Introduction

The basic idea of this book can be summed up in one sentence: Waste prevention will yield a much higher rate of return on investment than most other investments your company is now making.

Does that sound like a rash claim? It's not. In the chapters that follow, we'll take a look inside companies all across the United States where comparatively simple and inexpensive waste prevention initiatives have cut operating costs by thousands of dollars. These are not merely windfall savings but calculated, permanent reductions in production expense that continue to yield benefits year after year.

The surprising thing about these savings is that they usually include *unexpected* benefits. For example, when Acme Company sees that it no longer needs to use Shipping Crate A, the total cost saving will include several parts:

1. Avoided cost to purchase Crate A.
2. Reduction in Warehouse Space B to store Crate A.
3. Reduction in Clerical Time C to keep all the records associated with buying, storing, using, and replacing Crate A.
4. Reduction in Disposal Cost D or the final disposition of Crate A.

That's not all. By doing away with Crate A, Acme Company may also

5. Reduce Worker Injury Cost E stemming from the handling of Crate A.
6. Improve Throughput F and Turnover G by substituting more efficient handling of material than was possible with Crate A.

It's quite likely there will be an additional, significant benefit. By consuming fewer trees and using less power to turn trees into crates, Acme Company reduces its demand on the environment. As this list of benefits illustrates, waste prevention—using less stuff—usually entails *simple* changes in production routine, but it almost always pays *compound* interest.

ASK WHY FIVE TIMES

Though opportunities for preventing waste are often simple and, in hindsight, quite obvious, they are usually camouflaged by years of company routine. "Why do we use Crate A? Because we always have!" One way to peel off layers of company practice is to adopt the Japanese method of inquiry: To discover the real reason for practically anything, ask *why* five times.

Here's an illustration. Suppose that you were puzzled by the spacing of railroad tracks in the United States—4 feet 8-1/2 inches apart. At first glance, that precise dimension looks like a deliberate choice based on efficiency and cost. Let's ask *why* five times:

1. *Why are U.S. railroad tracks spaced 4 feet 8-1/2 inches apart?*
   Because the U.S. adopted the standard British spacing of railroad tracks.
2. *Why are British railroad tracks spaced that way?*
   Because the dimension was adopted from the design of tramways that preceded railroads.
3. *Why were British tramways spaced that way?*
   Because the jigs used to build tramways were the same as jigs for horse-drawn wagons.
4. *Why did the jigs for wagons set wheels 4 feet 8-1/2 inches apart?*
   Because that was the distance between wheel ruts on ancient British roads, built by Imperial Rome for chariots.
5. *OK, why were the wheels of Roman chariots spaced 4 feet 8-1/2 inches?*
   Because that's the optimum width to accommodate two horses in harness, butt to butt!

The story may be part fancy but the point is not—specifications are not always as scientific as they seem. Ask *why* five times about Shipping Crate A and you may be led to an equally implausible beginning as the spacing of railroad tracks in the U.S. In fact, before deregulation of the trucking industry, packaging standards for motor freight were heavily influenced by the corrugated cardboard industry. And those standards were adopted largely from railroad freight regulations which, because railroads owned a lot of forest land along their rights-of-way, strongly favored crates made of wood. It's easy to see how established practice—"the way we've always done it"—can survive for years without serious question.

MANY TARGETS OF OPPORTUNITY

Opportunities for waste prevention are many more than you might guess, even in the best run companies. In the next chapter we'll talk about how to examine a company, department by department, to identify wasteful *procedures*. Notice the emphasis on process: we'll be looking at everyday work routines, "the way things are done," as harbors of waste and unnecessary expense. To preview what we will find, here's a quick look at the largest targets for waste prevention in most business enterprises:

- Front office—*Paper* in all its forms, especially copy paper.
- Manufacturing department—*Production scrap,* all the leftover metal, plastic, wood, or fiber that remains after products are finished.
- Receiving/shipping—*Containers,* all kinds, both incoming and outgoing, both logistical and retail, with a lot of attention to corrugated boxes and wooden crates.
- Food service—All *single-use* items, such as throwaway paper and plastic.
- Housekeeping—Again, single-use items, such as trashcan liners that are replaced daily even when little if any trash has accumulated.
- Warehouse—*Stretch wrap,* another prime example of single-use materials. Many companies have found ways to curtail or eliminate stretch wrap from inventory.

WASTE PREVENTION—A TOUGH SELL

Though examples of waste may seem obvious, and the potential savings may seem significant, getting management's approval to invest time and money in waste prevention can be a very tough sell. Understandably, it's routine for managers to expect some pretty solid evidence in advance of any commitment of capital: How much money are we going to spend? How quickly will we recover the investment?

If funds are requested for familiar kinds of things, such as a production tool identical to others that are reliably stamping out products on the manufacturing floor, the process is fast-track: Purchasing Machine X will increase Output Y and, everything else remaining equal, Gross Revenue Z. Familiar investments pass inspection much more easily than investments of either money or time in the comparatively unknown territory of waste prevention. How closely, for example, do companies scrutinize proposals to invest in information technology—computers and related items? It has been estimated that no more than one company in five has a process in place to cost-justify an investment in IT. Decisions are based on familiarity and faith—remarkable when you consider that IT investments are approaching $1 trillion a year!

