LEAN AND GREEN

PROFIT FOR YOUR WORKPLACE AND THE ENVIRONMENT

PAMELA J. GORDON

20 LEADING ORGANIZATIONS MAKE IT HAPPEN—YOURS CAN TOO!

An Excerpt From

Lean and Green:
Profit for Your Workplace and The Environment

by Pamela J. Gordon

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Introduction

The Myth That Environmental Practices Are Bad for Business

> We compare our environmental expenses to the estimated savings that result from the company's pursuit of environmental leadership. The savings have offset the expenses by approximately two to one.
>
> —Diana Lyon, program director,
> Corporate Environmental Affairs, IBM

THE saddest myth in 20th-century business circles was that protecting the environment was the enemy of profitability. *Lean and Green* dispels this myth by presenting evidence gathered from organizations around the world that profitable business and environmental protection go together. Had we upended this myth sooner, companies would have enjoyed greater efficiencies, consumers lower prices, and the planet healthier conditions than when the century began. But we can still achieve all the benefits of being Lean and Green in the 21st century.

The Myth That Inspired a Book

As a successful business owner and consultant to high-tech industry executives, I've witnessed the cost of the myth that lean business practices and environmental measures are mutually exclusive. We cannot bring back the companies that have failed owing

to needless expenditures on wasted materials and inefficient production. It's too late to save the jobs of people whose companies could no longer afford to keep them because the companies had to spend millions of dollars on fines and cleanup after spilling hazardous materials. And thanks to action or inaction that resulted in polluted air and water, gone are countless species of animals and plants as well as billions of trees that a balanced planet needs. Our landfills are bulging with slow-to-decompose materials and our air contains 30 percent more carbon dioxide compared to early last century—even in areas as remote as the North Pole.

Yet in recent years I've met dozens of people in organizations who have challenged the myth that they can be either lean *or* green. Some have been motivated primarily to decrease expenditures and increase revenue—the two building blocks of profit—and the environment was a secondary beneficiary. Others primarily have wanted to do the right thing for the environment, and grew successful in their organizations by finding many ways to do so while maximizing profit. Impressed with what I had learned about improving profit and the environment, I decided to write a book about how people at any level of an organization can make their workplaces Lean *and* Green.

I realized that to convince you and other readers of the promise that workplaces and the environment can profit together, I would need to write for the skeptic. So I interviewed management and employees at organizations you know, compiling evidence of expenses saved or revenue generated by their environmental initiatives, as well as the costs of those programs. Here I present enough technical and business facts to dispel the skeptic's concern that, in business, green is a whitewash. The 20 organizations whose Lean and Green successes and mistakes I've included in this book have, at this writing, these three characteristics:

1. They are well known and economically successful (most are leaders in their fields).
2. In the past five years, they have committed no major infractions of environmental laws or regulations.
3. They have measurably increased their revenue and/or decreased their expenses through steps that benefit the environment.

Many of these organizations are particularly good examples because they have made environmental errors in the past and have learned from their mistakes. I chose organizations whose geographies and industries are diverse, as Table 1 illustrates (see pages 4–8). The table summarizes some of my favorite Lean and Green efforts—those that are particularly clever, that include all employees, or that dispel the myth that benefiting the planet and making a profit are incompatible goals.

In this book you will meet dozens of visionary leaders from these organizations and hear their stories about successes and mistakes in finding the intersection of profit and the environment. You also will meet many of these organizations' individual employees who—when they saw waste and missed opportunities—said to their managers, "We can do this a better way."

Totaling Monetary Benefit from Lean and Green Steps

As I prepared to visit the 20 organizations, I hoped I would find enough empirical evidence of the Lean and Green promise to convince even the skeptics that what benefits the environment can also provide monetary benefits. In visit after visit, my findings exceeded even my own expectations. Here are just a few:

(continued on page 8)

