Transport Packaging

Cost-Effective Strategies for Reducing, Reusing, and Recycling in the Grocery Industry

Prepared by Headley Pratt Consulting in association with J. Leslie Bell for

The Minnesota Office of Environmental Assistance
and the American Plastics Council

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Executive Summary

Transport packaging—which the Minnesota Office of Environmental Assistance (OEA) defines as old corrugated containers (OCC), plastic film, and wooden pallets—comprises about one-fifth of Minnesota's total municipal solid waste stream. Therefore, when the state set a goal to reduce its packaging discards by 25 percent, it targeted transport packaging as the most logical place to look for opportunities to reduce, reuse, and recycle.

Transport packaging—which the Minnesota Office of Environmental Assistance defines as old corrugated containers, plastic film, and wooden pallets—comprises about one-fifth of Minnesota's total municipal solid waste stream.

In addition, the state identified the grocery industry as one of the largest generators (and, hence, disposers) of transport packaging. Thus, working with stores, distributors, wholesalers, farmers, growers, processors, and product manufacturers to better manage their transport packaging waste was established as a high priority.

The state realized early on that a cooperative effort was key to achieving its waste reduction goals. Therefore, in a first step, a meeting was held with the OEA, the Minnesota Grocers Association, and senior managers from several grocery corporations to discuss possible options. At that meeting, the grocery industry indicated that before it could make changes it needed more information about cost-effective strategies (or "best practices") for managing transport packaging waste. The group also decided that a hands-on examination of waste management practices at stores and with wholesaler/distributors would be beneficial.

In a second step, the American Plastics Council (APC) joined forces with the OEA to help gather the information that the grocery industry needed. The APC was a logical partner because of its previous experience working with the grocery industry to implement stretch wrap recycling programs, and because of the growing use of plastics in transport packaging applications.

Together, the OEA and APC launched a project to

- determine how much transport packaging waste was generated by grocery stores;

- learn how that waste was being managed;
- develop "real world" data showing the potential economic advantages (and disadvantages) of making certain waste management decisions;
- identify viable reduction, reuse, and recycling options that grocers could realistically implement (given that waste management is not part of their core business); and
- compile the information into a report that grocers in Minnesota and across the country could use to make informed decisions about the economic and environmental benefits of reducing, reusing, and recycling transport packaging.

Three grocery stores—and, to a lesser extent, three wholesaler/distributors—also joined the effort. These facilities agreed to open their doors to the project team and provide it with a wealth of information on waste management costs and practices. By working cooperatively, the project team learned a number of valuable lessons about the potential for reducing, reusing, and recycling OCC, plastic film, and wooden pallets in the grocery industry.

Following are some of the key lessons learned.

OLD CORRUGATED CONTAINERS

- There is a strong economic incentive for stores to recycle OCC. Using data from the three participating stores, it is estimated that a typical grocery store will generate about 396 tons of OCC per year and pay an average of $89.88 per ton to dispose of it. If, however, it were to recycle that OCC, it could realize more than $35,000 in avoided disposal costs. (See the sidebar entitled "Defining a Typical Store.")
- There is an even greater economic incentive for recycling OCC if one includes the revenue generated from recovering it. Using a point-in-time average of prices received by the three stores participating in this project, the typical store could expect to generate more than $24,000 per year in revenue from recycling OCC.
- The typical store could realize an average of $4,800 per year in avoided disposal costs and $3,500 in additional recycling revenue by recovering recyclable OCC that currently is thrown away due to confusion with wax-coated OCC. In addition, the typical store could accrue more than $700 per year in avoided disposal costs by eliminating wax-coated OCC altogether, bringing the total economic benefit to about $9,000.
- All three stores participating in the project have mature OCC recycling programs. (They estimate their OCC recovery rate at about 95 percent.) Therefore, aside from changes with wax-coated OCC, the programs probably cannot grow significantly in terms of greater recovery. If OCC recycling programs in other stores are equally mature, then source reduction and reuse options should be emphasized with grocers to achieve greater diversion.

- While several options are available for reducing the amount of OCC generated, the most significant effort in the grocery industry relates to the growing use of tray/shrink packaging. (A tray/shrink package is composed of a corrugated tray and shrink wrap, which is used to secure goods to the tray.) When comparing full corrugated cases (which completely enclose products in corrugated) with tray/shrink packages, the project team found that the latter packaging strategy cuts the weight of a transport package in half. Industry sources maintain that this reduction in weight translates into better shipping efficiencies, improved processing capabilities, and lower material costs.

PLASTIC FILM

- There is not a strong economic incentive for grocery stores to recycle plastic film. Using data from the three participating stores, it is estimated that the typical grocery store will generate more than 10,000 pounds of stretch and shrink wrap per year, and realize only $500 per year in avoided disposal costs by recycling it. (Stretch wrap typically is used to secure goods to pallets, and shrink wrap is used to secure smaller quantities of like goods either together or to a corrugated tray.)

- There is, however, a greater economic incentive for *wholesaler/distributors* to recycle their own film as well as that generated by the stores they serve. Using data from one of the participating wholesaler/distributors, the project team calculated that it could expect net revenue of more than $45,000 per year by recycling its own and it stores' stretch and shrink wrap (given estimated volumes and its current market price). Even at a per-pound price that is 2-cents lower, the wholesaler/distributor would still realize net revenue of more than $7,500 per year. (At a price below $.025 per pound, however, the economics of film recycling for this wholesaler/distributor becomes questionable.)

- A typical grocery store today generates more shrink wrap than it does stretch wrap. Unfortunately, many recycling

Defining A Typical Store

Clearly, there is no such thing as a "typical" grocery store. They come in all shapes, sizes, and locations. But for this report, the data assigned to a typical store are simply an average of the data provided by the three stores participating in the project.

What should you know about these stores? All three were located in suburban areas, they had an average of 62,000 square feet, and their annual sales averaged $33 million. This information is important because other stores that want to use the data will need to adjust it accordingly. For example, a larger store with higher annual sales will probably generate more transport packaging waste than the "typical" store, whereas a smaller store with lower annual sales will generate less.

Keep in mind that the purpose of collecting this data was not only to inform grocers about how much transport packaging waste they generate, but, more important, to demonstrate the "real world" economic advantages and disadvantages of different reuse, reduction, and recycling options.

programs in the grocery sector focus only on stretch wrap, which means that the most significant portion of a store's film waste is not being recovered. This does not appear to be a market-driven decision, since 18 of the 22 film recycling companies interviewed for this project accept both stretch and shrink wrap. Given that many stores currently do not recycle any of their film, and that many others recycle only stretch wrap, it appears that there is significant room for growth in recycling plastic film in the grocery sector, particularly through wholesaler/retailer partnerships.

- Contamination—that is, anything that is not stretch or shrink wrap—is a concern in film recycling programs. Two of the three stores participating in this project had contamination levels above what is normally accepted by markets. This could be remedied, however, with fairly simple education programs designed to inform employees about what is and is not acceptable.

- While film itself has many source reduction benefits, there are products on the market that may enable the grocery industry to use less film. For example, one product that was discovered during the research phase of the project is Scotch™ Brand Stretchable Tape, which its manufacturer claims can reduce the amount of material needed to stabilize pallet loads by 77 percent. Using data from one participating wholesaler/distributor, it was found that the facility would generate 7.7 fewer tons of film waste per year by switching from stretch wrap to Scotch™ Brand Stretchable Tape. (The manufacturer also maintains that Stretchable Tape is compatible with stretch wrap in recycling and, therefore, will not contaminate remaining film streams.)

PALLETS

- Individual grocery stores do not commonly purchase or dispose of pallets; therefore, there is little incentive for them to explore opportunities for reduction, reuse, or recycling. Stores do, however, benefit economically from the current pallet management system. Because all pallets—whether they are wood or plastic, intact or damaged—are returned to grocery suppliers (or given away to employees or consumers), stores do not have to pay for their disposal. Because of that return and reuse system, the typical grocery store can expect to realize about $31,000 in annual avoided disposal costs.

- The most significant reuse effort underway in the grocery industry involves replacing wood pallets with plastic pallets in order to extend a pallet's useful life (thereby reducing costs and minimizing pallet waste). Any economic benefits of such a switch will be minimal at the grocery store level, but it appears that they may be substantial at the wholesaler/distributor level. Data provided by one of the wholesaler/distributors participating in this project showed that the facility realized a savings of 63 cents per trip by using plastic pallets instead of wood. In addition, it had the potential to reduce its workers' compensation, labor,

and shipping costs by about $556,000 per year (or $3.70 per plastic pallet). Furthermore, the wholesaler/distributor achieved payback for its initial up-front investment shortly after the second year of use.

- Although they do not realize direct economic benefits, the grocery stores participating in this project said they prefer working with plastic pallets because they are lightweight, nestable, take up less space, have four-way entry, and appear to work with all types of products, including frozen and perishable goods. The most significant drawback, according to the stores, is that plastic pallets cannot be stored on existing store and warehouse racks. (The racks are designed to hold pallets with flat boards extending the full length and width of the pallet platform. Plastic pallets, however, have nine small, protruding legs which are not compatible with current racking systems.) In addition, the stores indicated that plastic pallets are more likely to slide—particularly on truck beds in freezing weather—than their wooden counterparts which have rougher surfaces.

GROCERY STORES

- A careful analysis of data shows that participating stores realize significant savings in the form of avoided disposal costs because of their current transport packaging recycling and reuse efforts. Store 1 realizes about $61,000 per year in avoided disposal costs, Store 2 realizes $53,300, and Store 3 realizes $76,900.
- The stores could realize even greater savings by implementing the additional transport packaging strategies discussed in the full report. The project team estimates that Store 1 could save an additional $6,300 in avoided disposal costs, Store 2 could save $17,300, and Store 3 could save $6,000.

- From an environmental perspective, the three stores together are diverting more than 2,500 tons of transport packaging waste per year from the state's landfills through their current recycling and reuse efforts. Store 1 is diverting approximately 435 tons, Store 2 is diverting 788 tons, and Store 3 is diverting 1,279 tons.
- If the three stores were to implement the additional transport packaging strategies discussed in this report, they could divert an additional 216 tons of transport packaging waste per year from the state's landfills. Store 1 could divert almost 44 tons, Store 2 could divert 80 tons, and Store 3 could divert 92 tons.

The following study (1) discusses how these "lessons" were learned, (2) explains how the figures were derived, and (3) provides more in-depth information about how stores might implement the reduction, reuse, and recycling opportunities that are currently available for use by the grocery industry.

Chapter One

The Project

INTRODUCTION

In 1992, the Minnesota Legislature set a goal for the state to reduce its packaging discards by 25 percent within three years and authorized that any combination of reduction, reuse, and recycling could be used to meet that goal. After the law was passed, the Minnesota Office of Environmental Assistance (OEA) embarked on several subsequent projects to determine (1) which components of the packaging waste stream offered the greatest opportunities for reduction, reuse, and recycling, and (2) which sectors generated those components in large quantities.

In 1992, the Minnesota Legislature set a goal for the state to reduce its packaging discards by 25 percent within three years and authorized that any combination of reduction, reuse, and recycling could be used to meet that goal.

The follow-up studies all indicated that transport packaging—which the OEA defines as old corrugated containers (OCC), plastic film, and wooden pallets—offered more significant opportunities for reduction, reuse, and recycling than any other packaging type. The studies also found that the grocery industry was one of the largest generators of transport packaging waste and, therefore, a good candidate for reduction, reuse, and recycling programs.

As a result of these findings (and a 1996 study which found that the state had not reached its 25 percent goal), the OEA formed a partnership with the Minnesota Grocers Association and individual grocery corporations to examine ways to address issues related to transport packaging waste. Later, the American Plastics Council (APC) joined the effort and worked cooperatively with the OEA to learn more about how grocers manage their transport packaging waste and what options are available to reduce, reuse, and/or recycle it. Since the APC has worked with the grocery industry on previous projects, and since plastics are being used in greater quantities in transport packaging, the APC seemed a logical partner.

The OEA and the APC agreed that, to be effective, the project should focus primarily on individual grocery stores (since very little information is available from that point in the distribution system), and on the economics of reducing, reusing, and recycling at the store level (since economics are the primary driving factor behind all business decisions). The following report is what the two organizations learned over the course of the study.

THE PURPOSE

The purpose of conducting the study was fourfold. First, there is a great deal of theoretical discussion about what happens with transport packaging in the grocery industry. Unfortunately, there is very little concrete information about what happens in practice, particularly at the grocery store level. By sponsoring this project, the OEA and the APC hoped to obtain "real world" information about how grocery stores manage their waste.

Second, the project team wanted to put numbers to different waste management options to show grocers how implementing reduction, reuse, and recycling programs could affect their bottom lines. Because the grocery industry is highly competitive and operates on extremely low margins, it is unlikely that stores will implement programs unless they have some positive economic effect. Thus, the team wanted to use "real world" data to determine the potential economic impact of making certain waste management decisions.

Third, the project team wanted to identify realistic alternative waste management options that stores could use. There are a variety of reduction, reuse, and recycling options available, but it is unclear which of those options make the most sense for grocery stores.

Finally, the OEA and the APC wanted to take the data gathered in this project and put it into an easy-to-read report so that other grocery stores could benefit from the research. By seeing what was being done (and could be done) at three participating grocery facilities, the project partners hoped that other grocers may be more motivated to make reduction, reuse, and/or recycling a part of their day-to-day operations.

The project team realizes that this study has some shortcomings—it did not include actual waste sorts which would have provided valuable information; the data, in some instances, are limited; and the economic analyses focus primarily on avoided waste disposal costs because other types of economic information either were not available or were unreliable. Furthermore, time and budget constraints (inherent in all projects) did not allow for a full investigation of *every* reduction and reuse option—only those that partipating grocers deemed most significant and/or most viable. The study is, however, an excellent place to start looking at several cost-effective opportunities to reduce, reuse, and/or recycle transport packaging in the grocery industry.