By comparison, preventing waste at its source requires only small fractions of capital, sometimes none at all. Yet it can be a tough proposal to defend. Perhaps the reason is that it is hard to imagine the end result if the end is *less or nothing*. The very process of reduction sends shudders through many business enterprises because cutbacks are associated with failure and contrary to the natural business momentum of growth and increase. But the kind of reduction we are talking about is totally different. It is aimed at *preserving* profits and *sustaining* growth. "The business of source reduction is simple," writes Chaz Miller, a national authority on the topic. "A well-managed company will strive to reduce waste so that it can use its financial resources more efficiently."

TRUST NURTURES THE PROCESS

Waste prevention thrives in a climate of trust—trust between companies and their suppliers and customers. Easy to say, very hard to put into play. In an intensely competitive world economy, a company's natural inclination is to keep its guard up, to defend against undependable suppliers on one side and fickle customers on the other. Nevertheless, businesses are moving rapidly toward more interdependence. There is no better evidence than the rapid spread of just-in-time delivery of materials in the auto industry. Example: Car seats manufactured at noon at Setex Co. in St. Marys, Ohio, are installed 4 hours later and 25 miles away at the Honda plant in Lima. Honda trusts Setex to deliver on a very short schedule. To comply, Setex has ruthlessly eliminated waste in production and shipping, including the total elimination of protective wrapping of car seats for transport to the auto plant. They are bolted to a reusable platform, rolled into a semitrailer truck, and delivered direct to the assembly line.

An even tighter bond between supplier and customer is working well at the Volkswagen truck and bus plant 150 kilometers south of Rio de Janeiro. There, suppliers to the plant are not merely close to VW, they're *inside* the plant, actually installing modules along the production line. From VW's point of view, the effect on waste prevention is dramatic. Incoming shipping containers—pallets, crates, racks, boxes—are drastically reduced. Such a close connection between supplier and customer may not be appropriate in every setting, but it illustrates what is possible.

THE ENVIRONMENTAL DIVIDEND—DOING GOOD WHILE DOING WELL

This is a very practical book. We'll be pricing and measuring many things, and comparing alternatives, always with an eye to reducing cost by eliminating waste. In our approach, waste prevention and cost reduction will always go hand in hand. And that leads to the extra dividend of the entire process: While we are concentrating on rooting out waste, with the objective of reducing cost, simultaneously and unavoidably we'll be reducing the amount of stuff that goes to final disposal in a landfill or an incinerator. Disposal in a landfill carries the long-term risk of polluting groundwater, the source of drinking water for the majority of Americans. Disposal by burning in an incinerator immediately produces carbon dioxide, one of the prime suspects in the search for causes of global warming. Thus, by reducing the quantities of materials that ultimately are thrown away, companies exercise their corporate responsibility to preserving a healthy environment. In other words, by doing well for themselves—lowering costs—companies do good for their community. It's a compelling combination.

CHAPTER 1

How to Think About Waste Prevention

Suppose that you and a colleague decide to take a fresh look at the office and production area. You want to spot opportunities to reduce costs by preventing waste. But what exactly will you be looking for? And how will you know when you see it?

If you are already preventing waste at the source, you may find no trace of your wise action. Effective waste prevention leaves only an *absence* of something that once seemed indispensable. Unlike recycling, which looks like boxes, bales, and carloads of reusable scrap, waste prevention looks like nothing. It can be a beautiful sight!

The most important question to ask yourself, and others, as you look around the business for wasteful practices is, Why? Why do we do it this way? Why do we send out all these reports? Why is the dumpster full of pallets and cardboard boxes? Why are we producing so much scrap metal (scrap wood, plastic, paper, fiber, etc.) when these commodities are costly as production feedstock but earn so little as recycled scrap?

WASTE PREVENTION IS NOT RECYCLING

The distinction between waste prevention and recycling is important to keep in mind when you examine company operations. You may already be doing a very good job of *recycling*. You may have systems in place to capture such things as used cardboard, office paper, production scrap, newspaper—even soft drink containers—and to send all these things back to the mill for processing and remanufacturing into new products. That is a good way to manage materials, but it is not the best way. Some years ago, the U.S. Environmental Protection Agency created a "hierarchy," a good-better-best ranking for the management of materials that would otherwise become municipal solid waste, or MSW. Here's the hierarchy:

Solid Waste Hierarchy—The Three R's

1. REDUCE—Use less stuff, starting at the very front end of operations.
2. REUSE—Recover used materials intact, send them around the cycle again.

3. RECYCLE—Keep used materials out of the disposal system, send them to processors as feedstock for manufacturing new products

From the bottom up—recycling is good, reusing is better, reducing is best. For obvious reasons, it makes much more sense to curtail or eliminate unnecessary materials "from the top," from the beginning of operations, rather than to incur multiple costs—procurement, storage, inventory, handling, disposal, etc.—associated with managing materials all the way through the production pipeline and dealing with them creatively only when they reach the end of the pipe.