Table 1 The 20 Lean and Green Organizations with Stories in This Book

Organization and Website URL	*Sites Visited (products, services)*	*My Favorite Lean and Green Stories*
Agilent Technologies (formerly part of Hewlett-Packard) www.agilent.com	South Queensferry, Scotland (telecommunications)	Security guards wrote "nasty" notes to employees to encourage them to turn off computer screens at night; the result: 400 megawatts hours of electricity saved per year.
Apple Computer Corporation www.apple.com	Sacramento, California, USA (computer products)	Team Recycle drove Apple to recycle—which it now does for 97.3 percent of all incoming materials.
British Aerospace, Military Aircraft & Aerostructures Division www.bae.co.uk	Samlesbury, England (aircraft)	The company adopted an at-home environmental program, including a quiz written by an employee about Lean and Green shopping.
Celestica Inc. www.celestica.com	Toronto, Canada (electronics manufacturing services)	Instead of replacing ozone-depleting cleaners with water cleaners, they made the whole cleaning process unnecessary.
Compaq Computer Corporation www.compaq.com	Houston, Texas, USA (personal computers)	Architects designed buildings with skylights, to significantly reduce electricity use.

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Table 1 *(continued)*

Organization and Website URL	*Sites Visited (products, services)*	*My Favorite Lean and Green Stories*
Horizon Organic Dairy, Inc. www.horizonorganic.com	Paul, Idaho, and Annapolis Maryland, USA (dairy farm)	Through organic farming and by treating the cows better, the company eliminated the need to buy chemicals, hormones, or fertilizers.
IBM Corporation www.ibm.com	Endicott, New York, USA (printed-circuit boards)	By developing a method to reuse etchant chemicals through contact with oxygen-rich air, the company reduced its use of etchants by 50 million gallons a year.
Intel Corporation www.intel.com	Chandler, Arizona, USA (semiconductors)	Designing green manufacturing processes for products to be released 8 to 12 years into the future reduces the need to buy abatement equipment or get permits for hazardous processes that otherwise would have been used in the interim.
ITT Cannon, a division of ITT Industries www.ittcannon.com	Santa Ana, California, USA (connectors for ships, airplanes, etc.)	Employees convinced the military to use degreasers that do not deplete the ozone and that cost less.

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Table 1 *(continued)*

Organization and Website URL	*Sites Visited (products, services)*	*My Favorite Lean and Green Stories*
ITT Gilfillan, a division of ITT Industries www.gilfillan.itt.com	Van Nuys, California, USA (radar)	This company developed a method of labeling parts using a computer printer instead of smelly, hazardous paints.
Kyocera Corporation www.kyocera.co.jp	Tokyo, Japan (printers)	Designers developed printers that cost less to use and have fewer parts to replace.
Louisiana-Pacific Corporation www.lpcorp.com	Hines, Oregon, USA (wood products for building supplies)	Management overhauled the corporate culture, teaching employees to communicate with management and teaching management to value decisions that are environmentally sound.
LSI Logic Corporation www.lsil.com	Gresham, Oregon (custom semiconductors for communications products)	By reusing water in the production facility, the manufacturing process needs 63 percent less water than it did before.
NEC Corporation www.nec-global.com	Tokyo, Japan (semiconductors and consumer electronics)	The company's "zero waste" program is saving 0.2 percent in product costs.

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Table 1 *(continued)*

Organization and Website URL	*Sites Visited (products, services)*	*My Favorite Lean and Green Stories*
Philips Electronics N.V. www.philips.com	Eindhoven and Nijmegen, Holland (semiconductors for televisions, shavers, and other products)	Employees who design environmentally sound products and manage plants with Lean and Green results are eligible to win the company's EcoVision award.
Polaroid Corporation www.polaroid.com	Dumbarton, Scotland (cameras)	After redesigning the product assembly process to nearly eliminate wasted materials, the cost of manufacturing was reduced by 20 percent.
Santa Monica www.santa-monica.ca.us	Santa Monica, California, USA (city government)	This city was the first on the West Coast to pave residential streets with white-top, which is stronger and thinner than black asphalt, reduces urban heat by 15 degrees on the street level, lasts 50 years instead of 5, and costs just a little more to install.
Sony Corporation www.sony.com	Tokyo, Japan (sound systems and other products)	The company recycles sludge to make cement and has implemented other waste-less and recycle-more ideas; waste disposed of per unit of sales fell 30 percent in four years.