THE REPORT

While studying and working with the three stores and, to a lesser extent, the three wholesaler/distributors that agreed to participate in this effort, the project team learned a number of valuable lessons about the potential for reducing, reusing, and recycling transport packaging at the grocery store level. These lessons, or "best practices," have been summarized in Chapters 2, 3, and 4 of the report, and should help others in the grocery industry decide whether or not similar efforts could or should be undertaken in their own facilities.

The project team also wanted to include detailed information on each of the participating stores. Therefore, Chapters 5, 6, and 7 include the analyses that were prepared for each store showing how they currently manage transport packaging waste, the costs associated with those waste management practices, and proposed options for further reducing, reusing, and/or recycling the material. These analyses have been included for readers who want more detailed information on where the numbers in previous chapters came from, and for those who may want to compare themselves to a particular store.

Finally, included in this report are three other educational pieces. The first piece is a list of companies that currently accept OCC, wood pallets, and plastic pallets for recycling. The project team found that a lack of knowledge about available markets is one of the barriers preventing grocers from maximizing their recycling efforts. This list should provide the assistance that grocers need to make better program choices. (See Appendix A.)

The second piece is similar, but it focuses on markets that accept plastic film for recycling. This list is more detailed than the first: In addition to basic contact information, it includes details on the quantity of film the markets require, the form they want the material in, their quality specifications, current pricing information, and an indication of whether they currently accept film from the grocery sector. This more comprehensive list was prepared because the project team learned that grocers (as well as wholesaler/distributors) were not aware of the questions they should ask when trying to market plastic film. (See Appendix B.)

The final educational piece is a list of publications that the project team read while preparing this report. These reports can be used by grocers that want to further explore their own reduction, reuse, and recycling options. A brief synopsis of what was learned from the reports has been included to help grocers determine which ones will be of most use. (See Appendix C.)

As mentioned earlier, the project partners hope that grocers—in Minnesota and across the country— will use this report to make more informed decisions about the economic and environmental benefits of reducing, reusing, and recycling transport packaging waste.

While studying and working with the three stores and, to a lesser extent, the three wholesaler/distributors that agreed to participate in this effort, the project team learned a number of valuable lessons about the potential for reducing, reusing, and recycling transport packaging at the grocery store level.

Chapter Two

Lessons on Old Corrugated Containers

While this project had many goals, one of the most important was to determine how much OCC participating grocery stores were generating and what they were doing with it. To that end, the project team asked each of the stores to do two things: (1) provide waste billing invoices (for any length of time the stores could produce) showing the amount of OCC recovered, and (2) allow the team to conduct visual inspections of both loose and baled (or compacted) OCC to identify how it was collected and what contamination issues, if any, needed to be addressed. With that information, the project team could then determine what economic benefits the stores were accruing from their waste management practices related to OCC and what could be done to further minimize costs.

From the site visits, it was clear that all three stores participating in the project had mature OCC recycling programs. (The stores estimated their recovery rates at about 95 percent.) Store employees appeared to understand and willingly participate in OCC recycling, and it was a habit for them to direct OCC to a separate compactor or baler instead of disposing of it along with other waste. Each of the stores also had looked into different options for recycling its OCC and had selected programs that combined efficiency with convenience. Table 2A shows how much OCC each of the stores was collecting for recycling.

TABLE 2A

OCC Recycled at Participating Stores and Per Ton Disposal Costs

Store	*Quantity of OCC Recycled Per Year (in tons) [1]*	*Per Ton Disposal Cost [2]*
Store 1	264	$141.72[3]
Store 2	365	$67.76
Store 3	552	$60.17
Average	394	$89.88

[1] Amounts were taken from actual waste billing invoices provided by the stores. They have been rounded for summary purposes.
[2] Per ton disposal costs were obtained from actual waste billing invoices and include collection costs, disposal costs, state tax, the Minnesota Waste Assessment Fee, and any other costs the stores incur.
[3] Store 1 has a higher per ton disposal cost because it uses a smaller collection container (only 20 cubic yards) which increases the number of trips its hauler has to make to collect garbage. Store 1 could decrease the number of trips, and hence its trip charges, by converting to a larger container.

The next step of the project was to quantify what the stores were paying for waste disposal in order to determine what they were realizing in avoided disposal costs by recycling their OCC. Table 2A also summarizes the results of that work.

During the site visits, one common issue of concern arose—the stores were generating a fair amount of wax-coated OCC which could not be included in their recycling programs. These containers—which are typically used to package products that require ice or

moisture to maintain freshness, such as meat, poultry, broccoli, leaf lettuce, and carrots—are considered contaminants by most markets for corrugated and, therefore, must be thrown away.

To determine how much wax-coated OCC the stores were generating, the project team asked the stores to set aside samples of coated boxes and weighed the samples during the site visits. Table 2B shows what the team found.

It should be noted that each of the stores appears to be generating far less wax-coated OCC than the industry itself projects. For example, figures compiled by the Grocery Manufacturers of America suggest that wax-coated OCC may comprise as much as 30 percent of a store's total OCC stream. The stores in this project, however, appeared to have much less wax-coated OCC (ranging from 1.1 percent to 4.9 percent of the store's total OCC stream). It is unclear whether the discrepancy occurred because the stores generate much less of the material or because the store samples were underrepresentative of the actual stream. This is an area where waste sorts would provide more definitive information.

Table 2B also includes information on how much each of the stores would realize in avoided disposal costs if wax-coated OCC were eliminated as a form of transport packaging in the grocery industry. It should be mentioned that a few suppliers have begun using plain corrugated boxes with plastic liners, and others have begun experimenting with using plastic shipping containers in place of wax-coated OCC (a practice that is supported by the FDA). Unfortunately, information on the economics of these alternatives was not available for this project and, therefore, has not been included in the analysis.

During the project, it was determined that grocery stores may experience even greater savings than those found in Table 2B because, according to the American Forest and Paper Association (AF&PA), approximately 10 to 15 percent of nonwaxed boxes (i.e., recyclable boxes) are inadvertently thrown away at grocery stores because employees are confused about which boxes are and are not recyclable. Table 2C shows the amount of recyclable OCC that each participating store may be throwing away as a result of such confusion and what the stores could accrue in avoided disposal costs by eliminating the confusion.

TABLE 2B

Wax-Coated OCC Generated at Participating Stores and Potential Reduced Disposal Costs From Eliminating Wax-Coated OCC

Store	*Total Tons of Wax-Coated OCC Generated Per Year [1]*	*Per Ton Disposal Cost*	*Annual Avoided Disposal Costs From Eliminating Wax-Coated OCC*
Store 1	4	$141.72	$567
Store 2	18	$67.76	$1,220
Store 3	6	$60.17	$361
Average			$716

[1] Based on sample weights taken at each of the stores during the on-site visit. The numbers have been rounded for summary purposes.

TABLE 2C

Quantities of Recyclable OCC Thrown Away Due to Confusion with Wax-Coated OCC and Potential Avoided Disposal Costs from Eliminating Confusion

Store	Amount of Recyclable OCC that May Be Thrown Away Due to Confusion (in tons)	Per Ton Disposal Cost	Potential for Reducing Annual Disposal Costs by Eliminating Confusion
Store 1	269 x 15% = 40	$141.72	$5,669
Store 2	365 x 15% = 55	$67.76	$3,727
Store 3	555 x 15% = 83	$60.17	$4,994
Average			$4,797

Another thing the project team discovered is that all of the participating grocery stores were generating a significant portion of heavily inked OCC, which is found primarily in the vegetable and fruit sections of the stores. In speaking with market representatives, however, the presence of this material does not appear to have negatively affected the revenue that stores receive for their OCC. In fact, sources indicated that the vast majority of OCC recovery programs successfully comply with the Paper Stock Industry's specifications for Grade 11 requirements. (Those specifications are for corrugated containers having liners of either test liner, jute, or kraft, and containing no more than 1 percent prohibitive materials and no more than 5 percent total outthrows.)

The project team learned a number of valuable lessons while working with the stores to analyze their OCC streams and waste management practices.

Lesson 1: Avoided Disposal Costs

Clearly, there is a strong economic incentive for grocery stores to recycle their OCC, particularly since it is generated in such large quantities (making up the greatest proportion of transport packaging waste in a store's waste stream). Using data gathered from the three participating stores, a typical store could expect to generate an average of 396 tons of OCC per year and pay an average of $89.88 per ton to dispose of it. If, however, it were to recycle that OCC, it could realize more than $35,000 in avoided disposal costs. (See sidebar entitled "Defining a Typical Store.")

Lesson 2: Recycling Revenue

There is an even greater economic incentive for recycling OCC if one includes the revenue generated from recycling the material. Using a point-in-time average of prices received by the three stores participating in this project, the typical store could expect to generate more than $24,000 per year in revenue from recycling OCC. This figure should be used with caution when making programmatic decisions, however, since OCC prices fluctuate over time and vary greatly among stores. For example, waste billing invoices show that Store 1 received $65 per ton for its baled OCC, Store 2 received $36.55 per ton for its loose OCC, and Store 3 received $75 per ton for its loose OCC (combined with office paper and kraft bags). None of the stores received the national average per ton price for baled OCC, which industry trade publications put at $76.50 for 1997. These wide variations indicate that any decisions that include recycling revenue as a factor must be based on local market prices and conditions.

Lesson 3: Eliminating Confusion Related to Wax-Coated OCC

Making changes related to wax-coated OCC represents the single biggest area where stores could accrue additional economic benefits. Using data from the three participating stores, it was found that the typical store could realize an average of $4,800 per year in avoided disposal costs and $3,500 in additional recycling revenue by recovering recyclable OCC that currently may be thrown away due to confusion with wax-coated OCC. (Recycling revenue is based on the average price received by the three participating stores during a specific point in time.) In addition, the typical store could accrue more than $700 per year in avoided disposal costs by eliminating wax-coated OCC altogether. That brings the total economic benefit of making changes related to wax-coated OCC to about $9,000 per store per year.

Lesson 4: Alternatives to Wax-Coated OCC

Some people in the grocery industry believe that wax-coated OCC cannot be replaced. This does not, however, appear to be the case. According to the stores participating in the project, some suppliers of meat, poultry, vegetables, and fruit have already begun shipping their goods in alternative containers, such as plastic bags that are then contained inside recyclable corrugated boxes. An example of such a box was found at Store 2 for hydrocooled carrots distributed by Golden Valley Produce. A similar box was used by Golden Plump Poultry to ship chicken parts. (A competitor's chicken parts were sent in a plastic bag inside a wax-coated box.) In fact, Store 3 states that it no longer receives any meat or poultry in wax-coated containers.

The stores also point out that sometimes identical products from the same manufacturer come in both wax-coated and nonwaxed boxes. At Store 2, an employee showed the team a waxed box of bananas and a nonwaxed box of bananas shipped by the same company. This, perhaps, indicates that the type of transport package used may not always be driven solely by performance issues but also by the preference of the supplier and/or the availability of a certain type of package. Regardless of the reasons, apparently some manufacturers/growers have already begun to reduce their reliance on wax-coated containers.

Lesson 5: Reusable Shipping Containers

While researching alternatives to wax-coated OCC, the project team learned that some grocery systems have begun replacing both recyclable and wax-coated OCC with returnable plastic shipping containers. For example, in a study entitled "Transportation Packaging and the Environment (1997)," it was reported that Shaw's Supermarkets—a chain of 46 stores in Massachusetts—started a waste reduction program in 1993 in which reusable plastic shipping containers were substituted for corrugated containers, plastic bags, and polystyrene boxes when shipping perishable goods. As a result of the switch, the 46 stores realized a 70 percent decrease in the amount of waste they generated. While it is impossible to draw any conclusions about what the stores participating in this project might expect in the way of source reduction if they were to switch to returnable plastic shipping containers, it is worth mentioning that this practice has been supported by the FDA for perishable goods and appears to be working in practice within other grocery systems.

A precedent has been set at each of the participating stores for using returnable plastic shipping containers. For years their distributors have been shipping such things as health and beauty products, magazines, and general merchandise in plastic totes. In addition, bakeries commonly use returnable plastic trays to deliver baked goods. Obviously the issues of using returnable plastic containers in vegetable, produce, meat, and poultry applications are much more complex—such as the variety of products available, the number of growers and farmers involved, the need to pre-cool some products, and the shipping of wet goods—but these programs do demonstrate that returnable systems can be developed and work effectively in the grocery sector.

Lesson 6: Maturity of OCC Recycling Programs

The OCC recycling programs in the three participating grocery stores appear to be fairly mature. (The stores estimate their recovery rates at 95 percent.) Therefore, aside from changes with wax-coated containers, the programs probably cannot grow significantly in terms of greater recovery. If OCC recycling programs in other stores are equally mature, then source reduction and reuse options should be pursued with grocers to achieve greater diversion. The success of store OCC recycling programs indicates that stores *can* effectively recycle materials if (1) there is an economic incentive to do so, (2) there is support from store management, and (3) the programs are easy and accessible.

Lesson 7: Contamination

The project team did not notice any significant contamination issues associated with OCC. Two of the stores put their OCC in a designated compactor for storage and densification, and the project team found few contaminants except for an occasional piece of writing paper. One store—Store 1—bales its OCC, and the project team noted that it stores the bales outside on an unpaved lot without pallets. The store's market, however, did not have a problem with its storage practices or the fact that pallets were not used.

Lesson 8: Tray/Shrink Packaging

While several source reduction options exist for OCC—such as replacing full corrugated containers with kraft bags and source-reducing the flaps of corrugated boxes—the most significant source reduction trend in the grocery industry is the shift from full corrugated containers to tray/shrink packaging (where goods are placed on corrugated trays and sealed with shrink wrap). The sidebar entitled "Source Reduction Benefits and Other Issues Related to Tray/Shrink Packaging" shows that this packaging shift cuts the weight of a transport package in half. This reduction translates into lower shipping costs, lower material costs, and a reduction in processing costs, all of which help improve the efficiency of the grocery distribution system and reduce the amount of transport packaging waste that must be handled. (See the sidebar for more detailed information about the source reduction and cost benefits of tray/shrink packaging as well as grocers' perceptions of the package.)

