year, is easy. Just visit the *U.S. Department of Energy* website and look up the year, make, and model of the vehicle in question. Next, apply as many efficiency measures as possible (see page 350). Record how much was saved after one week or 30 days then share the results with employees and encourage them to seek more ways to cut waste and costs. Some companies reward their most efficient drivers on a monthly basis, which instigates a healthy competition between employees. 'Just remember to keep encouraging everyone,' a shift supervisor told me, 'because good ideas acquired with ease are just as easily discarded with ease.'

Suggestions for Reducing Energy Consumption in Cars and Trucks

- *Don't waste fuel idling*. Only idle when it's absolutely necessary. Large vehicles, like trucks and buses, consume huge amounts of fuel when idling – sometimes more than a gallon (3.78 liters) an hour or over $2,500 per year.
- *Invest in hybrid vehicles*. Hybrid cars and delivery vehicles are not only more fuel efficient, they're also gentler on the environment. For example, one gallon (3.78 liters) of gasoline weighs approximately six pounds (2.72 kilograms). When used to power a typical combustion engine, however, that same gallon produces almost 20 pounds (9 kilograms) of carbon dioxide. This is how a small, four-cylinder car driven approximately 15,000 miles (24,140 kilometers) a year can emit ten tons of CO2. By comparison, a more fuel efficient 2003 model *Toyota* Prius or 2003 model *Honda* Civic produces around 4.5 tons of CO2 over the same 15,000 miles (Grimes, 2007).
- *Decrease the amount of time spent driving*. Share journeys with other passengers. Combine errands or deliveries, car pool, take public transportation… do whatever is necessary to minimize driving time.
- *Check tire pressures*. Try pushing a car with flat tires and you'll discover why this is important. Keeping tires properly inflated can increase fuel efficiency by three-percent or more. Just make sure employees know what they're doing. According to the *Rubber Manufacturers Association*, 85-percent of people don't check their tire pressure properly.
- *Clean and maintain engines*. Clean or change the air filter regularly (two or three times a year), change the oil as recommended by the manufacturer (usually once or twice a year), check all fluids, and clean and replace spark plugs regularly.
- *Plan journeys*. Know every route in advance. This will save the time and expense of unnecessary travel or getting lost.
- *Don't spill fuel* when filling vehicles. A drop spilled is a drop wasted – and every drop adds up.
- *Eliminate unnecessary weight*. Don't carry around more items or equipment than is needed.
- *Load up trucks* to avoid making additional trips or to eliminate the need for two vehicles.

- *Remove luggage carriers, roof racks, and trailers when not needed*. The air resistance these items create dramatically decreases fuel efficiency.
- *Keep vehicle windows up*. Open windows create drag and increase air resistance. Keep interior vents open instead.
- *Turn off unneeded electrics*. Although some manufacturers dispute it, air-conditioning can consume up to ten-percent of a vehicle's fuel.
- *Observe the speed limit*. The faster a vehicle is driven the more fuel is burned. Driving 70 miles (113 kilometers) an hour as opposed to 60 miles (97 kilometers) per hour consumes around 20-percent more fuel.
- *Don't ride the brake and don't brake hard*. Too many drivers brake more often than necessary, particularly when switching lanes. Unfortunately, heavy braking decreases fuel efficiency by as much as 30-percent.
- *Coast on hills*. Taking your foot off the accelerator when descending a hill reduces energy consumption.
- For more tips and suggestions, visit: www.ecomodder.com

Reducing Aircraft Fuel Costs and Emissions

On average, most airlines spend more than $100 per minute, per flight in operating costs. Perhaps not surprisingly, most of these costs are attributed to fuel consumption. Aircraft also constitute one of the fastest growing sources of greenhouse gases. During the 1990's, carbon emissions from aircraft doubled - and they continue to grow at an unprecedented pace. Yet it has been estimated that a one-percent improvement in fuel efficiency could help the airline industry lower expenses by $700 million a year while reducing up to 25-percent of its emissions. This can only happen, however, if airlines, airports, and governments work together. Following is a synopsis of suggestions put forth by aviation analysts to achieve maximum fuel efficiency in the airline industry:

- *Reduce engine idling*. Idling aircraft engines consume approximately four gallons (15 liters) of fuel a minute. By towing commercial aircraft to take off areas, up to two tons of fuel per flight can be saved. *Virgin Airlines* has conducted trials in London and is holding talks with airport administrators in New York, Los Angeles, and San Francisco to prove just how feasible this practice can be (BBC, 2006).