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Table 1 *(continued)*

Organization and Website URL	*Sites Visited (products, services)*	*My Favorite Lean and Green Stories*
Texas Instruments Incorporated www.ti.com	Dallas, Texas, USA (semiconductors)	Having planned to design-out hazardous materials in 6 to 12 months, employees eliminated the use of 49 of 50 hazardous chemicals in only 2 months.
Thomson Multimedia www.thomson-multimedia.com	Boulogne, France (televisions and other consumer products)	Scientists improved the plastic for television cabinets to eliminate not only any caustic paints but also the entire expensive and time-consuming painting process.

- Texas Instruments' reduction of hazardous waste by 44 percent has an enormous impact on profitability and productivity. The company recycles 81 percent of nonhazardous solid waste in its U.S. operations (and 75 percent worldwide), which saves $23 million worth of water and energy, not to mention saving trees and reducing landfill. TI spends $160 million on manufacturing resources each quarter; the environmental programs are designed to optimize the company's resources by at least 10 percent—to save at least $16 million each quarter. Actually, TI's environmental achievement at this writing has exceeded the 10 percent target.
- LSI Logic's environmental programs have saved the company more than $2 million. LSI has significantly reduced its use of

hazardous manufacturing chemicals such as sulfuric acid, photoresist, and phosphoric acid, saving the company $1.2 million alone. The company has reduced its total volume of hazardous waste by 88 percent since 1987.

- NEC Semiconductor's environmental protection plan generates 0.2 percent of its total semiconductor sales in cost savings and recycling revenues.
- Thomson Multimedia's worldwide environmental projects yield the company $12.5 million each year through cost avoidance, cost savings, and revenue generation. Waste reclamation and glass recycling (from TV CRTs) contribute the most toward the $12.5 million. By reducing electricity, fuel, and gas in Europe alone the company saves $2.8 million.
- Sony's U.S. operations generated $1.8 million by reducing industrial waste (36,000 tons of industrial waste, including printed-circuit boards and office paper) and reduced electricity use by $1.3 million.
- Polaroid in Scotland saves £3.8 million (nearly $6 million) per year by creatively reusing (and eventually recycling) suppliers' shipping boxes.
- Philips has saved more than 1 billion Dutch guilders (more than $400 million) per year by reducing waste 28 percent, energy use 23 percent, and water use 34 percent. Philips saved 17 percent more than it had originally projected.
- ITT Cannon: Cost savings from replacing ozone-depleting chlorofluorocarbon (CFC) solvents with water-soluble solutions are close to $1 million each year.

- The city of Santa Monica, in addition to its white-top *street* success above, is saving $50,000 a year by using an innovative application of small paving materials for *sidewalk* repairs. Street maintenance employees developed this idea, which saves time, labor, and materials and reduces waste.
- British Aerospace: Samlesbury shop-floor employees' efforts to find environmentally friendly improvements that make their processes leaner yielded £480,000 (more than $700,000) savings per year.

And what about revenue gain? Some of the best-selling products of Lean and Green organizations, such as Horizon Organic Dairy and Louisiana-Pacific, were created to minimize waste, chemicals, and unnecessary transportation. Yes, green products designed to meet customer needs do sell well.

Another critical type of monetary benefit of Lean and Green thinking is protecting an organization's good reputation. Fear of violating environmental regulations motivated executives at chip maker LSI Logic to insist on a strong environmental department. Wilfred Corrigan, LSI Logic's chief executive officer, was one of the presidents of Fairchild, an early semiconductor company that generated significant environmental problems. During LSI's formative years in the early 1980s, the semiconductor industry was prominent on lists of polluting companies. Linda Gee, environmental health and safety director at LSI, told me, "I still have the memo Joe Zelayeta, executive vice president of worldwide operations, sent me when I started with LSI. It was a list of noncompliant companies that had discharged wastewater to the City of San Jose Sewer Plant. Joe wrote, 'Congratulations, this is a great list *not* to be a part of. I know you seldom get any notoriety except

when you have a problem, so I think you should get credit for avoiding the dishonor roll in the *San Jose Mercury News*. Thanks!'" Linda has kept LSI off the lists and in the black through her dogged attention to waste reduction and reuse of materials.

But How Much Is *Spent* on Environment Steps?

According to the lean *or* green myth, environmental concerns take resources away from business, and time and funds diverted from narrow-enough profit margins will take business off course. Actually, the reverse is true: IBM, for example, estimates that for every dollar spent on environmental benefit or pollution prevention, two dollars are added to the bottom line.