KEY DISTINCTIONS

Let's note that *reduction* means the same as the two-word, technical term *source reduction*, but that in this book we'll prefer another term we believe is more descriptive and familiar: *waste prevention*. (Do not substitute the term *pollution prevention*, which refers to minimizing the use and production of hazardous substances.) One more definition is essential to describe the general class of materials we are concerned with: *municipal solid waste*, or *MSW*, refers to nontoxic discards from offices, stores, factories, households, and institutions that are disposed of in landfills or incinerators. MSW is sometimes called *refuse*. It is distinguished from *hazardous* or *toxic* waste, both of which require special handling and disposal in special facilities.

CASE STUDY: Schumacher Electric Corp.

Rensselaer, Indiana

"Never buy anything you're throwing away."

Schumacher Electric, located in Rensselaer, Indiana, designs and manufactures electrical transformers for power, audio, and other applications. The products are small but heavy and require very secure packaging in corrugated cardboard cartons. To prevent damage during shipment to customers, the transformers are cushioned on the top, bottom, and sides with strips and rectangles of corrugated cardboard cut to special dimensions.

Loren Snow, the plant manager, has a management maxim: "Never buy anything you're throwing away." One day as he was walking around the plant, Snow observed that the Shipping Department was receiving and warehousing a steady supply of special-cut pieces of corrugated cardboard for use in packing finished products, while in another part of the department there was always a large stack of old corrugated cartons—discarded incoming packaging materials gathered up from here and there around the plant. Standard procedure was to bale the old cartons for sale to a paper recycler, about 16 tons of material a year.

For Snow, this was an "Aha!" moment. Why not convert the old cartons into cushioning strips for customer shipments? He found a bandsaw in a corner of the

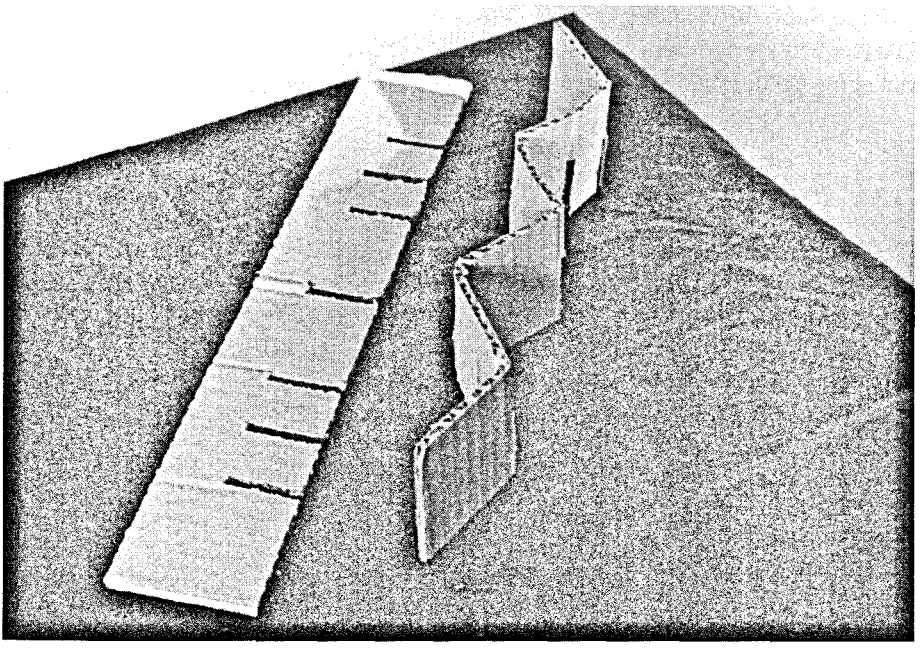

Figure 1 HOME MADE. Simple strips of corrugated cardboard packaging were costing a transformer manufacturer $60,000 a year to buy new. Now they are produced quickly as needed from incoming cartons, cut to size on an old bandsaw.

plant ("Every factory has at least one of these standing around," he said), moved it to the Shipping Department, and trained the receiving-shipping clerk to cut the old boxes into new packing strips. Under the new procedure, only torn or dirty old cartons go to the baler. Reusable cartons—90% of all incoming cartons—are flattened and stacked in neat piles. As packing strips are needed, the worker lifts a short stack of cartons to the bandsaw table and, guided by jigs, quickly cuts the various cushions, shelves, and partitions required to package transformers for shipment.

Payback

During the last full year that Schumacher purchased corrugated packaging parts from outside suppliers, the total cost was about $60,000. Because the conversion to inside manufacture of packaging required no capital outlay (feedstock, equipment, space, and labor all were available), there was no payback period. The $60,000 reduction in annual operating expense was available immediately.

Beyond the obvious reduction in direct costs, Snow believes there may be significant additional savings when products that have been purchased outside are manufactured in-house from "waste." For example, he gained about 2,000 square feet of storage space that had been dedicated to the inventory of custom-made cardboard pieces from outside suppliers. "You also avoid all kinds of paperwork," he observes. There is no longer any need to maintain parts numbers, for example; no need to generate purchase orders, maintain inventory records, and handle all the paperwork associated with paying vendors. Although he has not calculated all these

savings, Snow believes the reduced cost of clerical and supervisory time easily offsets whatever additional expense might be incurred from producing a necessary packaging product in house—from scrap.