- *Fly lighter aircraft*. By building aircraft out of lightweight carbon fiber components instead of aluminum and steel, the weight of a plane decreases by up to 30-percent with similar savings in fuel. The new *Boeing* 787 *Dreamliner* jet plane is a good example. *Boeing*'s *Dreamliner* is lighter, quieter, and more fuel-efficient than any other passenger aircraft on the market. As a result, it's also the world's fastest selling commercial aircraft.
- *Fly in formation*. By having airplanes fly in formation (to take advantage of the slipstream of each aircraft) it's been estimated that up to ten-percent of fuel costs (approx. $500,000) could be saved per plane, per year on long haul flights. Keep in mind that formation flying does not mean flying wingtip to wingtip. Because the slipstream (or vortex) of spiraling wind that flows from aircraft wings can extend outward for miles, planes would not have to be close together to take advantage of this system. Modifications would, however, have to be made to autopilot systems because formation flying is difficult to maintain manually.
- *Fly direct*. More direct flight routes between departure cities and destinations (as opposed to flying into 'hub' terminals and catching another plane) – as well as creating straighter flight routes – could save the airline industry up to $1 billion a year in fuel and maintenance costs.

Saving Energy in the Maritime Industry

Ships carry around 90-percent of all the world's transported goods. Approximately 90,000 ships, ranging from super tankers to small freighters ply the world's oceans everyday. These vessels consume vast amounts of fuel and emit a sizeable amount of pollutants. A new report by *Intertanko*, a major maritime industry body, estimates that the amount of greenhouse gases produced by the world's ships is about twice that of planes. Additional research has shown that ship engines continuously pump out more sulfur dioxide than all the cars and trucks in the world combined. This is because ship engines run 24 hours a day when they're under sail. Combine this fact with an increasing desire to deliver cargo faster (which consumes more fuel) and it becomes easy to understand why ships are burning more fuel then ever before. To date, few if any measures have been taken to reduce or counteract shipping pollutants, but some governments are

considering a clampdown on inefficient shipping practices as part of their effort to tackle global warming (McGrath, 2007). Cleaner fuels, more efficient engines, improved propulsion systems, sleeker hull designs, more direct routes, and less wasteful sailing practices could soon play a more active part in reducing toxic gases emitted by ships.

Recently, the addition of a large kite shaped like a parasail was added to a ship in Germany in an attempt to lower its fuel consumption. Guided by a computer and tied to a mast on the ship, the kite is designed to help pull the vessel through the water and reduce fuel consumption by up to 20-percent.

Large, sturdy, mast-mounted solar panels (that also act like sails) are another tactic being considered to help ships take advantage of wind power. Decks covered with solar cells and adjustable panels that protrude from the sides of ships (and act like sails) are being incorporated as well. The idea is to help boats, ferries, and ships become less dependent on fossil fuels. HMP (Hybrid Marine Power) ships are yet another idea designed to combine the efficiency and cleanliness of electric drives with the power of the combustion engine (much like the engines of hybrid cars). For more information visit: www.solarsailor.com.

Whether on land, the sea, or in the air, until ultra-efficient transportation alternatives can be found, maximizing fuel efficiency in all vehicles makes good financial sense. .

Chapter 38
Reducing Waste in Restaurants and Hotels

The American *National Restaurant Association* isn't exaggerating when it says that restaurants are a cornerstone of the American economy. To date, the United States is home to more then 925,000 restaurants that, together, rack up more than $537 billion annually in direct sales. That's equivalent to four-percent of the nation's GDP. In addition, restaurants are America's largest employer, providing 12.8 million jobs (analysts expect the number to grow another 1.9 million by 2016). So many people have been employed by the food service industry that 42-percent of American adults can claim to have worked in it. Indeed, over one-quarter of the USA's current workforce got their first job in a restaurant.

Restaurants, Energy Consumption, and Waste

In terms of floor space, restaurants are amongst the most energy-intensive businesses in the world. This is due to the fact that ovens, broilers, fryers, refrigerators, freezers, and other food service equipment and machinery consume vast amounts of electricity. Yet kitchen equipment is only part of the equation. When heating, cooling, lighting, and sanitation requirements are also factored in, the energy demands of restaurants become even more burdensome.

When I began this book, I envisioned writing a chapter dedicated to the reduction of energy and waste in the restaurant industry. Fortunately, an informative document on this topic already exists so there was no need to reinvent the wheel. Originally produced by the *Flex Your Power* organization (www.flexyourpower.org), this document is also available from *Energy Star* (www.energystar.gov) under the title: *Putting Energy into Profits: the Energy Star Guide for Restaurants*. For a free copy, visit:

www.energystar.gov/ia/business/small_business/restaurants_guide.pdf

To test the efficacy and readability of this guide, I asked several bars and restaurant owners to put its suggestions into practice and report back to me with the results. Much to my surprise, all of them relayed that they were quite impressed by what they achieved (I thought they were just being polite when they told me they would try out the suggestions). Perhaps more telling, however, was that most of them wanted to know if more information was available on the subject. The answer is 'yes' and it can be found at:

- EPA Waste Wise: www.epa.gov/wastewise
- EPA Water Sense: www.epa.gov/owm/water-efficiency/index.htm
- EPA Green Buildings: www.epa.gov/greenbuilding
- Food Service Technology Center: www.fishnick.com
- The Green Restaurant Association: www.dinegreen.com
- The National Restaurant Association: www.restaurant.org
- The North American Association of Food Equipment Manufacturers: www.nafem.org
- Pacific Gas and Electric Company Energy Reduction Action Plan for Restaurants: www.pge.com/rebates/123_reductionplans/restaurants
- The Consortium for Energy Efficiency: www.cee1.org
- The Air Conditioning and Refrigeration Institute: www.ari.org
- The American Society of Heating, Refrigerating and Air Conditioning Engineers: www.ashrae.org

Reducing Food Waste

With food prices on the rise and starvation a reality in many parts of the world, it's shocking to learn that more than 25-percent of all the food made in the United States each year - roughly 96 billion tons - is thrown away before it's eaten. If that isn't enough, approximately $1 billion a year is spent disposing it. Rather than delve into moralities here, let's jump straight into proven suggestions that alleviate food waste. They include:

- *Don't produce more than is needed.* A common mistake in food service operations is cooking and preparing more than is needed. Learn to apply lean-thinking concepts and only make what customers order.

- *Serve local or regional foods rather than shipping in out-of-season foods*. This can lower costs, help local economies, and eliminate pollutants created when food is shipped long distances. The distance that meat and produce travel before arriving at their destination is known as 'food miles' – and whether trucked, shipped, flown, or carried by train, the longer the distance the greater the cost of the food and its impact on the environment (see the bottom of page 275). Do keep in mind, however, that local produce delivered by nearby farms can create as much or more CO2 than tons of produce trucked in on a giant 18-wheeler – and that local greenhouses can also consume more than their fair share of energy.
- *Donate unused food to local food rescue organizations or food banks*. If food is not thrown away then it's not wasted. *Larry's Markets* in Seattle, Washington, for example, saves around $45,000 per year donating unsold canned goods and other unsold foodstuffs to charities.
- *Compost food into fertilizer or give it to an organization that does*. For example, *Shop Rite Supermarkets* in New Jersey saves $57 per ton of discarded food by composting it rather than sending it to landfill. The company also saves money because it doesn't pay to have it hauled away.
- *Sell animal by-products such as grease, meat, fat, and bones to a rendering business that will transform them into saleable commodities*. Every year, the *Fletcher Allen Health Care* business in Burlington, Vermont saves approximately $1,400 this way - by diverting its food waste to food banks and rendering facilities.
- *Sell or donate food for use as animal feed*.

For more information on reducing food waste, download the (free) 59-page EPA booklet titled *Waste Not, Want Not* (publication #EPA 530-R-99-040) from the following website:
www.epa.gov/epaoswer/non-hw/reduce/wast_not.pdf

Additional suggestions for reducing food waste can be obtained from:
www.besmart.org/festival/foodwaste.html
and
www.ciwmb.ca.gov/FoodWaste

Energy Conservation and Efficiency Tips for Hotels

Again, there's no need to reinvent the wheel here. The following websites offer a wide range of suggestions to help hotels improve their efficiency. Use them alongside the information provided in the other segments of this book to maximize waste reduction efforts (in particular, Chapters 23-26):

www.globalstewards.org/hotel.htm
www.hotel-online.com/News/PR2001_3rd/Aug01_CAEnlighten.html
www.permafrostonline.com/resources/hotel-energy-saving-tips.php
www.flexyourpower.com

Chapter 39
Agricultural Waste

A chapter about agriculture has been included in this book for two reasons. First, agriculture is *big* business. Second, students that come from agricultural backgrounds usually show more resistance to efficiency concepts than any other group I encounter (I'm not sure why, but this resistance can probably be placed in the category 'efficiency applies to others, not to us'). Let's start with the facts. According to the *American Farm Bureau Federation*, agricultural production accounts for 20-percent of America's GDP, thereby making agricultural products the country's largest export. In addition, the agricultural industry provides one out of every six American jobs (about 21 million). Farms are also huge users of energy, guzzling as much as ten times the amount of energy they consume (in the form of fossil fuel) compared to what they produce in the form of food energy. Furthermore, agricultural production uses around 64-percent of the world's depleting water supply.