Chapter Three

Lessons on Plastic Film

In addition to gathering information on OCC, another goal of the project was to determine what types of plastic film grocery stores were generating and in what quantities. The project team, therefore, asked each of the stores to collect a sample of plastic film. (The stores were allowed to select the number of days for which the sample was collected since each store had varying space constraints and levels of employee participation.) The project team did not define plastic film because it wanted to see what types of products would show up in the sample absent specific definitions.

From the samples, it was determined that grocery stores generate two basic types of plastic film: (1) stretch wrap, which is used primarily to secure goods to pallets (and is referred to as "pallet wrap" by most grocers), and (2) shrink wrap, which is used primarily to secure smaller quantities of like goods either together or to a corrugated tray. (Interestingly, those in the grocery industry often do not make a distinction between the two types of film.) Some stores also generate plastic bags when customers return them to the store for recycling.

Table 3A shows how much stretch and shrink wrap each of the participating stores collects on an annual basis.

It was determined that grocery stores generate two basic types of plastic film: (1) stretch wrap, which is used primarily to secure goods to pallets (and is referred to as "pallet wrap" by most grocers), and (2) shrink wrap, which is used primarily to secure smaller quantities of like goods either together or to a corrugated tray.

TABLE 3A

Annual Quantities of Stretch and Shrink Wrap at Participating Stores [1]

Store	Stretch Wrap (in pounds)	Percent of Total	Shink Wrap (in pounds)	Percentage of Total	Contaminants [2] (in pounds)	Percent of Total	Total Collected
Store 1	3,270	28	8,176	70	234	2	11,680
Store 2	5,256	36	7,884	54	1,460	10	14,600
Store 3	3,677	73	1,108	22	252	5	5,037
Average							10,439

[1] The numbers in this Table have been rounded for summary purposes.
[2] Contamination refers to anything included in the sample that was not stretch or shrink wrap, such as semi-rigid layer separators, paper, candy wrappers, and pigmented bags.

The next step in the project was to quantify what each of the participating stores was paying for waste disposal and what they could expect to realize in avoided disposal costs if they were to recycle their stretch and shrink wrap instead of throwing it away. Table 3B summarizes the results of that work.

TABLE 3B

Potential Annual Avoided Disposal Costs at Participating Stores From Recycling Stretch and Shrink Wrap

Store	*Quantity of Film Collected (in tons) [1] Per Year*	*Per Ton Disposal Cost [2]*	*Potential Annual Avoided Disposal Costs Through Recycling*
Store 1	6	$141.72	850
Store 2	7	$67.76	474
Store 3	3 [3]	$60.17	181
Average			502

[1] Quantities are based on samples collected and weighed during the site visits. The numbers have been rounded for summary purposes.
[2] Per ton disposal costs were obtained from actual waste billing invoices and include collection costs, disposal costs, state tax, the Minnesota Waste Assessment Fee, and any other costs the stores incur.
[3] It should be noted that Store 3's sample was much smaller than that of other stores and probably represents about half of what it could actually collect.

Of the three stores that participated in the project, only Store 1 was actively recycling plastic film. The store collects both stretch and shrink wrap, as well as plastic bags, and ships the material through a backhaul arrangement to its wholesaler/distributor. The wholesaler/distributor puts the film from Store 1 (along with that collected from other stores) into a holding area where it is combined with the stretch wrap generated by the distribution center. The wholesaler/distributor bales the material, and it is picked up on a regular basis by Bunzl Recycling, a local market. No revenue is received for the film by the store or the wholesaler/distributor; therefore, the only economic benefit is in the form of avoided disposal costs.

As Table 3A indicates, Store 1 does a fairly good job of keeping contaminants out of its film stream. The other two stores, however, had fairly high contamination rates in their samples. The contaminants included such things as green and blue semi-rigid layer separators (used with produce), red and beige potato bags, bag liners from produce boxes, strapping, plastic bottles, candy wrappers, and fresh flower wraps. Most of these contaminants could be avoided if a fairly simple, straightforward education program were developed. (Keep in mind that no education was done prior to sample collection.)

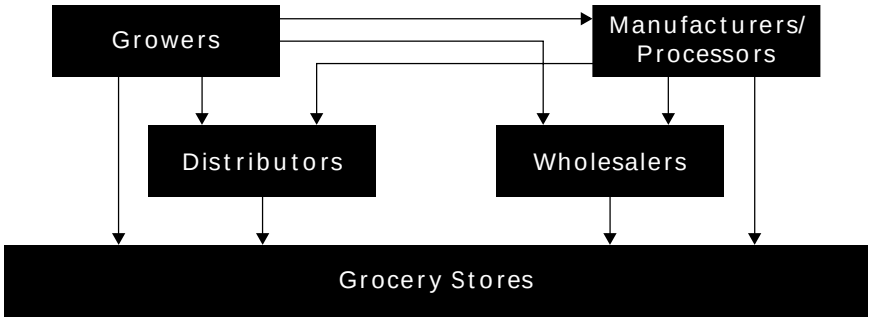
Two of the three stores participating in the project—Store 1 and Store 3—also collect plastic bags from customers for recycling. Samples from the stores indicate that the former collects approximately 1,144 pounds of plastic bags per year and the latter collects about 1,059 pounds per year. In both programs, the bags are sent back to the stores' wholesaler/distributors, where they are consolidated for Bunzl Recycling. At Store 1, the bags are marketed along with stretch and shrink wrap, whereas at Store 3 they are marketed alone. (Store 3's wholesaler/distributor collects its own stretch wrap for recycling but sells it to a different market.)

The project team learned a number of valuable lessons while working with the stores to collect stretch and shrink wrap.

GROCERY FLOW CHART

To fully understand issues related to managing transport packaging waste, it is important to know how products—and, hence, their transport packages—move through the grocery distribution system. The following flow chart provides a general map of how goods and their packages make their way through the grocery supply chain.

What the chart shows is that grocery stores receive products from a variety of sources, including growers, manufacturers, processors, nongrocery distribution centers, grocery distribution centers, wholesalers, and more. Given the variety of sources, stores often end up handling a variety of transport packages, which has implications in terms of how easily those packages can be managed (i.e., reduced, reused, recycled, and/or disposed). It also demonstrates why it may be difficult for stores to act as catalysts in changing the types of transport packages that are used in the grocery system.



In this flow chart, "growers" refers to farms, orchards, and other similar entities that grow food. "Manufacturers/processors" refers to large national companies—such as Procter & Gamble, Coca Cola, and Purina—as well as smaller companies that produce such things as baked goods, dairy products, meat, dry goods, and so forth. These companies may deliver goods through a wholesaler/distributor or deliver them directly to the store. Direct store delivery is particularly common with manufacturers/processors that produce lower volume goods and/or goods that perish quickly.

"Distributors" can either be part of a grocery chain—such as Nash Finch and SUPERVALU facilities—or operate outside the grocery chain, such as soft drink distributors. Typically, distributors are thought of as pass-through facilities that have a fairly quick turnaround time—usually two to three days. They receive large quantities of goods, unpack them, and repackage them in smaller quantities for shipment to individual stores.

"Wholesalers" are centers that buy goods in bulk from manufacturers at bulk rates and resell them to a variety of grocery stores independent of their chains or affiliations. They tend to have a wider variety of goods than distributors and keep them for longer periods of time. Wholesalers may send goods directly to stores or deliver them through distribution centers. In the grocery industry, one facility often acts as both wholesaler and distributor (as was the case with the three stores and three wholesaler/distributors participating in this project).

Lesson 1: Quantities of Plastic Film

Using an average of the data gathered at three participating stores, a typical grocery store could expect to collect more than 10,000 pounds of stretch and shrink wrap per year for recycling. (This is without any concerted collection efforts and without employee education.) While this amount may seem like a lot from a grocery store's perspective, it is not a lot from a market's perspective. Of the 22 markets contacted for this project, only 9 have no minimum quantity requirements. One market accepts minimum loads of 1,000 pounds, another four markets accept minimum loads of 5,000 pounds, and two markets have 10,000-pound requirements. The remaining six markets require more material than a grocery store is likely to generate in a year. Thus, it may be difficult (although not impossible) for stores to market stretch and shrink wrap on their own. Instead, as demonstrated by Store 1, it may be easier for grocery stores to recycle their film through a backhaul arrangement with their wholesaler/distributor.

Lesson 2: Avoided Disposal Costs

From a grocery store's perspective, there is not much economic incentive to recycle film. As Table 3B shows, the typical grocery store can expect to save an average of only $500 per year in avoided disposal costs by recycling stretch and shrink wrap. It is important to remember, however, that decreased costs of any amount may be valuable in the highly competitive, low-margin grocery industry. And if film continues to replace OCC in transport packaging, then the amount of film available for recycling will grow and the economic benefits of recycling it will improve.

Lesson 3: Economic Benefits for Wholesaler/Distributors

While there may not be an economic incentive for stores to recycle film, there may be an economic incentive for wholesaler/distributors to do so. For example, one participating wholesaler/distributor serves 180 stores in Minnesota. If each of those stores sent an average of 10,000 pounds of stretch and shrink wrap back to the wholesaler/distributor for recycling, that would equate to 1,854,000 pounds (or 927 tons) of film per year. Add to that the 34,600 pounds (or 17.3 tons) of stretch wrap that the wholesaler/distributor generates itself, and the total annual quantity of film available for recycling would be 1,888,600 pounds (or 946 tons). The wholesaler/distributor reported that it currently receives 5 cents per pound for its material, which means the total revenue from recycling film would be $94,430 per year.

The wholesaler/distributor will also incur some costs. An APC study entitled "Stretch Wrap Recycling: A How-To Guide" estimates that stretch wrap recycling programs cost about $.026 per pound, including expenses related to employee training, special containers, baling labor, bale wire/strapping, and labor related to collecting and upgrading the material. Using this estimate, the wholesaler/distributor could expect to incur costs of about $49,104. After program costs, therefore, the wholesaler/distributor could expect net revenue of $45,326 per year by recycling stretch and shrink wrap. (In addition, it would keep nearly 950 tons of waste out of the landfill.)

Even if you were to make a more conservative revenue estimate of 3 cents per pound, the wholesaler/distributor would still experience net gains of $7,554 per year from recycling film. If avoided disposal costs were figured into the equation, that same wholesaler/distributor would realize an additional $1,716 per year. (The wholesaler/distributor reported its disposal costs at $99.18 per ton. If that figure is multiplied by the 34,600 pounds of film it generates, it equates to $1,716 in avoided disposal costs per year.)

Lesson 4: Opportunities for Increased Recycling

It is a commonly held belief that most grocery stores and wholesaler/distributors are currently recycling their stretch and shrink wrap. This does not, however, appear to be true. Only one of the three stores participating in this project was recycling plastic film, and only one wholesaler/distributor was accepting film back from its stores for recycling. (The other two wholesaler/distributors were recycling their own film but not accepting it back from their stores.) Therefore, it appears that there is considerable room for growth in recovering plastic film from grocery stores.

Lesson 5: Recycling Stretch and Shrink Wrap Together

As Table 3A demonstrates, stores can expect to generate more shrink wrap than stretch wrap, which is not commonly known. (Store 3 was the one exception to that rule, but its sample was problematic in terms of both size and composition.) To date, many film recycling programs in the grocery sector have focused only on stretch wrap, which means the most significant portion of a store's film waste is not being collected. This does not appear to be a market-driven decision since 18 of the 22 film recycling markets contacted during this project accept both stretch and shrink wrap. It may, however, be driven by wholesaler/distributors which generate only stretch wrap and may not be aware that the two films can be marketed together.

Lesson 6: Contamination

Contamination is a problem that needs to be addressed in the grocery sector. As Table 3A shows, the amount of contamination found in the film samples at two of the three participating stores exceeded typical market specifications. Therefore, stores that want to recycle stretch and shrink wrap need to educate employees about what is and is not acceptable. As proven by Store 1, this bar-

It is a commonly held belief that most grocery stores and wholesaler/distributors are currently recycling their stretch and shrink wrap. This does not, however, appear to be true.

rier is not insurmountable. A simple training session in which employees learn what stretch wrap and shrink wrap is and where it is generated will go a long way toward improving quality. Samples of acceptable materials should be posted near collection containers so that employees can check the material prior to putting it in the collection box or bag. During the training session, employees should also be shown common contaminants—such as those mentioned earlier—so they know what not to include.

Lesson 7: Management Support

Enthusiasm for recycling film varies widely among stores. One of the stores participating in this project wanted very much to recycle film and was aggressive in obtaining its sample. Another store had its film sample thrown away twice prior to the site visit, and the third store was less than enthusiastic about obtaining a sample even though it had willingly agreed to participate in the project. The varying levels of enthusiasm are a reminder that recycling is not part of a grocery store's core business, and unless management is excited about recycling and committed to making its programs work, then stores cannot succeed.

Lesson 8: Storage Space

While all of the participating stores mentioned concerns about space constraints, none of them appeared to have problems in practice. They simply put the film in whatever type of container was available—ranging from gaylord boxes and carts to bags and metal cages—and stored it in any available space. Stores working with wholesaler/distributors on backhaul programs for film will have trucks coming and going on a daily basis, which should allow them to move stretch and shrink as often as necessary to keep it from taking up floor space.

Lesson 9: Marketing Film

The project team learned that one of the biggest barriers to recycling film at the grocery store and wholesaler/distributor level is the fact that people are not aware of the markets that are available for film, nor are they aware of what they must do to meet market specifications. For that reason, the project team developed a market listing (found in Appendix B) of companies in Minnesota and select companies from around the country that accept film from the grocery sector for recycling. For each company, the project team has listed the company name, location, and telephone number, as well as the quantity of film it requires, the form it wants its material in, its quality requirements, and pricing information where available. This listing can be used by grocers and wholesaler/distributors that want to start new film recycling programs or look for alternatives to current markets.

Lesson 10: Source Reduction

When working with one grocery store, the project team learned about a product being manufactured by 3M called Scotch™ Brand Stretchable Tape (ST). 3M maintains that the product—which is made with linear low density polyethylene (as is most stretch and shrink wrap), is 4 or 6 mils thick, and has a solventless adhesive—offers significant source reduction opportunities over traditional stretch film. In its product literature, the company indicates that 2.1 ounces (or 60 grams) of ST can replace 9.1 ounces (or 260 grams) of stretch wrap on a typical load, resulting in a 77 percent material savings.