SEVEN BASIC APPROACHES TO PREVENTING WASTE

Waste prevention focuses on the way we use materials. Practically all the strategies for preventing waste can be organized under the following seven approaches to materials:

1. Eliminate.
2. Reduce weight or thickness.
3. Increase capacity.
4. Replace single-use with multiple-use.
5. Purchase for long life.
6. Redesign.
7. Transform waste into product.

There are countless variations and combinations of these seven basic themes. At Schumacher Electric (cited above), plant manager Loren Snow saw an opportunity to eliminate a purchase (Basic Approach No. 1) by transforming a waste into a product (7), illustrating the principle of reusing materials instead of tossing them after a single use (4). The following seven cases have been selected to illustrate primarily one of the seven basic approaches to waste prevention, but in each you will probably see connections to more than one approach.

CASE STUDY: Alpine Windows

Bothel, Washington

***Eliminating** a crate cuts annual costs $265,000.*

Alpine Windows is one of the largest window manufacturers in the Northwest, employing 400 people. Previously, Alpine's glass supplier, a California company, delivered bulk packages of window glass in wooden crates. For example, a number of sheets of glass measuring 96 × 120 inches would be packed upright inside a wooden crate, with steel strapping on the exterior to secure this shipping package. Crateloads weighed 4,000 pounds and were shipped by common carrier on a flatbed truck. The glass supplier charged $50 each for the 12 to 24 crates required each day for shipments to Alpine. Thus, daily crating costs ranged from $600 to $1,200.

Because of the distance between glass supplier and window factory—900 miles—and because of the use of common carrier rather than a truck dedicated to this delivery service, Alpine did not have the option of deadheading empty crates back for reuse. So the empties became an expensive pile of scrap wood that Alpine

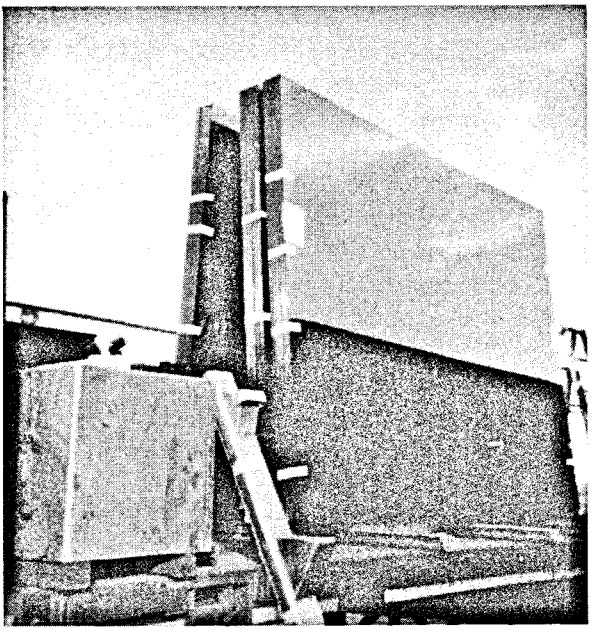

Figure 2 OUT OF THE BOX. Huge sheets of glass used to arrive at a window factory in heavy wooden crates. Now they are shipped uncrated, leaning against an A-frame on a flatbed truck.

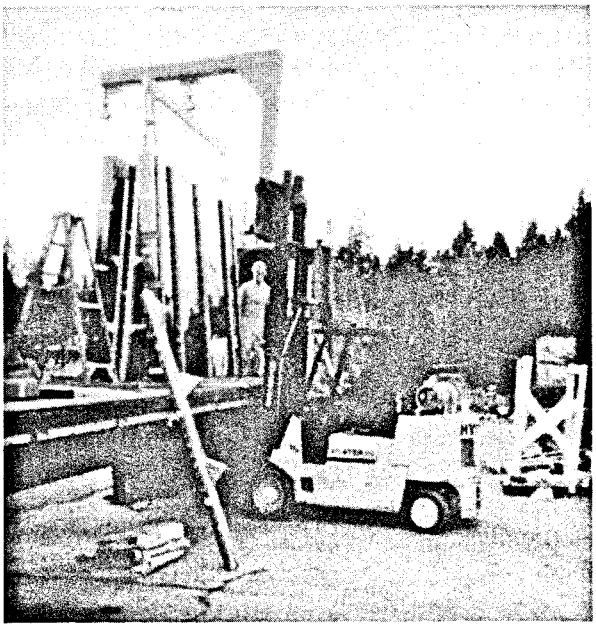

Figure 3 TROLLEY RIDER. Packs of glass are lifted off the delivery trailer by a forklift rigged with a special boom, then rolled inside on a trolley. Eliminating crates saves a window maker $265,000 a year.

placed out for scavengers to haul away free. Plenty of eager takers descended on the free woodpile. Periodically, Alpine gathered up the broken remnants and hauled them to a wood recycler at an average cost to Alpine of $200 per trip. All scrap wood was put to good use in one way or another, but it was an expensive community service!

The opportunity to eliminate wooden crates became apparent when Alpine adopted new technology for feeding individual sheets of glass into the glass cutter. Previously, whole crates were removed from the flatbed truck by forklift and placed on a heavy-duty cart for transport to the production area, where the crate was opened and sheets of glass were picked up one at a time by suction cups and placed on the feeder table.