The problems facing agriculture seem to go downhill from here. For decades the topsoil that farms depends upon to nourish and sustain crops has been disappearing at an alarming rate. In some areas topsoil is vanishing 17 times faster than it can be replaced - and what remains, in many cases, has been degraded to little more than a burned out crust by the overuse of fertilizers, pesticides, and herbicides. The resulting reduction in soil quantity and quality have reduced farm output by as much as eight-percent in the United States – an amount that could rise to around 20-percent over the next decade. The variety and amount of antibiotics used in livestock rearing, many of which are used because they make animals grow faster and prevent them from getting sick in dirty, cramped pens while they consume unnatural feed, is yet another agricultural hot topic – so much so that adding pharmaceuticals to animal feed has been described as the most controversial subject in medicine. By most estimates, farms consume more antibiotics than human medicine does (as much as 84-percent more). The fear is that the microbes these antibiotics are meant to

destroy often (and easily) mutate into more virile strains. Recent studies in Europe and Canada have even suggested that some livestock could become reservoirs for drug resistant disease strains that can then be passed on to humans. So why, you might ask, aren't more studies being carried out?

According to some experts, many agricultural scientists are loath to conduct research or make pronouncements on this subject due to the fact that their research grants, which are mostly funded by agricultural conglomerates and big pharmaceutical companies, may be put in jeopardy (Koppelman, 2007). Indeed, because most farms in the USA are little more than huge factory operations owned by all-in-one conglomerates that include seed and grain merchants, chemical suppliers, vegetable and fruit producers, and meat-packing as part of their corporate portfolios, most people have no idea what's in the food they eat, who's behind it, or how it's processed.

To add to the industry's woes, nearly half of the planet's calorie and protein intake comes from only three grains: wheat, rice, and corn – a situation that has not only led to a reduction in the genetic diversity[*] of these crops (thereby making them more prone to disease), but also contributes to soil nutrient depletion (which leads to the increased use of chemical fertilizers) and increased susceptibility to insects (which triggers the overuse of pesticides).

Insects, with their short breeding spans and remarkable ability to adapt to their environment, rapidly build resistance to whatever pesticide is thrown their way. This is why almost a billion pounds of pesticides are used every year to eliminate insects. The result has been a 2,000-percent increase in pesticide use since 1950. Ironically, however, despite the increase in pesticide use, total crop losses in the USA (from insects) have increased 20-percent compared to 50 years ago. Combined with the overuse of fertilizers and herbicides, this has led to dramatic increases in water pollution. The bottom line is that agriculture not only carries an enormous ecological rucksack, it's also considered one of the world's largest and most prolific polluters of water (Hawken, et al, 1999). Clearly, big agriculture is in need of an efficiency overhaul.

[*] a similar lack of diversity - with all its inherent dangers - is seen in the livestock industry.

Getting Started: Identifying Waste Sources

As with any industry, by applying a few basic efficiency practices to agricultural production it's possible to cut costs, reduce waste, and improve the overall environment. Fuel consumption is a good place to start. Since most farmers claim that fuel costs too much at any price, the best way to reduce fuel use is to examine the areas where maximum consumption occurs. On most farms, these areas are as follows:

- Tractors and transport vehicles.
- Irrigation systems (i.e.: pumping).
- Harvesting equipment.
- The heating, drying, cooling, and processing of crops.
- The production and distribution of chemicals, fertilizers, and animal feed.

Suggestions for Reducing Fuel Costs on a Farm

Basic efficiency practices not only reduce fuel usage and decrease the wear and tear of expensive equipment and machinery, they can also extend the life of tractors and harvesting equipment. Suggestions for improvement include:

- *Avoid unnecessary driving*. Use walkie-talkies to communicate from the field instead of driving back and forth to relay messages.
- *Ensure that fuel tank caps fit properly on all vehicles as well as stand-alone fuel storage tanks*. Damaged, loose or missing fuel caps can allow up to 40-percent of contained fuel to evaporate.
- *Upgrade vehicles and equipment to more fuel-efficient models*.
- *Keep tires properly inflated, aligned, and balanced*. Over and under inflated tires wear out sooner and cause engines to work harder, thereby consuming more fuel. Cold temperatures in particular decrease tire air pressure so check tire pressures when the tires are cold.
- *Maintain all engines and motors*. Proper maintenance includes regularly checking for fuel and oil leaks, looking for smoke, strange sounds, and other sign of improper fuel combustion, performing regular tune-ups, cleaning air,

fuel, and oil filters, using the right grade oil, cleaning fuel injectors, and changing oil as recommended by the manufacturer.