Using ST probably would not result in any significant benefits at the grocery store level (except for modest avoided disposal costs if the store were not recycling its stretch wrap), but it may provide a more significant opportunity for source reduction at the wholesaler/distributor level. For example, one of the wholesaler/distributors participating in this project reported that it purchases approximately 20,000 pounds (or 10 tons) of stretch wrap per year to secure goods to pallets and, in most instances, the stretch wrap is discarded by its stores. If the wholesaler/distributor were to use ST instead of stretch film, it would generate only 4,600 pounds (or 2.3 tons) of transport packaging waste, which is preferable from an economic perspective because eliminating waste at the source is more cost-effective than recycling it at the back end.

ST may also appeal to others in the grocery distribution system. For example, 3M reports that a meat packing house was packing 48-50 pounds of ham into 10-inch-high boxes. The boxes were then stacked in seven layers on a 48" x 40" pallet, secured with stretch film and cornerboards, and transported to an off-site blast freezer. At the freezer, the cornerboards and stretch film were removed to improve cold air flow to the hams and reduce freezing time. After that process, the hams were rewrapped and sent to a distributor.

When exploring ways to reduce its costs, the meat packing house found that ST was a good alternative to stretch wrap because (1) it allowed air to flow through the pallet load and, therefore, did not have to be removed during freezing, and (2) it required less raw material. The meat packer was using 15.7 ounces of stretch wrap each time the pallet was wrapped, which meant that a total of 31.4 ounces of material was being used for shipment. The same pallet configuration required a total of only 3.3 ounces of ST, resulting in 28.1 fewer ounces of transport packaging waste per pallet load. In addition, the meat packing house saved 42.5 percent in material costs.

It should be noted that the project team did not conduct any of its own research on the performance or cost of ST. The example is included only to apprise those in the grocery distribution system of a potential source reduction option they may want to investigate.

Chapter Four

Lessons on Pallets

As with OCC and plastic film, one of the project goals was to determine how many pallets stores receive; what they do with them after use; what reduction, reuse, and recycling options are available; and what the economic impact of those options would be on individual grocery stores. To that end, the project team worked with the stores to estimate how many pallets they receive on a regular basis. Table 4A shows the results of that work.

TABLE 4A

Tons of Pallets (48"x 40") Rotating in Stock Per Year

Store	*Number of Wood Units Rotating in Stock*	*Total Weight of Wood Pallets (in tons)*	*Number of Plastic Pallets Rotating in Stock*	*Total Weight of Plastic Pallets (in tons)*	*Total Annual Tonnage [1]*
Store 1	10,400	159.5	0	0	160
Store 2	15,695	372.8	4,380	50.37	423
Store 3	27,375	636.5	9,125	86.7	724

[1] The numbers have been rounded for summary purposes.

The stores participating in the project do not dispose of pallets at their facilities. Instead, when goods are unloaded, the pallets are stacked near the loading/unloading area and returned to the supplier, whether that be the store's wholesaler/distributor, a grower/farmer, or a processor/manufacturer. Even when pallets are damaged, they are returned to suppliers for repair or recycling, or given to customers and employees for their own use. This fully "returnable" pallet system, which has been in operation for many years, benefits stores economically in the form of avoided disposal costs. Table 4B shows the avoided costs that each store experiences because it does not have to dispose of pallets.

TABLE 4B

Avoided Disposal Costs that Result from Returnable Pallet Programs

Store	*Annual Tons of Pallets Generated*	*Per Ton Disposal Cost*	*Annual Avoided Disposal Costs*
Store 1	160	$141.72	$22,675
Store 2	423	$67.76	$28,662
Store 3	724	$60.17	$43,563
Average			$31,633

During the project, it was noted that two of the three participating stores are currently receiving goods on plastic pallets (or shipping platforms). In both instances, the pallets are part of a pilot project being run by the store's wholesaler/distributor to test the feasibility of using reusable plastic pallets in the grocery distribution system. Both stores report that they like plastic pallets because they are lightweight, nestable, uniform in size, and easier and safer to handle than their wood counterparts. The only drawback is that plastic pallets do not work with the stores' existing racking systems, which means that if goods are not immediately unloaded, the pallets must be stored on the ground (thus, taking up valuable floor space). This did not, however, appear to be a significant problem at either facility.

Since grocery stores do not purchase or dispose of pallets, there is little incentive for them to explore opportunities for reducing, reusing, or recycling. For that reason, the project team refocused its efforts on pallet issues that arise at the wholesaler/distributor level.[1] At present, one of the most pressing issues related to pallets (and the issue that was ultimately chosen for research in this project) is whether plastic is an economically viable alternative to wood.

To answer that question, the project team turned to SUPERVALU—the nation's largest grocery wholesaler/distributor headquartered in Eden Prairie, Minnesota—which volunteered to provide "real world" data on the economics of using returnable plastic pallets. Using SUPERVALU's data, the project team found that

- SUPERVALU saved 63 cents per trip over the course of three years by using plastic pallets instead of wood;
- it could potentially reduce its "indirect" or "soft" costs by approximately $556,000 per year (or $3.70 per pallet); and
- it achieved payback on its initial investment shortly after the second year of use.

Following is an explanation of how SUPERVALU and the project team arrived at those figures. It should be noted that, while the numbers were derived from actual data provided by SUPERVALU, they are based on a series of assumptions made by both SUPERVALU and the project team—assumptions that must be taken into consideration when trying to interpret the economic value of using plastic pallets. It also should be noted that neither SUPERVALU nor the project team purport that plastic pallets are a panacea; instead, they are one option that the grocery industry can explore in its efforts to implment economically viable reduction, reuse, and recycling programs.

COST ANALYSIS: DIRECT ECONOMIC BENEFITS

At present, SUPERVALU uses approximately 20 million pallets, which can be broken down into three basic categories: (1)

[1] *Slip sheets are another option that could have been explored, but the stores participating in this project believed that reusable plastic pallets were more prevalent and a better option to study given limited time and resources.*

about 3.5 million are wood CHEP pallets, which are leased through a third-party system, (2) about 16.35 million are standard white wood pallets that SUPERVALU sometimes purchases and manages, and (3) 150,000 are standard plastic shipping platforms that it purchases and manages. (The latter pallets are used for transporting goods to stores only and are not rackable.)

If the grocery industry were to make a straight cost comparison based only on the initial purchase price of a pallet, plastic pallets would not fare well. SUPERVALU reports that plastic pallets cost an average of $21, whereas white wood pallets cost only $7. SUPERVALU is quick to point out, however, that while the initial purchase price of a plastic pallet is three times that of a wood pallet, plastic pallets have a significantly longer life. For example, SUPERVALU reports that its plastic pallets make an average of 100 trips per year, and for the past three years have required minimal repair and replacement, putting their lifetime trippage to date at about 300 cycles. Comparatively, its wood pallets typically make only 10 cycles before needing replacement.

Put in financial terms, the average plastic pallet costs SUPERVALU 7 cents per trip ($21.00 divided by 300 trips), compared to the average wood pallet which costs 70 cents per trip ($7.00 pallet cost divided by 10 trips). Therefore, SUPERVALU is saving 63 cents per trip by using plastic pallets. (In practice, the savings are probably even greater since this analysis does not include expenses related to repairing wooden pallets—expenses that are usually incurred twice during the life of a wood pallet. In addition, the savings are based on three years of use, but SUPERVALU believes that plastic pallets will be used for a much longer period.)

A common question from grocery industry representatives regarding plastic pallets is: "How soon can we expect to achieve payback?" In other words, if they make a substantial upfront investment in plastic pallets, when will the savings start outweighing the expense? While there are several ways that one can make that calculation, the project team used a formula that took into account (1) the initial purchase price of both wood and plastic pallets, (2) repair costs for wood pallets, and (3) replacement costs for wood and plastic pallets. The team then projected these costs over a five-year period and found that SUPERVALU achieved payback sometime after the second year of using plastic pallets. The results also indicate that SUPERVALU can expect net savings of about $2.9 million over the course of five years by using 150,000 plastic pallets. (See Appendix D for more information on how these numbers were calculated.)

Another question that grocers ask is whether replacing wood pallets with plastic pallets will result in avoided disposal costs (another potential economic benefit). For SUPERVALU, the answer is no because its distribution centers do not dispose of wood pallets. Instead, wood pallets come into the distribution centers filled with goods from manufacturers. The goods are then removed from the pallets, broken down into smaller lots, reloaded on wood pallets, shipped to the stores that SUPERVALU serves, and shipped back to one of SUPERVALU's

distribution centers. The distribution centers then contract with local third-party pallet recyclers and remanufacturers to take the pallets, repair the damaged ones, recycle the ones beyond repair, and return the intact ones. While some SUPERVALU distribution centers pay for this service, others receive revenue (over and above the cost) from the wood stream they generate. When looking across the entire corporation, SUPERVALU believes that the total cost of handling wood pallet waste is offset by the revenues generated by recycling. Therefore, if wood shipping platforms were replaced with plastic shipping platforms, there would not be an economic benefit in the form of avoided disposal costs. (Similarly, most plastic pallet vendors will pay a small fee for returned damaged plastic pallets, but SUPERVALU believes these revenues would be offset by transportation costs.)

COST ANALYSIS: INDIRECT ECONOMIC BENEFITS

While several studies have been conducted on the potential direct economic benefits of using plastic pallets, very little information exists on potential "indirect" or "soft" benefits, such as savings that may result from reduced workers' compensation claims, reduced labor, or reduced shipping costs. In an effort to try to generate such data, SUPERVALU helped the project team develop a system for measuring indirect benefits. Following are the results of the project team's analysis using SUPERVALU's data and proposed methodology.

Reduced Workers' Compensation Claims

In 1997, SUPERVALU had a total of 186 pallet-related injuries, which generated $900,000 in workers compensation claims. Although the company does not distinguish between claims related to wood or plastic pallets, it does track general types of pallet-related injuries, including (1) stress injuries (that result from lifting, pushing, or pulling pallets); (2) slivers and cuts; (3) crushed extremities; and (4) injuries from stepping on pallets (such as falls, twisted ankles, and so forth).

In 1997, the greatest percentage of pallet injuries at SUPERVALU were stress-related. Of the 186 injuries, between 30 and 35 percent were stress-related (56-65 injuries), and those injuries accounted for 60 percent of SUPERVALU's pallet-related workers' compensation costs (or $540,000). SUPERVALU feels that stress-related claims probably are more likely to occur with wood pallets than with plastic pallets since the latter weigh considerably less. (The project team weighed SUPERVALU pallets at one of its stores and found that plastic pallets weighed only 19 pounds whereas its wood counterparts weighed 46.5 pounds.) Therefore, if SUPERVALU were to use all plastic pallets, it could reduce stress-related workers' compensation claims by as much as one-third or $178,200 per year. If those cost savings are applied on a per-pallet basis, SUPERVALU could save as much as $.009 per pallet in workers' compensation claims by switching entirely from wood to plastic ($178,200/20 million pallets in circulation = $.009 per pallet).

In addition, SUPERVALU reports that 5 percent of all injuries in 1997 were related to slivers and cuts, which are most likely to occur when using wood pallets. Considering

that those injuries accounted for about 2 percent of SUPERVALU's total workers' compensation costs that year (or $18,000), it could save an additional $ .001 per pallet by switching from wood to plastic ($18,000/ 20 million pallets).

Adding the $.009 per pallet in reduced claims related to stress injuries to the $.001 in reduced claims related to cuts and slivers indicates that SUPERVALU could reduce its total workers' compensation claims by as much as $.01 per pallet by switching from wood to plastic. Since SUPERVALU currently has 150,000 plastic pallets in circulation, it probably has reduced its actual costs by about $1,500 per year.

Reduced Labor Costs

The way that SUPERVALU calculates reduced labor costs relates to the way in which pallets are moved within the system. With plastic pallets, SUPERVALU engineers have calculated that they can save 6 seconds per pallet in movement time each time a plastic pallet makes a trip. Therefore, since SUPERVALU has 150,000 plastic pallets that each make 100 trips per year, it has a total potential time savings of 90 million seconds, or 1.5 million minutes, or 25,000 hours.

To translate that into dollars, SUPERVALU calculates warehouse employee salaries at $22 per hour ($15 per hour in wages plus $8 per hour in benefits). Using that figure and the 25,000 hours saved by using plastic pallets instead of wood, SUPERVALU could realize an annual savings of $550,000 per year, or approximately $3.66 per pallet.

Reduced Shipping Costs

Because plastic pallets have "four-way entry," SUPERVALU maintains that you can "spin" them when loading the truck. That spinning capability translates into space savings on the vehicle which, in turn, allows SUPERVALU to load more goods onto one truck. SUPERVALU estimates that by spinning pallets, it can get four extra pallets onto a vehicle, thereby increasing truck capacity by 10 percent.

It follows that if SUPERVALU can increase the amount of product it can load onto every vehicle, then there can be fewer deliveries, which should result in fewer total miles traveled. In 1997, SUPERVALU trucks traveled a total of 95 million miles at a conservative cost estimate of $1.25 per mile; therefore, its travel costs that year were $118,750,000. If SUPERVALU used all plastic pallets, it could reduce that cost by 10 percent or $1,187,500. Since it does not always send full loads to its participating stores, SUPERVALU recommends that that number be cut in half, meaning that it would really save about $593,750 in shipping costs by switching entirely from wood to plastic pallets. Dividing $593,750 by 20 million equates to a per-pallet savings of 3 cents (or $.030). Of course, at present, SUPERVALU has only 150,000 plastic pallets in circulation, which puts its actual annual savings at about $4,500.

Total Indirect Economic Benefits

As Table 4C shows, if you add up all of the preceding numbers, SUPERVALU could potentially reduce its "indirect" or "soft" costs by approximately $556,000 per year (or $3.70 per pallet) by using 150,000 plastic pallets.