The new feeder method at Alpine enables the glass supplier to lean uncrated packs of glass against an A-frame structure on the flatbed truck. Packs are covered with tarpaulins and securely tied down. For delivery at Alpine, glass packs are unloaded by a forklift rigged with a boom and webbed nylon slings. Packs are placed on a trolley rigged with an A-frame and moved to the production area, where individual sheets of glass are peeled away from the pack and permitted to fall onto the feeder table. Air pressure slows the rate of fall, preventing breakage.

Payback

Alpine invested about $400,000 in the new free-fall system of placing glass on the feeder table. The equipment has a service life of 20 years. The new handling system also reduces restock time, because uncrated packs of glass contain 50% more sheets than crated packs. Alpine estimates the labor savings at $35,000 a year. The combination of reduced crating costs and restock time enabled Alpine to recover its capital investment in about 20 months.

CASE STUDY: McDonald's

Oak Brook, Illinois

***Reducing** the hash browns bag saves $4 million.*

McDonald's has become widely known for its initiatives in waste prevention and solid waste reduction. Between 1991 and 1996, 105 various projects under the McDonald's/Environmental Defense Fund Waste Reduction Action Plan (WRAP) yielded very significant savings in the use of materials.

When making decisions about how to package its food products, the company weighs four factors:

1. Environmental impact
2. Cost
3. Customer satisfaction
4. Effect on store operations

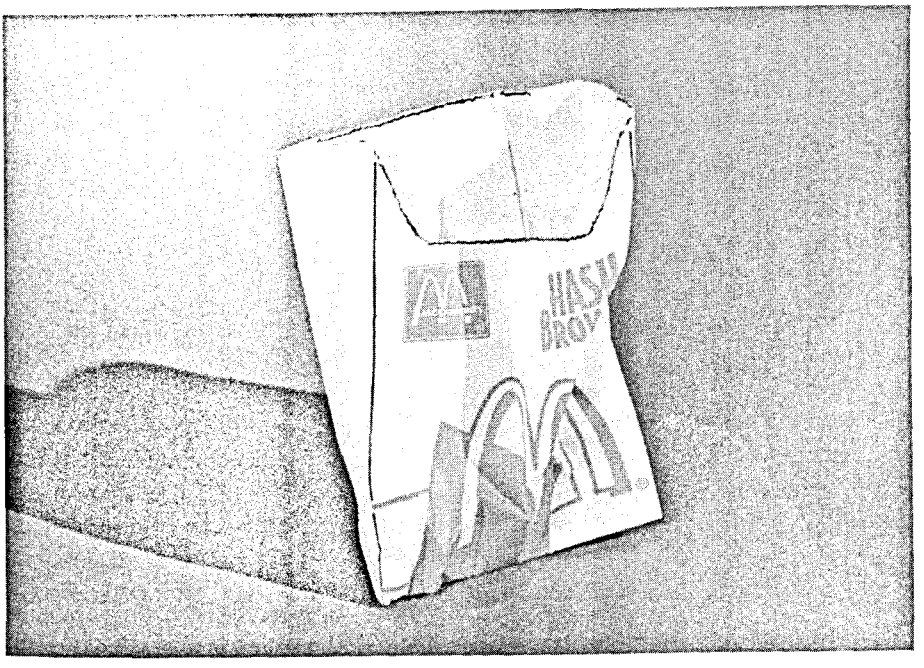

Figure 4 SLIMMED DOWN. By switching to a lightweight paper envelope for its hash brown potatoes, McDonald's saves $4 million a year in materials, shipping, storage, and disposal.

For many years McDonald's had packaged its hash brown potatoes, a breakfast menu item, in a cardboard-like carton with a paper basis weight of 110 pounds. The container worked well. Mainly it was thick enough to keep grease from soaking through to customers' hands. Changing to a lighter weight paper seemed out of the question because this essential quality would be diminished or lost. But a development in paper coating technology made it worthwhile to experiment with the hash browns container. 3M Company came out with a coating called Scotchban FC-807, designed as a food-safe grease barrier. This enabled McDonald's to design a new container made of white paper, basis weight 28 pounds, or about 75% lighter than the cardboard container.

Payback

The new generation of hash browns bag is printed with the familiar arched M and other simple graphics. It weighs one-quarter the weight of the old cardboard container, and it requires much less energy to produce. The lighter container has reduced the trash load: McDonald's calculates that, worldwide, the new bag has reduced the company's production of solid waste by about 3.5 million pounds a year. Additional savings accrue from the reduction in space required to ship bulk quantities of the hash browns bag to McDonald's stores. Bulk packages of the bag occupy only 30% of the space (cube) of comparable quantities of the old carton. McDonald's believes its total savings, including the reduced cost of a lighter bag,

reduced cost of disposal, and reduced shipping and storage space approximate $4 million a year.

CASE STUDY: Madison Chemical Co., Inc.

Madison, Indiana

***Increasing the capacity** of bulk shipping containers from 55 gallons to 350 gallons reduces costs $19,000 a year.*

Madison Chemical is a medium-sized formulator of nonhydrocarbon-based industrial chemicals used for conversion coatings, cleaners, lubricants, rust preventatives, and paint strippers. Previously the company stored and shipped its product in 55-gallon drums, using some 3,000 drums a year. Empty drums were delivered to a reconditioning contractor for cleaning and testing at $10 per drum before refilling by Madison. Drums could run this cycle up to four times before they were scrapped.