- *Minimize engine idling*. On average, idling consumes about one gallon (3.78 liters) of fuel per hour. A 75-horsepower tractor left idling ten minutes a day will consume around 31 gallons (117 liters) of fuel per year.
- *Keep tractor engines warm in cold climates with an electric engine block heater*. Engine heaters use less energy than liquid-fuel room heaters.
- *Use the right size equipment for the job*. This means using the smallest and lightest vehicles possible to ensure the best fuel consumption rate (particularly for rock picking, spreading, and spraying).
- *When seeding, fill up seed hoppers to reduce refill trips*.
- *Ensure a proper fit between tractors and equipment being towed*. Improper alignment results in the two fighting against one another, which increases fuel consumption.
- *Reduce unnecessary weight when towing*. Balance a tractor's towing weight to reflect current working conditions. Too much weight increases resistance, causes premature engine wear, and burns more fuel. Lighter loads consume less fuel than heavier loads, but too little weight can increase tire wear, which ultimately results in more fuel consumption
- *Drive farm vehicles at the speed recommended by the manufacturer*.
- *Gear up and throttle down when not hauling heavy loads*. For applications that require 50-percent to 75-percent of engine power, slow down the engine's rpm and shift to a higher gear. This practice alone can reduce fuel consumption by up to 30-percent.
- *Use recommended grades of fuel as stated by the manufacturer*. Don't buy more expensive grades if they aren't needed and don't use winter fuels in the summer
- *Avoid fast starts and stops*.

Making Fuel Storage Tanks More Efficient

- Paint fuel storage tanks white or silver to reflect sunlight.
- Better yet, keep storage tanks well shaded. A 300-gallon (1,134 liter) unshaded storage tank can lose 120 gallons (454 liters) of fuel annually from

evaporation due to excessive heat. Most experts agree that placing tanks underground is the best way to decrease evaporation. The downside to this practice is that a leak in an underground tank can go undetected, incur extra costs, and contaminate groundwater supplies.

- Regularly inspect fuel tanks for leaks and seepage. Ensure fuel hoses, nozzles, and valves are in prime condition.
- Use pressure-relief vacuum caps rather than screw-on caps to seal fuel storage tanks.
- Keep unattended fuel tanks locked.

Reducing the Costs of Tillage and Planting

The most effective way to reduce tillage costs is to till less. Decreasing tillage not only saves large amounts of fuel (up to 3.5 gallons [16 liters] per acre), it also can, under the right circumstances, increase crop yields, conserve soil moisture, and reduce time spent in the field. Additionally:

- Plant trees and shrubs to create windbreaks and shelterbelts that decrease wind-induced soil erosion.
- Prepare seedbeds just ahead of planting to reduce the chances of rain damage.
- Prepare seed beds in row areas leaving the middle areas rough.
- Combine operations. For example, combine seedbed preparation with planting or fertilization with tilling.
- Plant at optimal times to reduce the need (and the cost) of herbicides and pesticides).

For more information about efficient tillage and planting, visit: http://energytools.sc.egov.usda.gov (ATTRA, 2007).

Reducing Fertilizer Use

High levels of fertilizer nitrates are often found in the ground water of agricultural areas. Reducing chemical fertilizer is therefore as much a health issue as it is an economic issue (applying less chemical fertilizer can save as much as $12 an acre). An increasing amount of research shows that farms can easily use less nitrogen without lowering their crop yields (see:

www.innovations-report.de). A five-year study conducted by *Cornell University*, for example, showed that reducing fertilizer use, under the right conditions, produces no negative impact on crop yield or crop quality. The study also showed that using too much nitrogen actually *decreases* crop yields while using less nitrogen *increases* them (Jacobs & Dunn, 2007). Additional suggestions to help lower the need for chemical fertilizers include:

- *Leave crop residue on the surface of the soil to decompose naturally*.
- *Replace commercial fertilizers with manure*. Manure, if it's available, can reduce chemical fertilizer costs by as much as $85 per acre. Another good fertilizer source, which is used by farmers around the world from Canada to the Baltic region, is fish waste (if it's available).
- *Reduce overlap on fertilizer applications*. Up to $13 an acre can be saved by not covering the same areas twice.
- *Rotate crops*. Switching fields from non-legume production (e.g.: corn) to legumes (e.g.: peanuts, soybeans…) not only reduces the amount of fertilizer needed, in some cases it can eliminate insecticide requirements.
- *Control weeds mechanically*. According to the *Iowa State University Agriculture Engineering Department*, rotary hoeing and row cultivation can greatly control weeds when herbicides fail - in some cases, by as much as 50-percent. New tool designs allow for increased efficiency and decreased levels of crop injury.
- *Spot spray for weed control*. Spot spraying (i.e.: only spraying areas that need it) is more economical than spraying an entire field. Set up a dual spraying system for banding (spraying over a narrow width) and, if needed, a wider broadcast application. Contact a weed control expert for details (preferably one who is not selling herbicides).

Reducing Pesticide Use

Pesticides are non-discriminatory. This means that they kill beneficial insects as well as destructive ones. Breakthroughs in safe pest reduction include pheromones (mating scents) that attract and destroy insects, biologically-derived pesticides, insect traps, and other natural aids. Unfortunately, many farmers dismiss these alternatives and stick with poisons because they know that poisons

kill bugs. Genetically modifying crops to make them resistant to pests is another option, but the long-term effects of this practice are unknown. Critics say that the pests GM crops are designed to eliminate can ingest the gene-modifiers and develop into even nastier species.