TABLE 4C

Cost Reductions	Total Annual Savings	Per Pallet Savings
Reduced Workers' Compensation Claims	$1,500	$0.01
Reduced Labor	$550,000	$3.66
Reduced Shipping	$4,500	$0.03
Total Indirect Economic Benefits	$556,000	$3.70

The project team learned a number of lessons about plastic pallets while working with participating grocery stores and SUPERVALU.

Lesson 1: Direct and Indirect Savings

Using SUPERVALU's data, it appears that plastic pallets are an economically viable alternative to wood pallets for two reasons. First, over the course of three years, plastic pallets have provided the company with a savings of 63 cents per trip, which is a direct economic benefit. Second, in addition to those savings, SUPERVALU has the potential to reduce its workers' compensation, labor, and shipping costs by about $556,000 per year (or by $3.70 per pallet). While these numbers will vary somewhat in other grocery distribution systems, it demonstrates that there is an economic incentive—at least at the wholesaler/distributor level—for the grocery industry to further explore the implementation of reusable plastic pallet programs.

Lesson 2: Payback Period

A compartive analysis of plastic and wood pallets shows that SUPERVALU achieved payback for its initial up-front investment shortly after the second year of plastic pallet use. In addition, that analysis shows that SUPERVALU can expect net savings of about $2.9 million over the course of five years by using 150,000 plastic pallets.

Lesson 3: Performance

Plastic pallets also have a number of non-economic advantages. SUPERVALU representatives like that they are lightweight, nestable (which means they take up less space after unloading), take up less space on shipping vehicles, have four-way entry, and appear to work with all types of products. (At first the company had reservations about using plastic pallets for frozen and perishable goods, but they had few problems in practice. Representatives maintain that the nonskid surface on most plastic pallets works effectively, although the difference in friction is something that employees must get used to.) In addition, SUPERVALU representatives mentioned that employees in its distribution centers "always use plastic pallets first," because they like the way they perform.

The grocery stores that SUPERVALU serves also like plastic pallets. The manager of one of its stores told the project team that he and his employees like the pallets because they are "much lighter than wood, are easier to store, take up a lot less space in storage, are nestable, are very sturdy, and are easier to work with and move around." From his perspective, there were no disadvantages to working with plastic pallets.

Lesson 4: Racking

Plastic pallets do, however, have one important drawback—they do not work with current store and wholesaler/distributor racking systems. (The racks are designed to hold pallets with flat boards extending the full

length and width of the platform. Plastic pallets, however, have nine small, protruding legs which do not work with current racks.) SUPERVALU said that if the plastic pallet industry were to make a lightweight rackable plastic pallet, it would be interested in using them. (Right now, rackable plastic pallets do not weigh much less than wood, which limits their advantages.) Another grocery industry representative mentioned that a different option would be for the pallet industry to make a new racking system that is compatible with plastic shipping platforms or to retrofit existing systems.

SUPERVALU representatives also indicated that plastic pallets are probably best used in a closed-loop system where return policies (such as small deposits) can be implemented. At an initial purchase price of $21 per pallet, companies cannot afford to have plastic pallets disappear, particularly since their value to the company increases over time.

Lesson 5: Wholesalers as Advocates

Since grocery stores do not purchase, dispose of, or manage pallets, it is unlikely that they will be drivers of change in converting from wood to plastic pallets. Wholesaler/distributors such as SUPERVALU, however, can strongly advocate for their use with manufacturers and third-party leasing companies (such as CHEP) because they can demonstrate the economic advantages that can be gained through the use of plastic pallets.

Lesson 6: Indirect Benefits for Stores

While individual grocery stores will not experience direct economic benefits if the system switches from wood to plastic pallets, they may receive some "indirect" economic benefits. For example, if SUPERVALU saved $.01 per pallet through reduced workers' compensation costs, it stands to reason that grocery stores would accrue similar savings. If that is the case, the typical store can expect to save approximately $200 per year if its pallet inventory was switched entirely to plastic. (It also is likely that stores would reduce labor time by using plastic pallets, but data to support that belief are not currently available.)

The stores may also experience a reduction in future "passed on" costs if their wholesaler/distributors can improve the efficiency and cost-effectiveness of the distribution system by using plastic pallets. If each store's wholesaler/distributor were able to save $556,000 per year in "indirect" costs and save 63 cents per trip by using plastic pallets (as SUPERVALU did), then one could assume that at least a portion of those savings may be used to defray future cost increases for the stores.

Lesson 7: Avoided Disposal Costs

Individual grocery stores benefit economically from the current returnable pallet system (regardless of whether the pallets are wood or plastic) because they do not have to throw any pallets away. Using data from the three stores participating in this project, the typical grocery store can expect to save more than $31,000 per year in avoided landfill costs by being able to return both intact and damaged pallets to its suppliers.

Store Profiles

For several years, the OEA has been working with the grocery industry to identify opportunities for reducing, reusing, and recycling transport packaging. Through that work, it has developed good working relationships with several grocery corporations. When these corporations learned of the joint OEA/APC project, they polled some of their Minnesota stores to see which ones would be interested in participating in the project. Three stores (with support from their wholesaler/distributors) volunteered and agreed to provide the project team with detailed waste data, participate in telephone and personal interviews, collect samples of selected transport packaging materials for analysis, and allow the project team to conduct an on-site visit.

In return for their cooperation, the project team promised each store that it would receive a store "profile" including the following information:

- a written description of the store's waste management practices and an analysis of its waste management costs;
- a written description of how the store currently manages transport packaging;
- estimates of what the store currently experiences in avoided disposal costs through existing recycling or reuse programs;
- estimates of what the store could experience in additional avoided disposal costs if it changed specific waste management and/or transport packaging practices; and
- where appropriate, recommendations on how the store might strengthen its existing recycling programs.

Chapters 5, 6, and 7 make up the store "profiles" that the project team developed. It was from these anaylses that the "lessons" in previous chapters were drawn. It should be noted that the stores have not been named in this report in order to prevent the disclosure of any proprietary information.

CHAPTER 5
STORE 1: A PROFILE

Store 1 is a 55,000-square-foot urban/suburban grocery store located in Minnesota. It receives most of its goods from its wholesaler/distributor, but it also receives some goods—such as paper products, soft drinks, produce, and dairy products—directly from manufacturers, nongrocery distributors, and local growers and farms.

A careful analysis of data indicates that Store 1 realizes more than $61,000 in avoided disposal costs due to its current recycling and reuse efforts. The project team estimates that it could realize an additional $6,300 in avoided costs if it were to implement the transport packaging strategies discussed in this profile.

FIGURE 5-1
Store 1: Economic Benefits of Recycling and Reuse

Savings From Current Programs	Dollars Saved
Film Recycling Program	$850
OCC Recycling Program [1]	$38,123
Fully Returnable Pallet Program	$22,675
Total Current Savings	$61,648
Potential Savings From New Programs	
Eliminating Wax-coated OCC [1]	$561
Increasing Recovery of Recyclable OCC (by reducing wax confusion) [1]	$5,669
Switching from Wood to Plastic Pallets	$100
Total Potential Savings	$6,330
TOTAL POTENTIAL ECONOMIC BENEFITS THROUGH RECYCLING & REUSE	$67,978

[1] These amounts do not include revenue currently being received from recycling OCC and additional recycling revenue that could be accured if wax-coated OCC were converted to recyclable OCC. If those amounts were included, Store 1 would accrue an additional $20,111, bringing the total economic benefit to $88,089.00.

(See Figure 5-1.) Of course, Store 1 cannot do it alone; the next logical steps in reducing, reusing, and recycling transport packaging will require the cooperation of the store's wholesaler/distributors, growers and farmers, and processors and manufacturers. The following analysis explains how the project team arrived at these figures and the recommended cooperative strategies.

WASTE MANAGEMENT

In an effort to better understand the store's waste management practices, Store 1 provided the project team with waste billing invoices for an eight-month period from February 1997 through September 1997. An analysis of those invoices indicates that Store 1 generated 136.36 tons of garbage during that period—that is, garbage that was disposed of as opposed to recycled. That equates to an average of 17.04 tons of garbage per month or a total of 204.54 tons of garbage per year. (See Table 5A.)

Store 1 contracts with Adams Roll-Off to manage its waste. As Table 5A shows, Store 1 pays an average of $141.72 per ton for overall waste management services. That amount includes $41.95 per ton charged by Adams Roll-Off for collecting the material, $79.25 per ton charged by the county's waste-to-energy (WTE) facility for disposal, $11.54 per ton charged by Adams as required under the state's Waste Assessment Fee, $1.30 per ton charged by the county, and $7.68 per ton in sales tax. Using the average cost per ton, it appears that Store 1 pays more than $28,988 per year to dispose of its waste (204.54 tons disposed x $141.72 per ton disposal cost).

TABLE 5A

Waste Billing For Store 1

	Adams Roll-Off Collection Fee			County WTE Municipal Solid Waste Disposal		Other Monthly Charges			
Monthly Invoice	*Container Size (cubic yards)*	*(tons)*	*Collection Cost [1] ($)*	*WTE per ton Disposal Cost*	*Total Disposal Cost (tons x cost)*	*MN State Assessment Fee ($)*	*County Service Charge ($)*	*Sales Tax @ 6.5% ($)*	*Total MSW Mngt. Cost ($)*
Feb 97	20	19.89	$640	82.65	$1,644	$192	$0	$148	$2,624
Mar 97	20	17.32	760	82.65	1,431	162	0	112	2,465
Apr 97	20	16.23	720	82.65	1,341	134	0	143	2,329
May 97	20	17.23	760	82.65	1,424	228	0	142	2,554
Jun 97	20	17.37	760	82.65	1,436	228	0	143	2,567
Jul 97	20	17.42	680	82.65	1,440	204	0	138	2,462
Aug 97	20	17.16	720	67.65	1,161	216	94.04	122	2,313.04
Sep 97	20	13.74	680	67.65	920	210	82.81	108	2,010.81
TOTAL		136.36	$5,720		$10,807	$1.574	$176.85	$1,047	$19,324.85
PER TON			$41.95		$79.25	$11.54	$1.30	$7.68	$141.72

[1] Collection costs include a $40 trip (or pull) charge which is assessed each time Adams empties Store 1's 20-cubic-yard container.

One way that Store 1 could conceivably reduce its annual waste disposal costs is by recycling, reusing, or reducing its transport packaging, particularly OCC, plastic film, and pallets. Following is an analysis of how Store 1 currently handles those materials and the cost benefits that could be realized by making some changes in its waste management practices.

CORRUGATED CONTAINERS

Because OCC comprises a significant portion of Store 1's waste stream, it also presents significant opportunities for potential cost reductions through recycling, reuse, and/or source reduction. Recognizing that potential, Store 1 established a recycling program to divert its OCC from the waste stream. When goods come into the store, the corrugated boxes and trays are removed either near the unloading dock or inside the store, broken down, and taken to a vertical baler located in the back storage area. When the baler is full, the bales are tied off and stored outside on the ground in Store 1's unpaved side lot. During the time for which data were made available, the hauler for the store was picking up the bales of corrugated once each week and marketing it along with OCC from other sources.

Waste billing invoices from Store 1 indicate that, for the period from February 1997 through September 1997, the store collected 179.5 tons of OCC. (See Table 5B.) That equates to an average of 22.4 tons of corrugated per month or 269 tons per year. These rates were corroborated by samples that the store set aside for the project team to observe. The sample showed that, during a particular week, Store 1 generated 15 bales of OCC with each bale weighing between 500 and 600 pounds. Using this as a measure, it appears that Store 1 generates between 3.75 and 4.5 tons of OCC per week or between 195 and 234 tons per year, which is very close to the information gathered from billing invoices. For this analysis, the actual numbers from billing invoices will be used to calculate potential cost benefits.

TABLE 5B

OCC Generation at Store 1

Month	*OCC Tons Collected [1]*
February 1997	20.09
March 1997	23.48
April 1997	21.24
May 1997	23.60
June 1997	23.40
July 1997	20.61
August 1997	23.60
September 1997	23.48
Total	179.50

[1] These numbers came from actual waste billing invoices.

When the site visit was conducted, the project team noted that Store 1 was generating a fair amount of wax-coated corrugated containers. These containers are considered a contaminant by OCC markets and, therefore, must be thrown away. Based on discussions with the store manager, it is estimated that Store 1 receives about 40 wax-coated fresh produce boxes and 24 wax-coated meat boxes per week. This equates to a total of about 3,328 wax-coated boxes per year.

As shown in Table 5C, with an average weight of 2.48 and 2.22 pounds for wax-

TABLE 5C

Wax-Coated, Nonrecyclable OCC

Corrugated Container Type	*Number of Units Generated per Year*	*Per Unit Weight (in pounds) [1]*	*Total Pounds Generated*	*Total Tons Generated [2]*
Fresh Produce Wax-Coated OCC	40 x 52 = 2,080	2.48	2,080 x 2.48 = 5,158.4	3
Meat Wax-Coated OCC	24 x 52 = 1,248	2.22	1,248 x 2.22 = 2,770.6	1
Total Non-Recyclable OCC			7,929.0	4

[1] The per unit weight for produce boxes is based on actual weights recorded during the site visit at Store 1. The weight for meat boxes is based on average weights obtained during site visits at other stores.
[2] The numbers have been rounded.

coated fresh produce and meat boxes, respectively, Store 1 generates approximately 7,929 pounds (or 4 tons) of nonrecyclable OCC each year.

Cost Benefit Analysis

- By recycling its OCC, Store 1 experiences about $38,123 in avoided disposal costs each year (269 tons of OCC x $141.72 per ton disposal cost).

- Store 1 also realizes revenue from recycling its OCC, but because per-ton prices fluctuate so dramatically, the project team was reluctant to include such a figure. A specific point-in-time analysis shows that, in 1997, Store 1 received approximately $65 per ton for its OCC, which resulted in revenue of $17,485, but this number should be used with great caution when making program decisions since it may not remain constant over time. (It should be noted that this figure was not used by the project team in calculating the store's overall economic benefit from recycling and reuse programs.)

- If Store 1 could work with growers and processors to eliminate wax-coated OCC, it would realize about $567 in additional avoided disposal costs (4 tons x $141.72).