After studying the advantages, Madison converted to the use of 350-gallon intermediate bulk containers (IBCs) to reduce the number and overall cost of containers, and to respond to customer concerns over drum handling and disposal. The IBC is constructed of stainless steel and plastic. With proper handling and cleaning it can be used indefinitely.

Madison found that replacing 55-gallon drums ($20 each) with 350-gallon IBCs ($500 each) saved about $19,000 a year in overall cost, even including the higher $30 per drum cost to recondition the IBC. These savings are calculated on the basis of purchasing 100 IBCs per year. As the company adds to its inventory of IBCs, savings will increase.

Madison also implemented a system for certain large customers wherein it replaced large numbers of circulating 55-gallon drums with IBCs that remain permanently at the customer's site and are refilled from bulk tanker trucks. The IBCs do not require cleaning because they are refilled with the same chemical. The IBCs used in this service are specially configured to include detachable, four-way-entry, reusable skids manufactured of plastic.

Payback

Madison Chemical estimates it earned back the investment in IBC containers for shipping alone (not including storage) in 6 months. And there were additional benefits:

1. Reduced handling of product in storage and no shipping of raw material containers.
2. Reduced handling of finished product in IBCs for shipment to customers versus multiple barrels.
3. Easier and safer stacking of IBCs compared to barrels.
4. Better customer relations—customers said they liked the IBCs because of ease of handling and the ability to meter material usage.
5. Reduced product residue in empty IBCs because the discharge valve is located on the bottom.

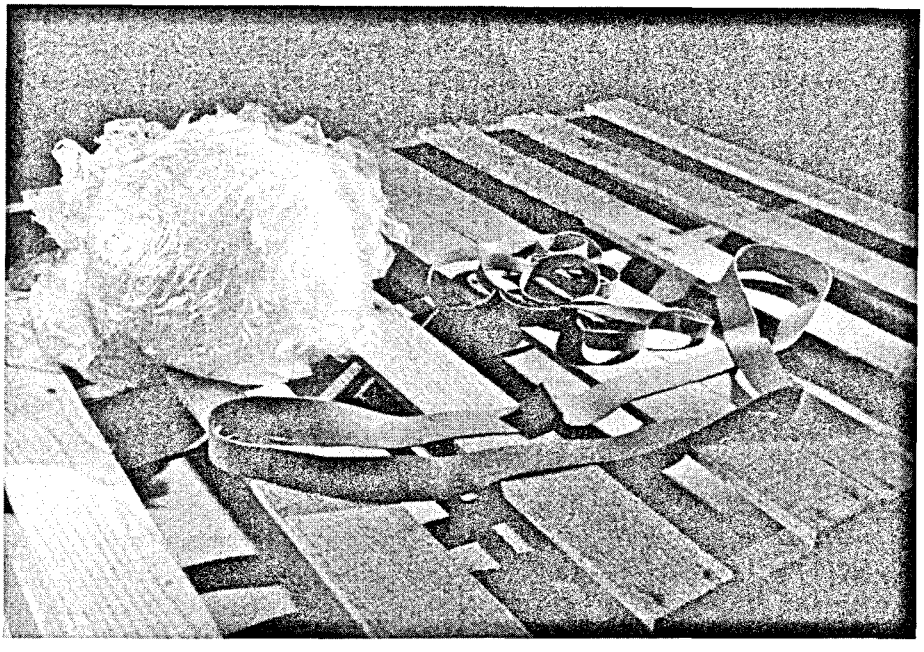

Figure 5 CINCHED. For warehousing operations, large rubber bands work as well as stretch-wrap—and can be used repeatedly. Making the switch, a Wisconsin factory saves nearly $50,000 a year.

CASE STUDY: Traex/Menasha Corp.

Dane, Wisconsin

***Replacing** single-use stretch-wrap with multiple-use rubber pallet bands saves $49,706 a year in warehouse operations.*

Traex manufactures injection molded plastics and other products for the food service industry. Finished products are boxed in corrugated containers and stored on pallets in the warehouse until needed to fill orders. Previously the company stretch-wrapped the pallet-loads by hand for transfer to the warehouse. The wrapping process was time-consuming and required most of one employee's attention over three shifts. The process also exposed workers to the risk of back injury from stooping and straining.

Traex was motivated to make a change in this method of warehousing when its waste hauler said it would begin requiring customers to bale discarded stretch-wrap. Purchasing a baler would be costly and require floor space and labor. Traex began testing rubber pallet bands as a replacement for stretch-wrap. The unstretched bands measure 3/4 inches wide by 92 inches in circumference, adequate to span a load of cartons on a standard 40 × 48-inch pallet. Typically, two bands are used per pallet, one looping around the top layer of cartons and the other at about mid-load. Bands are applied by hand, an operation that takes one worker about 10 seconds per band. (By comparison, stretch-wrapping required about 1 minute per pallet.) When pallets

are brought from the warehouse to fill orders, the bands are quickly and easily snapped off the load and tossed in a small barrel for reuse. At the Traex plant, it takes a pallet band about 6 weeks to make the round-trip from initial placement around a pallet-load at the production line, to warehouse, back to the order fulfillment department where bulk loads are broken down as orders are filled.