Simple and safe suggestions for reducing the cost and dangers of pesticide use include (keep in mind that golf courses, which are widely believed to among be the most chemically treated areas in the world apart from fruit orchards, can also benefit from pesticide reduction):

- *Rotate crops*. Again, switching fields from non-legume production (e.g.: corn) to legumes (e.g.: peanuts, soybeans…) can eliminate or greatly reduce insecticide requirements.
- *Determine a bonafide need for insecticides before applying them*. Don't assume that crops need spraying simply because the neighbors are spraying theirs (they may be working to a different planting schedule or planting different hybrids). Equally as important, don't immediately start spraying when pests have been discovered. First determine if the damage caused by the pests looks to be greater than the costs of spraying. Contact a local agricultural center for advice.
- *Reduce pesticide use*. Research in 12 American states shows that reducing pesticides by up to 75-percent can provide just as much protection as the amount suggested by the manufacturer. In other cases, half as much insecticide was just as effective as the recommended dose. Granted, most pesticide manufacturers will not cover losses from crop loss when applications are used below recommended rates, however, under the right circumstances, reducing pesticide use can be both efficacious and cost effective.

Saving Water on Farms

Most of the water needed by farms is used for irrigation purposes (sometimes three times more than is needed). Because water is heavy, it requires huge amounts of energy to move from one area to another. Proven suggestions for reducing agricultural water requirements include:

- *Conduct regular inspections of irrigation systems*. Fix leaks, replace worn nozzles, and trim pump impellers when appropriate (see Chapter 35).
- *Install water meters and monitor water use*. Water usage can't be properly managed until it's measured.
- *Use efficient pumps*. On average, it takes 185 kWh of electrical energy to raise one acre-foot of water an elevation of 100 feet (30 meters). If the efficiency of a water pump is increased from 55-percent to 65-percent, annual energy consumption can be reduced by 26-percent.
- *Don't irrigate on a set schedule - only irrigate when conditions call for it*. As with any production process, monitor what is happening in real-time. This means ensuring an area needs watering before irrigating. Equally as important, monitor soil conditions during watering to prevent using too much. Inexpensive calibration tools are available for this purpose and will eliminate the need for guessing.
- *Use drip irrigation wherever possible*. When installed correctly, a drip irrigation system can reduce water waste by 30-percent or more. In addition, drip irrigation – which has inherent efficiency levels of up to 96-percent - has been proven to decrease off-target chemical drift, reduce insecticide costs while lowering the need for physical labor, and diminishing soil erosion. Of course optimum performance depends on the uniformity of moisture held in the soil, the type of soil being watered, the capacity for water supply and drainage, and system configuration as well as ground cover.
- *Don't flood irrigate*. Flood irrigation is the most inefficient way to irrigate a field, followed by (in order of inefficiency) Van den Bosch irrigation, traveling irrigators, fixed sprinklers, and center pivot irrigation.
- *Lower water pressure*. Converting sprinkler systems from medium-pressure to low-pressure can save $9 in water costs per acre. Switching from a high-pressure to a low-pressure system can save $41 per acre.
- *Trap excess water and reintroduce it into the irrigation system*. Obviously, the more efficient an irrigation system is the less chance there is of recapturing excess water. Regions that receive periodic heavy rain, however, can make this idea viable. Water recapture can also 'recycle' run-off fertilizers. This means that recaptured water must be checked first to ensure it can be used for its intended purpose.

Reducing Water Requirements when Working with Livestock

On average, a typical dairy farm uses approximately four gallons (15 liters) of water to make one gallon (3.78 liters) of milk. Yet many experts claim that water use can be reduced by up to 75-percent with the following practices:

- *Train employees to use water efficiently*. Get them to agree that wasting water is unacceptable.
- *Fix leaks*. A leaking joint or faucet can waste ten gallons (37 liters) of water per day.
- *Pay attention when filling tubs and tanks*. An unattended tank or tub running over wastes up to five gallons (19 liters) of water a minute. Install floats that shut off water supplies when the tank is full
- *Use automatic shut-off nozzles on all water hoses*. This simple solution reduced the water use of a UK dairy farm by 21-percent, which resulted in annual cost savings of $2,400.
- *Don't use water hoses as brooms*. Clean up spills instead of hosing them away. If possible, reuse dairy water for yard wash (which reduces the risk of overloading effluent ponds with extra water).
- *Use high-pressure, low-volume cleaning systems and inspect air injection components and operation settings to ensure that only the amount of water needed for each wash cycle is used*.
- *Divert wash water to a storage tank and reuse it as gray water*.
- *Capture and reuse the pre-cooler water used to chill milk*. Allowing it to run down the drain can waste up to 30 gallons (113 liters) of water per minute.
- *Rinse equipment in sinks or buckets rather than with running water*.
- In hot climates or temperatures, livestock often have to be sprayed with water to cool them down. Don't spray continuously. *Cycle the unit off and on in coordination with a fan system*.
- *Decrease the amount of manure produced by adjusting feed rations*. This is particularly true with hog-raising. By reducing crude protein levels and feeding pellets and enzymes rather than meal, manure productions can be decreased along with the need to hose down the pig pens.