Intel participates in a benchmarking study with PricewaterhouseCoopers to determine the cost to organizations of their environment, health, and safety (EHS) organization—the number of EHS employees per billion dollars of revenue. Intel's cost is among the lowest in the sample, and the by-product of its environmental programs is reduced operational costs and getting new products to the market faster by fulfilling and going beyond environmental-permit standards.

Linda Gee at LSI Logic says that many environmental program expenditures—such as for on-site recycling equipment through which used chemicals are passed, then used again—make money for the company in less than one year.

Polaroid's savings of £3.8 million (nearly $6 million) from its reusable-box program does require paying four times more per box for the reusable shipping boxes (£4) than it paid for cardboard boxes (£1). The original plan was that after reusing the same box for four trips, Polaroid would break even. Polaroid stopped counting the return trips after the boxes exceeded 64 trips, and the company estimates that many boxes have made more than 500 trips

before being recycled. Even including the cost of shipping flats of the reusable boxes back to suppliers in Mexico and Malaysia, savings exceed ship-back costs hundreds of times.

Four Lean and Green Steps for the Biggest Impact

I want to make it as easy as possible for you to make quick, effective changes in your workplace for the improvement of our natural environment while strengthening your organization. So, I am giving you the four fastest steps to Lean and Green (listed in sidebar). I synthesized these four steps after witnessing results at the Lean and Green organizations and asking the Lean and Green champions I visited around the world which techniques had produced the most cost savings or revenue *and benefited the environment*.

Four Steps to Lean and Green

1. **Question wasteful practices, and design Lean and Green steps to benefit profit and planet.** Get people in your organization to think creatively in order to arrive at Lean and Green solutions; for the most dramatic benefits, encourage them to think about steps that can be taken *before* waste is created.
2. **Gain endorsement for Lean and Green ideas using business language.** Lead your environmental points with profit in mind — starting with strategies that yield the highest rewards to profit and planet.
3. **Collaborate throughout the organization to meet Lean and Green goals.** If you can, start at the top of the organization to obtain buy-in there, then adopt the Lean and Green practices elsewhere in the organization.
4. **Measure your organization's Lean and Green progress, and strive continuously to improve.** Make sure that the Lean and Green steps your organization is taking are truly healthful both for planet and for profit, and keep raising the bar.

Chapters 1 through 4 guide you through these four steps. Then, the rest of this book's chapters present real-life stories that provide inspiration for making the four steps work at *your* organization. They include practical suggestions for what *you* can do in *this* century to help produce a win-win outcome: successful business practices and a healthy planet.

Competition Is Doing Its Job

Leaders who think that what is good for the environment is bad for busi-

ness are at a competitive disadvantage. Their profit margins are several points lower because they purchase and dispose of excess materials and pay for waste that needn't have been created in the first place. They forgo revenue from recycling (such as Apple's gain of $1 million) and from marketing "green" products (such as Philips's popular GreenChip™). They take unnecessary processing steps and pay sick leave and health care costs when employees are exposed to ill-chosen chemicals. Some of these leaders' organizations have leaked toxins into the groundwater and polluted the air—resulting in millions of dollars in fines and cleanup costs. Had these inefficiencies been avoided and accidents been prevented by sound environmental policies, their earnings would have been much higher.

By taking environmental steps, many of the Lean and Green organizations are shaving 1 to 15 percent and more off costs. These savings can allow them to reduce prices—a move that usually increases market share—or earn higher profits if prices are held steady.

As *Lean and Green* organizations outperform those that are buying too much, wasting what they buy, and missing green revenue opportunities, more stakeholders will insist on changes. Note how my Lean and Green contacts achieve competitive advances by making environmental improvements in their organizations.

- Danny Martland is environmental advisor at British Aerospace's Samlesbury facility. He observes that his site "is renowned for lean manufacturing to survive in the world market. We've already looked with a fine-tooth comb to make machines more efficient and cut out waste. Then in only 12 months of getting people interested in making environmental

improvements, we achieved nearly an additional £500,000 of efficiency."

- David Lear, environmental program manager at Compaq, says, "It's hard to put a price on avoiding liability, but I try to do so by looking at financial and environmental reports for what our competitors have spent to correct environmental mistakes: some electronics companies have spent upwards of $150 million in one year. Think of the number of computers they'd have to sell to earn back that money in profits! We also look at other companies' employee count and departments assigned to clean up environmental mistakes. Our group is lean because we've not had environmental mistakes to clean up."