With training provided by the warehouse manager, this change in operations was adopted without difficulty. Employees like the rubber bands better than shrink-wrap. During a 10-month test period, only four bands broke. Apparently there is no risk to workers from snapping bands.

Payback

The most important saving is reduced labor cost. Traex calculates that it recovered the cost of its initial supply of rubber bands in just four three-shift production days. Here is the company's summary of overall annual savings:

Reduced labor	$50,112
Reduced disposal expense	400
Reduced purchase of stretch-wrap	195
SUBTOTAL	$50,707
Less 550 rubber bands @ 1.82	– 1,001
NET SAVING	$49,706

Reduced demand for stretch wrap has freed some storage space, and additional labor has been saved by avoiding the baling of stretch-wrap. Occasional use of temporary workers for unwrapping stretch-wrap has ended, as have occasional injuries to workers from using a knife to cut away stretch-wrap.

CASE STUDIES: Minnesota

Grand Rapids and Minneapolis

***Purchasing long-life** fluorescent bulbs to replace incandescent bulbs cuts electricity, waste disposal, and labor costs.*

The Minnesota Office of Environmental Assistance (OEA) was one of the first state agencies to reach out to private enterprise with a waste prevention program. To demonstrate a variety of approaches, the OEA has assisted a variety of businesses in identifying targets for waste preventive action and has documented the results.

One of the opportunities at the Itasca Medical Center was conversion of exit sign lights from incandescent to fluorescent bulbs. There are 18 exit signs throughout the facility. All were replaced, with the following results: *Waste stream reduction for this item, 89%.* Exit signs are illuminated continuously. The incandescent bulbs were rated at 2,500 hours of service life but lasted somewhat less, with 18 signs requiring a total of 67 new bulbs a year. Fluorescents required 7.2 replacements per year.

Frattalones Ace Hardware, Minneapolis, converted from incandescent bulbs to 25-year-life LED bulbs for exit signs. Two 20-watt bulbs, using a total of 40 watts per sign, were replaced with LED bulbs using a total of 2 watts per sign. Payback for the labor and conversion kit occurred within 9 months. Thereafter, cost savings were 97 percent ($34) per sign per year. Waste volume reduction was 95 percent (127 cubic inches) per sign per year. Waste weight reduction was 96 percent (2.3 pounds) per sign per year.

CASE STUDY: Haworth, Inc.

Holland, Michigan

***Redesigning** the traditional printed catalog as a CD-ROM vastly reduces paper consumption and improves presentations to customers.*

Haworth, Inc. is the second largest manufacturer of office furniture in the U.S. Like many companies selling merchandise to the business sector, Haworth has for years printed a large, frequently updated catalog, along with numerous related publications and forms. In 1992, the company began to develop an alternative, paperless way to distribute this information—SourceBook—a CD/ROM that runs on Windows 95.

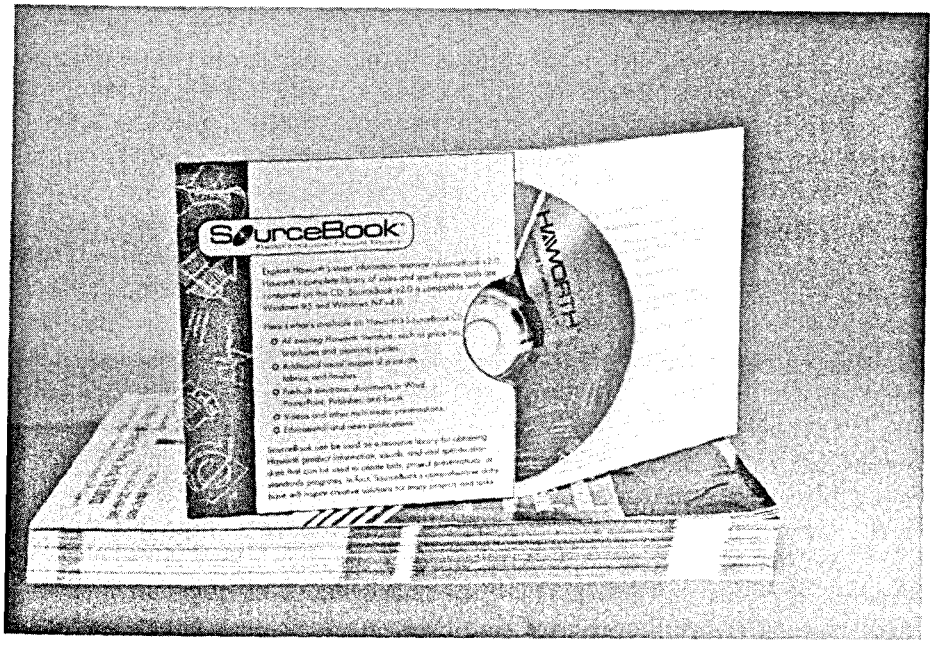

Figure 6 COMPACTED. Haworth replaces the old-style printed catalog with a CD-ROM, a costly project but a likely source of long-term printing savings and sales productivity increases.