Additional Livestock Facts and Figures

Like any product, livestock consume vast amounts of raw materials (e.g.: animal feed) while producing large amounts of waste. For example:

- It takes ten pounds of feed grain to produce one pound of beef.
- Three pounds of animal feed are required to produce a pound of pork.
- Two pounds of animal feed are needed to produce one pound of chicken[*].
- And one-and-a-half pounds of feed pellets are required to produce one pound of farmed fish (the exception is farmed salmon, which is notoriously inefficient).

The waste produced as a byproduct of all this feed – manure - is another concern, usually amounting to more than can be used as fertilizer. Excess manure produces huge quantities of nitrous oxide, a compound that has a heat-trapping potential 296 times that of carbon dioxide.

Despite what many farmers believe, using natural processes to raise livestock can be cheaper (and safer) than artificial alternatives. For example, by keeping cows in pasture longer and regularly moving them from area to area to imitate the natural grazing cycles of wild animals (which can avoid the energy, expense, and labor of processed hay and feed) it's possible to save over $10 in feeding costs per cow while reducing grazing damage. Additional cost effective practices that can make livestock rearing more affordable include:

- Keep livestock pens clean and well ventilated.
- Replace incandescent light bulbs in indoor livestock areas with energy-efficient bulbs or skylights.
- Fully insulate buildings or structures that require heat or cooling.
- Regularly clean and adjust fans, shutters, motors, controllers, and thermostats.

For more farm and livestock related energy-saving ideas visit: http://adminsrv.usask.ca/psci/energy.htm

[*] as wasteful as livestock keeping may be, the materials and processes needed to create a roast chicken dinner actually produce fewer greenhouse gases than that produced by the making of a cheese pizza (Gaist, 2007).

Vertical Farming

Although many ideas are being put forth to alleviate the problems of overworked farmland, one of the more intriguing is *vertical farming* (i.e.: using multi-storied greenhouses to grow crops). Humans have been growing food indoors for hundreds of years, but the idea of building a dedicated greenhouse system based in a multi-storied structure (a concept promoted by Dickson Despommier of *Columbia University*) is relatively new. Despommier has calculated that one vertical farm taking up the space of one city block and rising to 30 stories could provide enough nutrition to accommodate the needs of 10,000 people. With each story capable of containing up to three (or more) work surface levels, one acre of vertical farm would therefore be equivalent to as many as 10 to 20 traditional farm-based acres (depending on the type of crop grown). Growing crops indoors would also enable numerous year-round harvests. Additional benefits include:

- There would be no weather related crop failures.
- Crop failures from pests or diseases would be virtually nonexistent.
- Chemical pesticides and herbicides (and most chemical fertilizers) could be completely eliminated.
- Water and wastewater could be used more efficiently (i.e.: by locating close to a city, unlimited supplies of gray water and sewage water could be used for irrigation).
- Locating closer to population centers means that agricultural processing and storage waste can be greatly reduced.
- Spoilage problems facilitated by inadequate processing, storage, and transport, could be eliminated.
- Infectious disease agents (e.g.: geohelminths, malaria, schistosomes, etc) that thrive on, or are transmitted by, traditional agricultural methods (plowing, sowing, irrigating, and harvesting) can be reduced.
- Agricultural vermin populations (rats, cockroaches, mice, etc) would decline or be eliminated.
- New employment opportunities would be created.
- The use of fossil fuels would be drastically reduced (no tractors or plows are needed in vertical farming).

- Traditionally farmed areas could be converted back into a natural state.
- Methane produced from decomposing crop remains could be converted into a reliable power supply.
- Lastly, according to some proponents, the lessons learned from vertical farming would be invaluable in colonizing the moon and Mars!

For more information about vertical farming, visit: www.verticalfarming.com.

The message here is that no matter how simple or complex a production system is, a few thoughtful changes can help set it off in a new, less costly and more efficient direction. Granted the ideas in this and other chapters of ***Managing the New Frontiers*** may seem a bit basic (or even foreign), however, we all have to begin somewhere. With each passing day, new techniques and new technologies are being developed to help make production less wasteful and even more cost effective. Don't be left behind. Start with the fundamentals, gain a few good habits, and progress from there. Every business mentioned in this book will tell you that it's worth the effort. .

Bibliography

ATTRA (the National Sustainable Agriculture Information Service), www.attra.ncat.org, accessed October 2007.