- Walt Rosenberg is director of corporate environmental affairs at Compaq, where, on a per-product basis in the competitive personal computer market, he says, "even 1 percent cost savings is motivational. We're fighting on pennies on some components—because pennies count when multiplied by millions of units. The mindset is 'every single cent.' A reusable transport pallet saves $5 per unit—this becomes a fundamental business benefit."

- Bob Barrett, an environmental and material engineer at ITT Gilfillan, notes that the radar market is very competitive right now. "When we improve radar design so they are smaller, lighter, more efficient, and more reliable, and use fewer materials, less coolant, less power, and less space, and use fewer chemicals with associated complications, we get a competitive edge."

- Frank O'Rourke is the EHS manager at Celestica. He looks for every possible way to save money because, in Celestica's

industry—electronics manufacturing services—profit margins are small. The main reason name-brand companies outsource manufacturing to companies like his is to reduce costs.

Becoming Lean and Green Table 3 provides a few typical "before and after" stories about Lean and Green organizations. *You* can help create an "after" picture for the organizations you know.

Table 3 Company Practices Before and After Lean and Green

	Before Lean and Green	*After Lean and Green*
Purchases	Buying, storing, and managing more materials than really needed; paying higher bills for energy and water.	Eliminating some purchases by designing processes and products that save steps, time, materials, and square footage; reducing other purchases by reusing existing materials.
Disposal	Paying freight and handling to dispose of materials that could have been avoided, reused, or recycled; obtaining and renewing time-consuming and expensive permits for disposing of hazardous materials.	Paying less for disposal because much less is wasted; earning revenues through recycling.
Transportation	Paying more for transportation of incoming materials and hauling waste.	Using less transportation by processing and packaging and reducing the quantity of materials flowing into and out of each site.

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Table 3 Company Practices Before and After Lean and Green

	Before Lean and Green	*After Lean and Green*
Labor	Excessive hiring to maintain wasteful procedures; watching absences and illness rise owing to exposure to unnecessary chemicals.	Employees reporting fewer headaches and other illnesses and accidents; morale increases through the pride of working for a Lean and Green organization.
Cleanup and Fines	Cleaning up spills and paying penalties of millions of dollars; damaged reputations and even prison sentences.*	Incurring no costs for cleanup or fines; strengthening reputations by processing wastes properly.
Revenues	Losing market share to competitors who use material and energy efficiencies to offer less expensive products or products that have a smaller impact on the planet.	Earning greater market share by introducing efficiencies that allow prices of products to be reduced; offering innovative products that reduce operational costs and meet customers' increasing "green" standards.
Bottom Line	Higher expenses and lower revenues = LESS PROFIT	Lower expenses and higher revenues = MORE PROFIT

*As occurred at one of the twenty organizations before it became Lean and Green.

You Can Transform Your Organization

In this book, I introduce you to clerks, farmers, lumber mill workers, engineers, city employees, chemists, managers, and executives. They work for 20 successful organizations all over the world. You will read about their successes and mistakes as they

strived to make their organizations healthier financially and more productive for employees, the community, and the planet. All of them have made a discovery: Lean and Green can coexist because what's good for business—less waste and fewer production steps—is good for the environment too.

I invite you to be receptive to the idea that it's possible for you to make the organizations you touch Lean and Green.

Part I
The Four Steps for Creating a Lean and Green Organization

THIS part of the book provides you with the basics: the four Lean and Green steps, which are helpful to memorize, and some ideas about how to take each one.

Step 1. Question wasteful practices, and design Lean and Green steps to benefit profit and planet.

Step 2. Gain endorsement for Lean and Green ideas using business language.

Step 3. Collaborate throughout the organization to meet Lean and Green goals.

Step 4. Measure your organization's Lean and Green progress, and strive continuously to improve.

When I make a list of what I want most in life, I start it with the wish that the planet have clean air and clean water. To me, every-

thing else pales in comparison. Also on my list is continued success in my career as a management consultant in the high-tech and environmental fields. I get tremendous satisfaction from helping executives to increase the profitability of their businesses.