- Furthermore, if recent studies are accurate that show that between 10 and 15 percent of nonwaxed boxes are inadvertently mixed in with waxed boxes at the grocery store and sent out for disposal, then Store 1 may realize as much as $5,669 in additional avoided disposal costs by eliminating wax-coated boxes or taking steps to improve their identification (269 tons of OCC x 15 percent = 40 tons x $141.72 per ton disposal cost = $5,669). In addition, it could accure $2,600 in additional recycling revenue if it captured that OCC for recycling. (Again, the recycling revenue figure was not used by the project team in calculating the store's overal economic benefit from recycling and reuse programs.)

- Another avenue Store 1 could pursue would be to work with growers and processors to replace wax-coated OCC with returnable plastic shipping con-

tainers. A precedent for using returnable plastic shipping containers has been set at Store 1: Its wholesaler/distributor and its Health & Beauty Care and General Merchandise distributor have both been using returnable plastic totes for years to deliver health and beauty products and general merchandise to the store. While the issues of using returnable plastic containers in produce and meat applications are much more complex, these programs do demonstrate that returnable systems *can* be developed and work effectively in the grocery sector. (See Chapter 2, Lesson 5 for more information.)

Opportunities to Strengthen the Program

- One thing that was noted during the site visit is that Store 1 stores its baled OCC outside on the ground in an unpaved area. Placing that material on the ground increases the chances that dirt, moisture, and gravel will get mixed in with the material and, hence, lower its value. Store 1 may want to explore returning to its one-time practice of storing OCC bales on pallets (unless its market prefers the current practice).

- After the project team's site visit and waste calculations, Store 1 took a step to optimize its OCC recycling program. Instead of marketing loose OCC through its waste hauler, Store 1 contracted directly with a local end market to take its OCC. That end market provided Store 1 with a baler at a small monthly rental fee, but did not charge to pick up the material. Thus, while Store 1 is not getting a higher per-ton price for its baled OCC (any higher revenues are offset by the rental fees), it does not have to pay a pull or trip charge which has improved the economics of its overall OCC recycling program. The store did not share the exact cost benefits with the project team, but indicated that other stores may want to explore this model for marketing OCC.

PLASTIC FILM

At present, Store 1 generates three types of plastic film: (1) stretch wrap, which is used primarily to secure loads of goods to pallets, (2) shrink wrap, which is used primarily to secure smaller quantities of like goods together or to a corrugated tray (i.e., tray/shrink), and (3) plastic grocery bags. At Store 1, the first two types of plastic film (stretch and shrink wrap) are handled together and the latter is handled separately.

Stretch and Shrink Wrap

The store's stretch and shrink wrap is taken off of pallet loads of goods either at the unloading area at the back of the store or in the store where pallets of select products are stored on metal racks. When employees remove the film, they take it to the back storage area and put it in two gaylord boxes that are used as both storage and shipping containers. Then the store's wholesaler/distributor picks up the film and takes it back to its facility for recycling. Store 1 estimates that the film is picked up about once every other week although it is totally at the discretion of the driver.

When analyzing a three-day sample set aside by the store, it was found that Store 1 generated about 95 pounds of stretch and shrink wrap. Dividing that number by three shows that the store generates an average of 32 pounds of stretch and shrink wrap per day which equates to 11,680 pounds (or 6 tons) per year. Of that amount, approximately 70 percent is shrink wrap, 28 percent is stretch wrap, and 2 percent is contamination. Contaminants included such things as plastic strapping, diaper overwraps, red pigmented potato bags, and bubble wrap.

When the site visit was conducted, one thing in particular was noted about Store 1's film recycling efforts—the store had temporarily stopped collecting stretch and shrink wrap due to heavy traffic during the holiday season. The store manager indicated that employees were too busy and storage space was at too high of a premium to worry about recycling film. In addition to cost implications, the reasons for program suspension highlight two important barriers to grocery film recycling efforts in general: (1) there must be adequate space for the storage of film, and (2) there must be a strong commitment to recycling film since it is not part of a store's core business.

Cost Benefit Analysis

- By recycling its film instead of disposing of it, Store 1 saves about $850 per year in avoided disposal costs (6 tons x $141.72 per ton disposal cost). While this amount is quite small, any decreased costs in the highly competitive, low-margin grocery industry can positively affect the bottom line. In addition, if current trends continue and film continues to replace OCC in transport packaging, then the amount of film available for recycling will grow and the economic benefits of recycling it will improve.

- Labor costs associated with recycling film at Store 1 are very small. The store does not have special containers, does not bale its film, and has no formal training/education program. Even employee handling costs are minimal since the store does not do any upgrading of the material—employees simply put the film in gaylord boxes instead of putting it in the garbage compactor. The simplicity of the program has two benefits: (1) any costs incurred from running the program are minimal, and (2) because it is so simple, it is easy for employees to participate.

- Store 1 does not receive any revenue for its film since it is shipped in a backhaul program to its wholesaler/distributor. Under its current program, the wholesaler/distributor does not receive any revenue either because it simply passes the material through to Bunzl Recycling along with its own stretch wrap. If the wholesaler/distributor were to obtain a different market for the film—one that was willing to pay for the material—it could conceivably "pass on" some of the economic benefit to Store 1, making its film recycling program more attractive. (For an example of possible revenues, see Chapter 3, Lesson 3. It shows the potential economic benefits that a wholesaler/

distributor might realize from recycling film.) The film market listing in Appendix B shows that there are markets that are currently paying for stretch and shrink wrap as long as quality is maintained. (Many of those markets will accept plastic bags as well.)

- As mentioned earlier, suspending the film recycling program during the holiday season had a cost. The film was disposed of for at least 70 days at a total volume of 2,100 pounds (or 1.1 tons) and, thus, a total disposal cost of $156.00.

Opportunities to Strengthen the Program

- As with most grocery stores, Store 1 does not have a great deal of storage space. For that reason, every effort should be made to minimize the amount of floor space required to recycle film. There are several options Store 1 could explore. One is placing a covered (and locked) storage container outside the facility near where the bales of corrugated are stored. (The cover is critical since it will keep moisture—a contaminant—out of the film.) There would be an initial investment required to purchase such a container, but having one would eliminate the need to store film inside. If the container had compacting abilities, it could reduce the number of times the store's wholesaler/distributor had to pick up the film, thus further streamlining the program.

- Another option (and from a quality perspective a better option) Store 1 could explore is to work with its wholesaler/distributor to pick up film more regularly during busy times so that it would not have to be stored as long and, hence, would not take up as much space (perhaps moving to once-a-week pickup instead of once-every-other-week.) Since the wholesaler/distributor has trucks coming to the store on a daily basis, a cooperative effort to pick up film more regularly could prove helpful and assist in correcting storage problems at the store level.

- If Store 1 continues to collect and store film inside, having designated storage containers that are not standard corrugated boxes may improve the store's film recycling program in two important ways. First, it would send a message to store employees that the program is important and permanent—not something that can be stopped and started throughout the year. Second, it would reduce the chances of film being thrown away. (Collected film samples were mistakenly thrown away by employees two times prior to the project team's site visit.) A permanent, carefully marked collection container that has signage saying "plastic film only" would be helpful. In addition, the store could attach samples of the kinds of film accepted in its program to help employees make better decisions about what should and should not be included.

- All successful grocery film recycling programs have one thing in common—

a committed store manager and committed, educated employees. While film recycling is not part of a store's core business, a manager can impress upon employees the importance of recovering film for recycling. Development of a simple training brochure showing employees how and what to recycle, a memo stating the store's support for the program, and brief, periodic educational sessions showing how much film has been recycled (as well as other materials) would help demonstrate the value of such a program. Even enlisting one or more employees to help oversee the program could improve storewide commitment.

- During the site visit at Store 1, the project team learned that in order to store pallet loads of goods inside the store, employees must use a forklift to place certain pallets onto high shelves. In instances where employees believe a pallet load is too unstable to move, they often wrap adhesive tape around the film to stabilize the goods. Once tape has been used on the film, it can no longer be recycled in the store's program and must be disposed of.

In order to capture that film, Store 1 essentially has two options: (1) to find a tape that is more compatible with film in recycling, or (2) remove the film prior to taping the load. Recently, 3M introduced a new product called Stretchable Tape (ST), which the company maintains is compatible with low density polyethylene film in recycling. The tape is made of linear low density polyethylene which comes from the same family of plastic resins and, because the tape detackifies when stretched, adhesives pose less of a problem to recyclers than traditional tapes. Of course, Store 1 would need to approve the use of this product with the market of its wholesaler/distributor, but it could potentially solve the problem.

Another option is that Store 1 could remove the film prior to taping. ST is said to have sufficient strength to secure pallet loads, can be applied by hand, and because it detackifies when stretched, will not tear labels and graphics from products when removed.[1] Therefore, if Store 1 could use this product after removing the film, contamination concerns would be eliminated. (See Chapter 3, Lesson 10 for more information.)

Plastic Bags

While plastic bags are considered "film," Store 1 does not handle them in the same way as it handles stretch and shrink wrap, partly because the bags are generated by the public not by the store. The point of generation for the bags is at the front of the facility, where Store 1 has placed one collection container—a metal hanging rack that holds one large plastic bag. A sign above the rack says "plastic bags," but otherwise there are no instructions for the public to follow.

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[1] *This suggestion should be viewed only as that—a suggestion. The 3M product mentioned has not been tested by the project team to determine its compatibility with stretch wrap in recycling nor has it tested the product for performance. Therefore, this should not be viewed as an endorsement of the product, but simply an example of one potential solution the store can explore.*

When the collection bag is full, employees tie the bag off and take it to the back storeroom where it is stored on the floor near the collection containers for stretch and shrink wrap or placed into a large metal cage. These bags are then placed in produce bins, gaylord boxes, or whatever else is available and shipped back to the wholesaler/distributor through a backhaul arrangement. The driver determines the frequency of pickup, but it appears that collection occurs about once every other week as with the plastic stretch and shrink wrap.

During the site visit, the project team was able to work with a two-week sample of collected plastic bags. At that time there were 12 bags of material each weighing an average of 3.67 pounds. Using that information, it can be estimated that Store 1 generates about 44 pounds of material on a two-week basis (12 x 3.67), or 1,144 pounds of plastic bags per year (44 x 26).

Cost Benefit Analysis

- It is difficult to connect any cost benefit to recycling plastic bags in terms of avoided disposal costs because the store would not be collecting the bags if they were simply going to throw them away. Similarly, the store does not generate any revenue through the recycling of bags because the bags are backhauled to its wholesaler/distributor which then passes them along to Bunzl Recycling. Therefore, the only potential economic benefit to Store 1 from recycling bags is the service it provides for its customers, which may give the store a competitive edge in a highly competitive industry. Common thinking is that if you can increase store traffic by offering services that customers want, then you can potentially increase sales. Unfortunately, there are no available data to determine what such a service is worth to patrons or what it may translate into in terms of increased purchases.

- There also is some overall benefit to the surrounding community. If Store 1 did not collect the bags for recycling, consumers would presumably have to throw them away at home. By having the program, Store 1 is helping the community divert 1,144 pounds of waste from area landfills.

Opportunities to Strengthen the Program

- Visual inspection of the plastic bags collected in the Store 1 program showed that shoppers bring a wide variety of bags into the store—some low density polyethylene, some high density polyethylene, and many bags from other retail outlets. There also were several heavily pigmented bags (with red, black, white, blue, and purple dyes and pigments) as well as one windshield wiper fluid bottle, one plastic food bucket, and several types of overwrap, such as that used with toilet tissue and diapers. While the project team did not weigh the contaminants at this store, it is estimated that they comprised about 2 percent of the total sample. One relatively simple way that Store 1 could reduce contamination would be to have better signage at the front of the store where plastic bags are collected. A sign that had samples of acceptable materials attached would help consumers make better choices, as would

a sign listing acceptable materials (such as LDPE and HDPE bags) and unacceptable materials (such as diaper overwraps, colored bags, paper bags, and plastic bottles). Since the bags are collected in a clear bag, periodic inspection by store staff to remove unacceptable items would help reduce contamination as well.

PALLETS

According to estimates by the store manager, Store 1 currently receives about 200 standard 48" x 40" pallets each week. Of that amount, 25 pallets (or 13 percent) are shipped directly from Pepsi Cola and returned via backhaul arrangements with the soft drink distributor. The Pepsi Cola pallets, which are distinguished from other pallets by their light blue solid platform, are stored separately from other pallets in a designated area of the storeroom and picked up once per month by the distributor.

A similar program is operated by Morton Salt. Each week Store 1 receives about six pallets (or 3 percent of its total pallet inventory) from the manufacturer, which are used to transport salt for outdoor use. Each pallet carries a $3 deposit for which the store "pays" at delivery and receives a $3 "credit" upon return. (These transactions are carried out on paper and recorded in the store's monthly invoices.) Morton Salt pallets are stored outside in the covered parcel pickup area at the front of the store and are picked up on an as needed basis through a backhaul arrangement.

The remaining 169 pallets that Store 1 receives each week are used to transport general merchandise items and grocery products. Once goods are removed, the pallets are stored in a designated area inside the back storage room. When the store's wholesaler/distributor delivers new goods on pallets, the empty ones are backhauled to the distribution center.

There are three things that should be noted about pallets at Store 1. First, all broken pallets are accepted back by Pepsi Cola, Morton Salt, and the store's wholesaler/distributor. Occasionally damaged pallets will be given away to customers and/or employees, but for the most part they are shipped back along with the functional pallets. Second, because of its backhaul arrangements and its "give-away" program, Store 1 does not have to dispose of any pallets. Therefore, there would be no avoided disposal costs for the store if it were to make a transport packaging change, such as switching from wood to plastic pallets. Third, at this time, all of the pallets used in the Store 1 delivery system are wood—there has been no experimentation with plastic pallets.

Table 5D provides information on the estimated weight and quantity of each of the three types of pallets found at Store 1.