This has been an expensive project. Start-up costs have included $500,000 for software development; and $2 to $3 million more to train 600 people, equip 260 market managers with laptop computers, and other costs. Despite the heavy initial expense, Haworth believes it is making a wise investment that will pay off in the long term. The company says it has already realized these benefits:

1. *Decreased printing costs and paper usage.* Because of frequent price and product changes, Haworth over the years has consumed vast amounts of paper, and spent more than $1 million annually for updated sales literature. Introduction of the CD will enable the company to reduce its annual printing budget by 40% by 2005.
2. *Higher quality client presentations.* With the CD, salespeople custom-design client presentations on the computer. The old way was to cut and paste from catalogs, which wasted large amounts of paper and yielded an inferior presentation by comparison. Response time to customer questions also has been reduced, since all essential information is loaded on the CD/ROM. (Haworth estimates that the 2,000-plus documents in SourceBook equal a stack of paper 6 feet tall. An updated CD is sent out monthly.)
3. *New training opportunities.* SourceBook helps to train employees and customers. For example, one video clip on the CD explains how wood veneer furniture is made and shows the various kinds of wood available.

Payback

Systems Analyst Ted Evans says, "We believe that from a marketing perspective alone, SourceBook has already paid for itself through customer satisfaction, the general impressiveness and high visibility of the product, and the increase in employee efficiency."

CASE STUDY: Haarmann & Reimer

Elkhart, Indiana

***Transforming** a production waste into cattle feed saves $584,000 a year.*

Haarmann & Reimer (H&R) is a major producer of citric acid used in the production of such items as fruit flavored drinks, sodas, and orange juice supplement. In the early 1990s, H&R's parent company, Bayer Corporation, initiated a company-wide waste reduction program known as WRAM—Waste Reduction and Management. Mycelium landfill waste at H&R was soon identified as the fourth largest waste stream among Bayer's entire enterprise of more than 50 manufacturing sites.

Mycelium is the residual husk of selected enzymes added to the citric acid production process to enhance biologic fermentation. Because of the low weight and "blowing" properties of mycelium, H&R was paying a premium to haul the waste and dispose of it in a landfill.

A major alternative to disposal appeared to be the use of mycelium as a supplement to cattle feed. In 1994, Bayer commissioned Purdue University to study the nutritional value of mycelium as cattle feed. The study concluded that 1 pound of

dry mycelium was the nutritional equivalent of 1 pound of corn, assuming that mycelium did not exceed 30% of the total diet.

Other alternatives to disposal also were evaluated, including land application of mycelium as a soil nutrient; use of mycelium to remove small particle solids from wastewater in mining operations; composting; and decomposition of mycelium in anaerobic waste treatment reactors.

Because of the comparatively low price of feed corn at the time of its investigation, H&R had difficulty finding local buyers of mycelium as feed. But when feed corn prices rose, a major farm in lower Michigan expressed interest, agreeing to take waste mycelium free but to pay shipping costs. To increase solids from 20% to 40% dry basis, H&R installed a filter press. This cut the shipping weight in half, reduced shipping costs, and doubled the daily amount of wet feed that cattle could consume.

Payback

Bayer/H&R invested more than $1 million in the study performed by Purdue University, as well as new equipment costs. But since implementation of the new program, H&R has totally eliminated some 10,000 tons per year of mycelium from its waste stream. Out of projected annual savings of $584,000, avoided landfill tipping fees alone total $221,000. A payback period of less than 2 years is expected.

THE POWER OF COMPOUND INTEREST

Financial planners like to point out how putting aside a little money on a regular basis over a long period of time can produce a quite sizeable nest egg. The combination of compound interest plus the passage of time turns small savings into large savings. We see exactly the same thing happening in each of the preceding case studies of waste prevention. At McDonald's, for example, the small amount of money saved per unit by shifting from a cardboard container to a lightweight paper envelope for hash brown potatoes is multiplied—compounded—by millions of units per day and hundreds of millions over a year. One small step in waste prevention yields a huge, permanent reduction in waste and operating cost.

Simple initiatives are much more common than complex projects to prevent waste, and they can yield just as much beneficial effect. At Traex/Menasha, switching from stretch wrap to rubber bands for containing pallet-loads was as easy as asking around for ideas among supplier companies, and experimenting in the warehouse. At Madison Chemical, the economies of moving chemicals in 350-gallon drums seemed obvious from the start; the only thing missing was some assurance of customer acceptance. By comparison, Haworth's conversion from the familiar printed catalog to a CD-ROM took a great deal more imagination, time, and money. And the payback is expected to be sizeable, as well.

If the dividends of waste prevention are so substantial, why does it take some companies so long to start cashing in? The answer is familiarity and habit. It is just as hard for companies to discard the familiar, habitual way of doing things as it is

for individuals. Yet it's amazing how quickly companies capitalize on waste prevention opportunities once they sense the cost implications. Nancy Hirshberg, director of natural resources at Stonyfield Farm, summarizes the idea: "Waste in any form is lost profits. Maximizing efficiency through reducing our waste stream is not only good for the environment—it's good for our bottom line as well."

In the next chapter we'll look at the tactics companies use to position themselves at the front line of waste prevention.