Those two goals are my biggest motivation for writing this book to convince you that you can make improvements—right away and with less effort than you might think—to the health of the environment and your business or organization. The four Lean and Green steps featured in Chapters 1 through 4 are the best way I know of to achieve the Lean and Green promise in your workplace.

Chapter 1

Question Wasteful Practices

> The groundswell associated with the environment is changing industry. Employees who completed school 10 and fewer years ago ask their managers, "Why are we doing such and such a thing?" They're bringing in waste-reduction ideas.
>
> —Ian McKeown, senior engineer of Health, Safety, and Environment, Polaroid

THIS chapter focuses on the first of the four Lean and Green steps: Question wasteful practices, and design Lean and Green steps to benefit profit and planet. Get people in your organization to think creatively to arrive at Lean and Green solutions; for the most dramatic benefits, encourage them especially to think about steps *before* waste is created. Many of the Lean and Green companies' best ideas for cost savings and environmental good come from employees without "environment" or "manager" anywhere in their titles. Let your creativity soar. Your idea could save money, trees, or likely both.

One of the reasons I wrote this book is to make more people aware of the tremendous impact organizations can have on the planet and its inhabitants' health—both positively and negatively. Think about this: You and I can reduce waste at home and recycle our newspapers, cans, bottles, and paper. In fact, doing so

happens to be my favorite household chore because I know that these items will not contribute to local landfills, which in my community are filling up the beautiful San Francisco Bay. Yet you and I can reduce the use of landfills and incinerators in several communities—perhaps around the world—when we create waste-reduction strategies for our organizations. This truly is a faster and more effective way to curb and reverse the trend on our planet to waste more and more resources.

At IBM, for example, which has dozens of manufacturing sites and hundreds of sales and administrative offices worldwide, individual employees at all levels have helped to improve the environment while benefiting IBM's business. One employee's idea to give each employee a ceramic mug is reducing the company's use of paper and styrofoam each year. In addition to providing an environmental benefit, IBM's suggestion program gives its employees a percentage of the cost savings that result from their ideas.

Notice and Question

Employees in the trenches—those with customer contact, who order materials, and who build products—often are better positioned than management to notice practices that can be improved and to question why things are done a certain way. Wherever you work, pay attention to what chemicals, energy, and supplies your company buys that could be eliminated with only a few changes.

Here's an example of how individual employees are encouraged to notice and question usual practices: Henk de Bruin at Philips told me that employees at a new factory wanted the plant to meet the environmental standard set by ISO 14000 (see Glossary) by the time it started manufacturing products: "So the factory simply created environmental-action teams in each

department who asked all employees in the plant, 'Suppose that in your day-to-day work you want to decrease negative impact on the environment, how would you do it?' Someone said, 'Let's use as many as four receptacles for paper, cans, and other recyclable trash.' Another said, 'Why don't we use coffee mugs instead of disposable cups?' The factory employed these ideas in the six months it took to get the factory started." De Bruin emphasized the importance of employee suggestions: "We establish improvement targets at the corporate level, but the filling in of ideas to meet these targets has to be from the bottom up."

Some Lean and Green solutions seem so obvious, but they took at least one employee to notice the waste or pollution and create a new way. ITT Cannon is making good use of some old machines, but they leak oil. The company used to spend $50,000 a year on kitty litter, which it spread on the floor around the leaking equipment to absorb the oil, and then incinerated. Since one employee questioned this expensive, environmentally questionable, and messy practice, Cannon has eliminated the kitty litter and instead is using pans under the machines to catch the oil drips; the oil is then vacuumed up and resold.

How would you like to save your company $20 million? The Packaging and Commodity Logistics Team at Texas Instruments examines how TI packages its products for shipment around the world. It considers whether materials that are thrown away could instead be recycled, reused, or eliminated. Shaunna Sowell says, "The team asks, 'Why are we doing it this way? Why can't we do it better?'" In three years the team saved TI $20 million in real costs by doing such things as getting suppliers to return packaging materials so TI doesn't have to buy them. Says Sowell, "We make people clear on what the enemy is and turn people's creativity loose on it."