Cost Benefit Analysis

- As Table 5D shows, by having a fully returnable pallet program, Store 1 is preventing 160 tons of waste from going into the landfill each year at the store level. That translates into about $22,675 per year in avoided disposal costs (160 tons of pallets x $141.72 per ton disposal cost). This calculation assumes that

TABLE 5D

Pallet System at Store 1

Pallet Types	*Origin*	*Per Unit Size (in inches)*	*Estimated Number of Units Rotating in Stock Per Year*	*Weight per Unit in Pounds [1]*	*Annual Tonnage [1]*
Wooden Pallet	Pepsi Cola	48 x 40	25 x 52 = 1,300	50	33
Wooden Pallet	Morton Salt	48 x 40	6 x 52 = 312	54	8
Wooden Pallet	Wholesaler/Distributor	48 x 40	169 x 52 = 8,788	27	119
Total			10,400		160

[1] Per unit weights for each wooden pallet are based on actual weights recorded during the site visit.
[2] The numbers have been rounded.

Adams Roll-Off would charge Store 1 the same rate to dispose of pallets as it charges for disposing of municipal solid waste. This may or may not be the case, however, since some haulers have different fee structures for handling pallets.

- Since Store 1 does not buy pallets or dispose of them, the store would not realize any direct economic benefits from switching from wood to plastic pallets. The store may, however, realize reduced "future" costs. For example, in Chapter 4 of this report, it was noted that SUPERVALU (a Minnesota-based wholesaler/distributor) saved 63 cents per trip over three years for every plastic pallet in its inventory, and realized $556,000 per year in reduced workers' compensation, labor, and shipping costs (or $3.70 per pallet). If Store 1's wholesaler/distributor were to realize similar cost savings by using plastic pallets instead of wood, Store 1 may benefit in the form of lower future "passed on" costs.

- In addition, Store 1 may experience some indirect economic benefits. For example, data show that SUPERVALU could experience a one-cent cost reduction per pallet in workers' compensation claims as a result of switching from wood to plastic. If Store 1 saw its entire inventory of pallets switched from wood to plastic, it would decrease workers' compensation claims by about $100 per year (10,400 pallets x $.01). It is possible that the store may also experience a decrease in labor costs as a result of switching from wood to plastic pallets, but data to support that claim are not currently available.

CHAPTER 6
STORE 2: A PROFILE

Store 2 is a 45,000-square-foot suburban grocery store located in Minnesota. At present, Store 2 receives most of its goods from its wholesaler/distributor, although it also receives some goods—such as paper products, soft drinks, produce, and dairy products—directly from manufacturers, nongrocery distributors, and local growers and farms.

A careful analysis of data indicates that Store 2 realizes more than $53,300 in avoided disposal costs due to its current recycling and reuse efforts. The project team estimates that it could realize an additional $17,300 in avoided costs if it were to implement the transport packaging strategies discussed in this profile. (See Figure 6-1.) Of course, Store 2 cannot do it alone; the next logical steps in reducing, reusing, and recycling transport packaging will require the cooperation of the store's wholesaler/distributors, growers and farmers, and processors and manufacturers. The following analysis explains how the project team arrived at these figures and the recommended cooperative efforts.

FIGURE 6-1
Store 2: Economic Benefits of Recycling and Reuse

Savings From Current Programs	Dollars Saved
OCC Recycling Program [1]	$24,730
Fully Returnable Pallet Program	$28,660
Total Current Savings	$53,390
Potential Savings From New Programs	
Recycling Film	$474
Eliminating Wax-coated OCC [1]	$1,220
Increasing Recovery of Recyclable OCC (by reducing wax confusion) [1]	$3,727
Eliminating OCC Pull Charges by Marketing OCC directly	$11,772
Switching from Wood to Plastic Pallets	$200
Total Potential Savings	$17,393
TOTAL POTENTIAL ECONOMIC BENEFITS THROUGH RECYCLING & REUSE	$70,783

[1] These amounts do not include revenue currently being received from recycling OCC and additional recycling revenue that could be accured if wax-coated OCC were converted to recyclable OCC. If those amounts were included, Store 2 would accrue an additional $15,350, bringing the total economic benefit to $86,133.

WASTE MANAGEMENT

To better understand the store's waste management practices, Store 2 provided the project team with waste billing invoices for three "typical" months in 1997—March, April, and October. An analysis of those invoices show that Store 2 generated 90.08 tons of garbage during those three months—that is, garbage that was disposed of as opposed to recycled. That equates to an average of 30.03 tons of garbage per month or a total of 360.32 tons of garbage per year. (See Table 6A.)

At present, Store 2 contracts with United Waste Services (UWS) to manage its waste. As Table 6A shows, the store pays an average of $67.76 per ton for overall waste management services. That amount includes $17.18 per ton charged by UWS for collecting the material, $39.13 per ton charged for disposing of the waste, $7.79 per ton charged by UWS as required under the state's Waste Assessment Fee, and $3.66 per ton in sales tax. Using the average cost per ton, it appears that Store 2 pays about $24,415 per year to dispose of its waste (360.32 tons disposed x $67.76 per ton disposal cost).

TABLE 6A

Waste Billing for Store 2

	United Waste Services Collection Fee			United Waste Services Disposal Fee		Other Monthly Charges		
Invoice	*Container Size (cubic yards) [1]*	*(tons)*	*Collection Cost ($) [2]*	*Per Ton Disposal Cost*	*Total Disposal Cost (tons x cost)*	*MN State Assessment Fee ($)*	*Sales Tax @ 6.5% ($)*	*Total MSW Mngt. Cost ($)*
March 1997								
Week #1	30	8.22	129	38.00	312.36	54	28.69	524.05
Week #2	40	7.70	129	38.00	292.60	72	27.40	521.00
Week #3	40	6.82	129	38.00	259.16	72	25.23	485.39
Week #4	30	7.08	129	38.00	269.04	54	25.87	477.91
April 1997								
Week #1 [3]	-	-	-	-	-	-	-	-
Week #2	30	7.93	129	38.00	301.34	54	27.97	512.31
Week #3	30	8.07	129	38.00	306.66	54	28.32	517.98
Week #4	30	8.18	129	38.00	310.84	54	28.59	522.43
October 1997								
Week #1	30	8.14	129	38.00	309.32	54	28.50	520.82
Week #2	30	8.45	129	50.00	422.50	54	35.85	641.35
Week #3	30	9.51	129	38.00	361.38	54	31.87	576.25
Week #4	30 & 40	9.98	258	38.00	379.24	126	41.42	804.66
TOTAL		90.08	$1,548		$3,524.44	$702	$329.71	$6,104.15
PER TON			$17.18		$39.13	$7.79	$3.66	$67.76

[1] UWS leaves either a 30- or 40-cubic-yard container at Store 2 depending on what is available.
[2] Collection costs include a $129 pull charge which is assessed each time UWS empties the 30- or 40-cubic-yard container (whichever is left on-site that week).
[3] There was no collection of waste during Week #1 in April 1997.

One way that Store 2 could conceivably reduce its annual waste disposal costs is by recycling, reusing, or reducing its transport packaging, particularly OCC, plastic film, and pallets. Following is an analysis of how Store 2 currently manages those materials and the cost benefits that could be realized by making some changes in its waste management practices.

CORRUGATED CONTAINERS

Because OCC comprises such a significant portion of a grocery store's waste stream, it also presents significant opportunities for potential cost reductions through recycling, reuse, and/or source reduction. Recognizing that potential, Store 2 established a recycling program to divert its OCC from the waste stream. When goods come into the store, the corrugated boxes and trays are removed during stocking, broken down, and placed in a 30-cubic-yard roll-off container where the material is compacted. The OCC is then collected by UWS (the store's hauler) and marketed along with OCC collected from other sources.

Typically UWS provides Store 2 with a monthly "credit" for its OCC. Waste billing invoices for three months—November 1997, December 1997, and January 1998—show that the store generated a total of 91.23 tons of OCC during that period. (See Table 6B.) Dividing that

TABLE 6B

OCC Generation at Store 2

Month	OCC Tons Collected [1]
November 1997	28.20
December 1997	31.45
January 1997	31.58
TOTAL	91.23

[1] Quantities are based on actual waste billing records for each month.

figure three shows that Store 2 generates an average of 30.41 tons of corrugated per month, which equates to 365 tons per year. When the site visit was conducted at Store 2, it was noted that the store also generates a fair amount of wax-coated corrugated containers. These containers are considered contaminants by most OCC markets and, therefore, must be thrown away.

Based on discussions with store personnel, it is estimated that Store 2 generates about 274 wax-coated corrugated meat and vegetable containers per week, which equates to 14,248 boxes per year. (See Table 6C.) Using sample weights collected during the site visit, it can be determined that Store 2 generates 35,594 pounds (or 17.8 tons) of wax-coated corrugated containers each year. Since these containers cannot be recycled, they must be disposed of with the store's waste thereby increasing the store's overall disposal costs by more than $1,000 per year.

Cost Benefit Analysis

- By recycling its OCC, Store 2 experiences $24,732 in avoided disposal costs each year (365 tons of recyclable OCC x $67.76 per ton disposal cost).

- Store 2 also realizes revenue from recycling its OCC, but because per ton prices fluctuate so dramatically, the project team was reluctant to include such a figure. A specific point-in-time analysis shows that, in

TABLE 6C

Wax-Coated, Nonrecyclable OCC

Corrugated Container Type	Number of Units Generated Per Year	Per Unit Weight (in pounds) [1]	Total Pounds Generated	Total Tons Generated [2]
Meat Boxes				
Chicken Boxes	50 x 52 = 2,600	2.00	5,200	2.60
Beef Boxes	50 x 52 = 2,600	2.43	6,318	3.16
Vegetable/Produce Boxes				
Lettuce (various leaf types)	30 x 52 = 1,560	3.88	6,053	3.03
Cauliflower	13 x 52 = 676	2.24	1,514	.76
Celery	32 x 52 = 1,664	2.61	4,343	2.17
Broccoli	40 x 52 = 2,080	2.40	4,992	2.50
Baby Carrots	50 x 52 = 2,600	2.41	6,266	3.13
Other Produce [2]	9 x 52 = 468	1.94	908	.45
Total Non-Recyclable OCC	14,248		35,594	18

[1] Per unit weights for each container type are based on weights recorded during the project site visit.
[2] Other produce includes various seasonal items. The estimates are based on an average quantity and weight of boxes used to ship such items.
[3] The total in the last column has been rounded.

1997, Store 2 received an average of $36.55 per ton for its OCC, which resulted in revenue of $13,340, but this number should be used with great caution when making program decisions since it may not remain constant over time. (It should be noted that this figure was not used by the project team in calculating the store's overall economic benefit from recycling and reuse programs.)

- If Store 2 could work cooperatively with growers and processors to eliminate wax-coated OCC, it could accrue an additional $1,220 in avoided disposal costs (18 tons of wax-coated OCC x $67.76 per ton disposal cost).

- Furthermore, if recent studies are accurate that show that between 10 and 15 percent of nonwaxed boxes are inadvertently mixed in with waxed boxes at the grocery store and sent out for disposal, then Store 2 may realize as much as $3,727 in additional avoided disposal costs by eliminating wax-coated boxes or taking steps to improve their identification (365 tons of OCC x 15 percent = 55 tons x $67.76 per ton disposal cost). In addition, it could accrue about $2,010 in additional recycling revenue if it captured that OCC for recycling. (Again, this figure was not included in the project team's calculation of the store's overall economic benefit from recycling and reuse programs.)

- Another avenue that Store 2 could pursue would be to work with growers and processors to explore the feasibility of replacing wax-coated OCC with reusable plastic shipping containers. A precedent for using returnable plastic shipping containers has been set at Store 2: Its wholesaler/distributor has been using returnable plastic totes for years to deliver health and beauty products and general merchandise to the store and using returnable plastic trays for bakery products. While the issues of using returnable plastic containers in produce and meat applications are more complex, these programs do demonstrate that returnable systems *can* be developed and work effectively in the grocery sector. (See Chapter 2, Lesson 5 for more information.)

Opportunities to Strengthen the Program

- One way in which Store 2 could optimize its current OCC recycling program is to try selling its OCC directly to a market instead of going through its hauler. For example, it could start a program similar to that at Store 1 where the store was able to improve its program by baling its material which allowed it to ship OCC directly to market. (The market provided Store 1 with a baler for which it charges a small monthly rental fee.) While Store 1 did not experience an increase in its per ton revenue for OCC, it did eliminate the trip fee that the hauler was charging to pull the store's OCC. If Store 2 could do the same, it would accrue annual savings of up to $11,772 per year. (This is based on actual billing invoices which show that Store 2 averages 9 pulls of OCC per month or 108 pulls per year at a cost of $109 per pull.) Store 2 may also be able

to increase its revenue for OCC (even over and above any baler rental charges) because it is currently getting such a low price for its OCC ($36.55 per ton). The March 16, 1998 issue of *Recycling Times* shows that markets were paying between $60 and $80 per ton for baled OCC in the East Central Region of which Minnesota is a part. Of course, these potential cost savings need to be weighed against the time required to identify and work with a market as opposed to the ease of working with the store's designated hauler.

PLASTIC FILM

Store 2 currently generates two types of plastic film: (1) stretch wrap, which is used primarily to secure loads of goods to pallets, and (2) shrink wrap, which is used primarily to secure smaller quantities of like goods either together or to corrugated trays. Unlike the other two stores in the project, Store 2 does not generate any plastic bags because it does not have a bag collection program.

Store 2 does not currently recycle any of the plastic film generated in its store. Instead, when pallets are unwrapped, the stretch film is thrown into the garbage compactor along with the store's waste. Similarly, when shrink wrap is removed from products or corrugated trays, it is thrown into the garbage compactor and removed for disposal.

The store manager indicates that the reason the store is not recycling film is simply because he has not had an opportunity to explore the feasibility of establishing a program. He mentioned that he was concerned about potential space constraints and issues related to sanitation, but confirmed that the store was open to exploring the possibility of recycling its film.

To better understand the types and quantities of film generated by Store 2, the project team asked it to collect a five-day sample of stretch and shrink wrap. The team purposefully did not define "stretch and shrink wrap" so that it could determine what employees would likely include in a recycling program without explicit instructions. It should be noted that the employees at Store 2 were very enthusiastic and cooperative in obtaining the sample and were meticulous in identifying material for inclusion.