BBC, Virgin Atlantic Move to Save Fuel', http;//news.bbc.co.uk/go/pr/fr/-/2/hi/business/6203636.stm, December 3, 2006.

Debert Eco-Industrial Park: The Road Forward, by the School for Resource & Environmental Studies, Dalhousie University, 2005.

EIT (Energy Innovators Initiative, Office of Energy Efficiency, Natural Resources Canada, http://oee.nrcan.gc.ca/eii, 2002.

EMIAA (the Environmental Management Industry Association of Australia), 'Cleaner production – Reuse, Recycle, and Treatment Options – Banskia Food Product Pty Ltd', www.emiaa.au, accessed November 2007.

Energy Matters, 'Why Your Plant Should be Efficient', published by the U.S Department of Energy (Energy Efficiency and Renewable Energy), www.eere.government.org, Winter 2007.

Energy Star, www.energystar.gov

Gaist, Liz, 'Earth to Peta', *Salon.com* (www.salon.com/news/feature/2007/peta), October 22, 2007.

Grimes, Cathy, 'Help Your Car Become More Efficient', www.dailypress.com, Newport News, Virginia, September 6, 2007.

Hawken, Paul & Lovins, Amory & Lovins, L. Hunter, *Natural Capitalism*, Little, Brown and Company, Boston, 1999.

Hollander, Justin B., & Lowitt, Peter C., Applying Industrial Ecology to Devens: A Report for the Devens Enterprise Council, www.devensec.com/ecoreport.html, March 2000.

Jacobs, Eleanor & Dunn, Kara L., 'On-Farm Research Shows Farmers can Use Less Nitrogen to Save Money and Reduce Environmental Impact', *Cornell Chronicle Online* (www.news.cornell.edu/stories/June07/less.nitrogen.kd.htm/), June 19 2007.

Jyrki, Heino & Tuomo, Koskenkari, 'Industrial Ecology in the Metallurgy Industry: the Harjavalta Industrial Ecosystem' (proceeding of the Waste Minimization and Resources Use Optimization Conference, June 10 2004), University of Oulu, Finland, *Oulu University Press*, pp. 143-151, 2004.

Koppelman, Alex, 'Is the Way We Raise Our Food Giving Us MRSA?' www.salon.com, November 7, 2007.

Korean NCPC (for more information contact: jaekim1@kitech.re.kr or jykang@kitech.re.kr), 2007.

Laudal, Terry, 'The Deeper benefits of Going Green: More than Just Buildings', *GreenBiz.com*, (accessed October 2007).

Lovins, Amory & L. Hunter Lovins & Hawken, Paul, 'A Road Map for Natural Capitalism', *Harvard Business Review*, May-June 1999, pp. 145-158.

McGrath, Matt, 'Ship's CO2 Twice That of Planes', *BBC News*, http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/7052037.stm, October 19, 2007.

Sayre, Caroline, 'Make One Right Turn After Another', *Time.com* (www.time.com/time/printout/0,8816,1603741.html), March 28, 2007.

Smallbiz, 'What are the Benefits of Cleaner Production?', www.smallbiz.nsw.gov.au (see 'cleaner production), Dept, of State and Regional Development, New South Wales, Australia, accessed November 2007.

UNEP, 'Cleaner Production – Key Elements', www.uneptie.org/pc/cp/understanding-cp/home.htm, accessed Nov. 2007.

White, Sue, 'Save Water, Save Waste, and Smell the Difference', *The Sydney Morning Herald* (www.smh.au), September 26, 2007.

WSDE (the Washington State Department of Ecology), Office of Communication and Education, 'Toxic Reduction Successes', 07-01-032, July 2007.

Yu, Qian & Yun, Chen & Yanbin, Jiang & Lijuan, Zhang, *Journal of Cleaner Production*, vol. 15, issue 10, November 2007, pp. 920-926.

Zelinski, Peter, 'Why Boeing is Big on Right-Size Machine Tools', *Modern Machine Shop Online*, www.mmsonline.com/articles/030601.html, accessed September 2007.

ENDNOTE

As the secondary title of this book states, the material presented within these pages has been designed primarily for beginners (as well as experienced practitioners looking for a broad reminder of the fundamentals). For more in-depth analysis and material, start by visiting the websites of the following organizations. Each is dedicated to providing the latest research, information, and commentary on efficiency, sustainability, waste reduction, and related subjects.

GreenBiz
www.greenbiz.com

Greener Design
www.greenerdesign.com

Greener Buildings
www.greenerbuildings.com

The Product-Life Institute
www.product-life.org

The Rocky Mountain Institute
www.rmi.org

The World Resources Institute
www.wri.org

Business for Social Responsibility
www.bsr.or

The Stockholm Environmental Institute
www.sibi.su.se/exp.html

The International Institute for Sustainable Development
www.iisd.org

The World Business Council for Sustainable Development
www.wbcsd.org

INDEX