A suggestion made by a team of three machine operators at

British Aerospace is saving the company £30,000 per year. They noticed that the vapor-degreasing machine ran 24 hours a day, consuming 18,000 liters of solvent and creating unsatisfactory emission levels. They questioned why the equipment had to run all the time. Danny Martland explained, "First the team decided to cut off the nightshift emissions. Then they said, 'Let's use an automatic timer to do it just two hours a day.' They found a way to improve the degreasing method by dipping parts in the tank and then raising them slowly." The environmental and cost savings resulted from controlling the degreaser operating times, fitting an automatic timer, creating new timetables for operating the degreaser, and training operators how to improve degreasing methods. The cost of implementing this change was a one-time charge of £50. Solvent use was reduced from eight barrels per week to only three, and emissions decreased by 60 percent. For creating this idea, the three operators split a £5,000 award. Danny says, "The operators on the process were putting into action part of our ethics—getting people involved. We tell employees that we look very favorably on the environmental suggestions put in the suggestion box."

Danny Martland at British Aerospace stresses the effectiveness of training employees in environmental process improvement and encouraging them to create ideas. He says, "If without this training an engineer had asked the team of three operators to make the degreasing process more efficient, the operators would not have been able to do so." An environmental coordinator at each plant helps employees develop their ideas.

Ideas to Spark *Your* Imagination

"All right," some of you are thinking, "I'm convinced from all these examples that a person could notice pollution or waste in

his or her organization, question the usual procedures, and think of a way that cleans up or prevents the waste, which means lower expenses for the company. But I'm not an expert in the environment, and I'm not particularly creative." (And if you're also thinking, "Furthermore, how could I convince management to make the change?" hold on to that question—you'll see in the next chapter that it's possible, and sometimes easy.)

Here are some creative and successful Lean and Green tactics to spark your imagination about improvements at *your* organization:

Inspired by Model Trains?

While walking down a corridor in LSI Logic's flagship facility in Oregon, I looked up and saw what looked like a model train on a track in a rectangular glass tube affixed to the ceiling. It was a cart transporting semiconductor wafers (disks from which individual semiconductor chips are sliced; also see Glossary) in a miniature clean-room environment. An employee had realized that the eight-inch wafers did not need a whole people-sized room to move from one point to another, so why not use a model-train-sized "room"? The train — which rounds the corner to go inside, out of, and around the clean room — is a unique design that saves energy and reduces costs by eliminating the need for a full-sized clean room just for the transport of wafers.

Hey—don't throw that away! Before 1994, any employee caught taking wood from one of Texas Instruments' dumpsters was fined. This policy existed because management was afraid of liability from accidents or injury. In 1994 management changed the policy: Now anyone can raid the dumpster of broken pallets or crates and use the wood to build sheds in their backyards or for other purposes. Not only is this a perk for employees, but it is a way of recycling and reduces TI's disposal costs.

What step comes before this one? One way to come up with creative solutions to pollution or waste problems is to ask yourself, "What step comes *before* this one?" Nirmal Singh at ITT Cannon provides an example (of course, some of the most creative ideas seem obvious only *after* they've been discovered): "We'd rather change

the process such that we don't need to use any chemical whose impact we are not certain of. For example, we used to use a cleaning process after production employees handled a part—to remove fingerprints. We realized that we could have the workers wear gloves so that no fingerprints occur and that cleaning step can be eliminated!"

Why can't we do this for free? As Harry Reid at Agilent Technologies explains, "An engineer named Werner Gauss in the Boeblingen, Germany, site had an idea for cooling buildings for free. Werner explained it to me and I explained it to our building program development manager, who worked with consultants to adapt it to several European sites. Werner sits on the Boeblingen sustainability group—and this idea came out of his own environmental conviction." (More about Agilent's "free" cooling system is in Chapter 2.)

Steal an idea from elsewhere in your organization "Stealing" Lean and Green ideas is encouraged by most of the 20 organizations I studied. Steve Dolan at Compaq says, "Business units are encouraged to steal ideas for environmental programs from other business units."

Exchange green ideas with competitors Some of the Lean and Green companies' ideas came from other companies. Bob Barrett at ITT Gilfillan reports that at conferences environmental managers from Hughes and other military/aerospace companies network and talk with each other informally: "At the U.S. Navy's conference at China Lake last year, a Hughes employee expressed interest in a corrosion-resistant paint process I developed, and I shared it with him. People are willing to talk."

Skip over that polluting, time-consuming process Michel Compérat at Thomson Multimedia explained to me that television cabinets normally are painted to produce a smooth finish on the set. Thomson first minimized the caustic painting process by using organic solvents, then turned to even less environmentally intrusive water-based solvents. But then the company designed some television sets whose cabinets are no longer painted at all! Thomson Multimedia has invested in the plastic-molding process to create high-quality cabinets that are so smooth that paint is not needed for cosmetic reasons. Compérat says, "We're using just half the paint now that we did three years ago." He reports that the new plastic-molding equipment was expensive but explains that his company's paint-processing equipment, systems for capturing air emissions, treatment of water and waste, and the paint itself were all even more expensive. Also, the new molding process requires less plastic material. "So," he concludes, "we have less cost, less impact on water and air, and less waste."

I asked Compérat where the idea to invest in the plastic-molding process originated. "This was the idea of several people," he said, "especially Thomson Multimedia's mechanical development group. Initially the idea was mainly for quality improvement. But we are focusing more and more on manufacturing costs reduction and on the environment benefits also." He was proud to tell me that Thomson Multimedia's small TV assembly plant in Zyrardow, Poland, which was opened in 1998, has never used paint.

Wanted: Radical Notions

When questioning wasteful practices and designing Lean and Green steps to benefit profit and planet, let your creativity take you to places previously uncharted. Some of today's common-

place products and ways of producing them were once radical ideas. I asked some of the Lean and Green contacts, "What would your company really have to do, even if it's a radical notion, to contribute to the repair of the planet's ecosystems?" Here are my favorite responses:

- Tim Yeakley, chemical optimization project manager at Texas Instruments, says "Make semiconductors out of air and water. Use supercritical water, whose by-product is water."
- LSI Logic's Linda Gee thinks like Tim about making semiconductor chips radically differently for the least impact on the environment: "Perhaps we can use only baking soda, water, and sand to produce semiconductors, or use living brain cells for chips." She adds an idea that would not only reduce impact but also *repair* the planet: "We can perhaps make chips that can help speed up environmental remediation projects."
- The "radical notion" of Walt Rosenberg at Compaq is "to use no shipment packaging at all—packaging products using air. The ultimate would be when there's a computer on a chip that does not require fans and larger enclosures. Instead of disk drives and diskettes, we'll each have a flashcard we carry with us. Instead of using computer display screens, we'll wear glasses for individual viewing. Or we'll share one flat-panel computer display in each room; the screen saver will resemble a Rembrandt, so it looks like a painting. We'll have hand-held units that plug into computers."
- Frank O'Rourke at Celestica says, "The high-tech industry as a whole needs to be more prepared for radical changes (like CFC removal) than ever before. People are getting used to change, and it's getting more competitive." He suggests as a

possible environmental solution in his industry bioelectronic devices and processes, even at the cellular level. Today this sounds radical, but tomorrow . . .

I encourage you to continuously think of ideas that will make products smaller, lighter, use fewer materials, and cost less.

And if you run out of creative juice, take a tip from Agilent's Martin Izatt: "To tell the honest truth, I've run out of ideas for conserving significantly more utilities. That's one reason I'm taking a new function (space planning and managing the engineering group, and keeping tabs on the construction of the new building), and passing along the utilities function to others who can look at these issues freshly."

MAKING IT EASY

Help Your Company Be Lean and Green by Letting Your Creativity Soar

1. This week, notice and question the purchases made by your organization. Which items arrive in excess packaging that you just have to throw away or recycle? Could the packaging be removed or modified so that it serves a double purpose? Send an e-mail to the supplier addressed to the environment, health, and safety manager, describing your idea. In the subject field, enter "Lean and Green idea for your product."
2. Ask your friends who work for other organizations how they reduce waste or avoid polluting processes. Get the facts and suggest those ideas to your management. Make them aware of the nonproprietary Lean and Green steps *your* organization has taken.
3. Suggest to your manager a "radical" environmental goal, such as Werner Gauss's idea to cool the Agilent Technologies building "for free." Stress the money-saving aspect of the idea.
4. During breaks and lunch this month, tell your colleagues about some of the Lean and Green ideas in this chapter that impressed you most. You'll inspire others to think creatively.

One creative idea for environmental and cost savings at your organization can make more difference than a lifetime of an individual family's recycling efforts at home.

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