When analyzing the five-day sample set aside by the store, it was found that Store 2 generated 198 pounds of plastic film. That equates to an average of 40 pounds of film per day or 14,600 pounds (or 7 tons) per year. Of that amount, approximately 54 percent is shrink wrap, 36 percent is stretch wrap, and 10 percent is contamination. The contaminants included such things as green and blue semirigid layer separators for produce, red and beige potato bags, bag liners from produce boxes, paper, fresh flower wraps, six-pack ring holders, and some white, yellow, and blue plastic strapping.

Cost Benefit Analysis

- If Store 2 were to recycle its film instead of disposing of it, it could save about $474 in avoided disposal costs per year (7 tons x $67.76 per ton

disposal cost). While this amount is quite small, any decreased costs in the highly competitive, low-margin grocery industry can positively affect the bottom line. In addition, if current trends continue and film continues to replace OCC in transport packaging, then the amount of film available for recycling will grow and the economic benefits of recycling it will improve.

Opportunities for Establishing a Program

- This store has three key ingredients for a successful recycling program: (1) a store manager that is committed to environmental programs and exploring ways to improve the efficiency of his operation, (2) employees who are enthusiastic about recycling and committed to making programs work, and (3) ample storage space for film collection. (Compared to the other two grocery stores in the study, Store 2 appeared to have the most available storage space.) Given these three key ingredients, the store is an ideal candidate for film recycling.

- As is true of most grocery stores, Store 2 generates a fairly small amount of film compared to other types of organizations. It generates only 14,600 pounds of stretch and shrink wrap per year. While that may seem like a lot from the store's perspective, it is a very small amount from a market's perspective. Only 9 of the 22 film markets surveyed for this project have no minimum load requirements. One market accepts loads of 1,000 pounds, another four accept minimum loads of 5,000 pounds, and two have 10,000-pound requirements. The remaining six markets require more material that a grocery store is likely to generate in a year. (See Appendix B for a list of those markets.) Thus, it may be difficult for Store 2 to try to recycle film on its own.

- Another option that Store 2 could explore is establishing a backhaul arrangement for plastic film with its wholesaler/distributor. It already has a backhaul arrangement for pallets and plastic totes. Therefore, a precedent exists that could work for film recycling. (See Chapter 3, Lesson 3 for more information on the feasibility of recycling at the wholesaler/distributor level.)

- In order for a film recycling program to work at Store 2, an educational program will need to be implemented. As mentioned above, 10 percent of the film sample was made up of what most markets consider contaminants. Since markets typically do not accept film with more than 0-3 percent contamination, the store would need to educate employees about what should and should not be included in a film recycling program. Conducting a training session with employees and posting signs indicating what types of film should be included, where they should be stored (usually in gaylord box, plastic bag, cart, or cage), and how they should be prepared would go a long way toward improving quality. (Many markets will help stores develop

such educational programs). In addition, Store 2 should assign one or two employees to be responsible for leading the film recycling effort. That will help employees feel a part of the program and ensure that someone besides the manager will see that it runs effectively.

PALLETS

According to estimates by the store manager, Store 2 receives an average of 55 standard 48" x 40" pallets each day. At present, the vast majority of the pallets are made of wood, although the store's wholesaler/distributor has introduced a small number of plastic pallets into the system to test their performance. Of the 55 pallets the store receives per day, an average of 43 are wood and 12 are plastic. That means that, on an annual basis, Store 2 receives about 15,695 wood pallets and 4,380 plastic pallets per year. (See Table 6D.)

Once goods are removed from pallets (either wood or plastic), they are stacked at the back of the store near the loading/unloading dock where the originators of the pallets take them back. If the pallets are broken or otherwise damaged, they either go back to the originator or are given to employees or customers to take home. Because of this fully returnable pallet system, the store rarely throws any pallets away.

The store manager indicated that he and his employees like the plastic pallets because of their nestability, uniformity, and light weight. (During the project site visit, samples of each pallet were weighed. As noted in Table 6D, it was found that wood pallets weighed 47.5 pounds compared to plastic pallets which weighed 23 pounds.) He also said plastic pallets are easier to handle than their wood counterparts because they do not splinter. The only drawback is that the plastic pallets are not compatible with the store's existing racking system, which means that if they do not unload goods immediately, the pallets are cumbersome to store.

TABLE 6D

Pallet System at Store 2

Pallet Type	*Per Unit Size (in inches)*	*Estimated Number of Units Rotating Per Year*	*Weight Per Unit (in pounds) [1]*	*Annual Tonnage [2]*
Wooden Pallet	48 x 40	43 x 365 = 15,695	47.5	373
Plastic Pallet	48 x 40	12 x 365 = 4,380	23	50
TOTAL				423

[1] Per unit wieghts for each pallet type are based on actual weights recorded during the on-site visit.
[2] The numbers in this column have been rounded.

Cost Benefit Analysis

- As Table 6D shows, by having a fully returnable pallet program, Store 2 is preventing 423 tons of waste from going into the landfill each year at the store level. That translates into more than $28,662 per year in avoided disposal costs (423 tons x $67.76 per ton disposal cost). This calculation assumes that UWS would charge Store 2 the same rate to dispose of pallets as it charges for disposing of municipal solid waste. This may or may not be the case, however, since some haulers have different fee structures for handling pallets.

- Since Store 2 does not buy pallets or dispose of them, the store would not realize any direct economic benefits from switching more of the pallet inventory from wood to plastic. The store may, however, realize reduced "future" costs. For example, in Chapter 4 of this report, it was noted that SUPERVALU (a Minnesota-based wholesaler/distributor) saved 63 cents per trip over three years for every plastic pallet in its inventory, and realized $556,000 per year in reduced workers' compensation, labor, and shipping costs (or $3.70 per pallet). If Store 2's wholesaler/distributor were to realize similar cost savings by using plastic pallets instead of wood, Store 2 may benefit in the form of lower future "passed on" costs.

- In addition, Store 2 may experience some indirect economic benefits. For example, data show that SUPERVALU could experience a one-cent cost reduction per pallet in workers' compensation claims as a result of switching from wood to plastic. If Store 2 saw its entire inventory of pallets switched from wood to plastic, it could expect to decrease its workers' compensation claims by about $200 per year (20,075 pallets x $.01). It is possible that the store may also experience a decrease in labor costs as a result of switching from wood to plastic pallets, but supporting data are not currently available.

CHAPTER 7
STORE 3: A PROFILE

Store 3 is an 85,000-square-foot urban/suburban grocery store located in Minnesota. It receives the majority of its goods from its wholesaler/distributor, but it also receives some goods—such as drug store items, magazines, paper products, soft drinks, seasonal produce, and dairy products—directly from manufacturers, nongrocery distributors, and local growers and farms.

A careful analysis of data indicates that Store 3 realizes more than $76,900 in avoided disposal costs due to its current recycling and reuse efforts. The project team estimates that it could realize an additional $6,000 in avoided costs if it were to implement the transport packaging strategies discussed in this profile. (See Figure 7-1.) Of course, Store 3 cannot do it alone; the next logical steps in reducing, reusing, and recycling transport packaging will require the cooperation of its wholesaler/distributors, growers and farmers, and processors and manufacturers. The following analysis explains how the project team arrived at these figures and the recommended cooperative efforts.

FIGURE 7-1
Store 3: Economic Benefits of Recycling and Reuse

Savings From Current Programs	Dollars Saved
OCC Recycling Program [1]	$33,394
Fully Returnable Pallet Program	$43,563
Total Current Savings	$76,957
Potential Savings From New Programs	
Recycling Film	$362
Eliminating Wax-coated OCC [1]	$1,220
Increasing Recovery of Recyclable OCC (by reducing wax confusion) [1]	$4,994
Switching from Wood to Plastic Pallets	$365
Total Potential Savings	$6,082
TOTAL POTENTIAL ECONOMIC BENEFITS THROUGH RECYCLING & REUSE	$83,039

[1] These amounts do not include revenue currently being received from recycling OCC and additional recycling revenue that could be accured if wax-coated OCC were converted to recyclable OCC. If those amounts were included, Store 3 would accrue an additional $47,870, bringing the total economic benefit to $130,909.

WASTE MANAGEMENT

To better understand the store's waste management practices, Store 3 provided the project team with waste invoices for two typical months in 1997—August and September. An analysis of those invoices shows that Store 3 generated 108.17 tons of garbage during the two-month period—that is, garbage that was disposed of as opposed to recycled. That equates to an average of 54.09 tons of garbage per month or a total of 649.02 tons of garbage per year. (See Table 7A.)

At present, Store 3 contracts with United Waste Services (UWS) to manage its waste. As Table 7A shows, the store pays an average of $60.17 per ton for overall waste management services. That amount includes $10.98 per ton charged by UWS for collecting the material, $38.79 per ton charged for disposal, $7.16 per ton charged by UWS as required under the state's Waste Assessment Fee, and $3.24 per ton in sales tax. Using the average cost per ton, it appears that Store 3 pays more than $39,000 per year to dispose of its waste (649.02 tons disposed x $60.17 per ton disposal cost).

TABLE 7A

Waste Billing for Store 3

Invoice	United Waste Services Collection Fee: Container Size (cubic yards) [1]	(tons)	Collection Cost ($) [2]	United Waste Services Disposal Fee: Per Ton Disposal Cost	Total Disposal Cost (tons x cost)	Other Monthly Charges: MN State Assessment Fee ($)	Sales Tax @ 6.5% ($)	Total MSW Mngt. Cost ($)
August 1997								
Week #1	40	24.49	216	38.00	930.62	144	74.53	1,365.15
Week #2	40	11.61	108	38.00	441.18	72	35.70	656.88
Week #3	40	17.77	216	41.71	741.19	144	62.22	1,163.41
Week #4	40	8.89	108	38.00	337.82	72	28.98	546.80
September 1997								
Week #1	40	11.76	108	38.00	446.88	72	36.07	662.95
Week #2	40	9.70	108	38.00	368.60	72	30.98	579.58
Week #3	40	8.88	108	38.00	337.44	72	28.95	546.39
Week #4	40	15.07	216	39.32	592.55	126	52.56	987.11
TOTAL		108.17	$1,188		$4,196.28	$744	$349.99	$6,508.27
PER TON			$10.98		$38.79	$7.16	$3.24	$60.17

[1] Collection costs include a $54 trip (or pull) charge which is assessed each time UWS empties Store 3's 40-cubic-yard container.

One way that Store 3 could conceivably reduce its waste disposal costs is by recycling, reusing, or reducing its transport packaging, particularly OCC, plastic film, and pallets. Following is an analysis of how Store 3 currently manages those materials and the cost benefits that could be realized by making some changes in its waste management practices.

CORRUGATED CONTAINERS

Because OCC comprises such a significant portion of a store's overall waste stream, it also presents significant opportunities for potential cost reductions through recycling, reuse, and/or source reduction. Recognizing that potential, Store 3 established a recycling program to divert its OCC from the waste stream. When goods come into the store, the corrugated boxes and trays are removed and taken to a 40-cubic-yard roll-off container at the back of the store where corrugated is commingled with kraft bags and recovered office paper. This material is then collected by UWS and marketed along with OCC collected from other sources.

Waste billing invoices for Store 3 indicate that in August and September 1997, the store generated a total of 92.48 tons of corrugated. (See Table 7B.) Dividing that figure by 2 shows that Store 3 generates an average of 46.24 tons of corrugated per month or 555 tons per year.

When the site visit was conducted at Store 3, it was noted that the store also generates a fair amount of wax-coated corrugated containers. These containers are considered contaminants by most OCC markets and, therefore, must be thrown away. Based on discussions with store

TABLE 7B

OCC Generation at Store 3

Month	OCC Tons Collected [1]
August 1997	
Week #1	10.74
Week #2	14.13
Week #3	13.93
Week #4	8.95
September 1997	
Week #1	14.19
Week #2	6.06
Week #3	7.07
Week #4	17.41
TOTAL	92.48

[1] OCC quantities are from actual waste billing invoices.

personnel, it is estimated that Store 3 receives about 100 wax-coated fresh produce boxes per week, which equates to a total of 5,200 wax-coated boxes per year. (Interestingly, Store 3 maintains that it no longer receives any meat or poultry in wax-coated boxes except the occasional box of neck bones and suet, both of which are seasonal products. Instead, meat and poultry now come packaged in plastic bags which are housed inside traditional corrugated boxes.) With an average weight of 2.4 pounds for wax-coated fresh produce boxes, Store 3 generates approximately 12,480 pounds (or 6 tons) of nonrecyclable OCC each year.

Cost Benefit Analysis

- By recycling its OCC, Store 3 experiences $33,394 in avoided disposal costs each year (555 tons of recyclable OCC x $60.17 per ton disposal cost).

- Store 3 also realizes revenue from recycling its OCC, but because per ton prices fluctuate dramatically, the project team was reluctant to include such a figure. A specific point-in-time analysis shows that, in 1997, Store 3 received approximately $75 per ton for its OCC, which resulted in revenue of $41,625, but this number should be used with great caution when making program decisions since it may not remain constant over time. (It should be noted that this figure was not used by the project team in calculating the store's overall economic benefit from recycling and reuse programs.)

- If Store 3 could work cooperatively with growers and processors to eliminate wax-coated OCC, it could accrue an additional $361 in avoided disposal costs (6 tons of wax-coated OCC x $60.17 per ton disposal cost).

- Furthermore, if recent studies are accurate that show that between 10 and 15 percent of nonwaxed boxes are inadvertently mixed in with waxed boxes at the grocery store and sent out for disposal, then Store 3 may realize as much as $4,994 in additional avoided disposal costs by eliminating wax-coated boxes or taking steps to improve their identification (555 tons of OCC x 15 percent = 83 x $60.17 per ton disposal cost). In addition, it would realize $6,245 in additional revenue if that OCC were captured for recycling. (Again, the recycling revenue figure was not used in calculating the store's overall economic benefit from recycling and reuse programs.)

- Another avenue that Store 3 could pursue would be to work with growers and processors to explore the feasibility of replacing wax-coated OCC with reusable plastic shipping containers. A precedent for using returnable plastic shipping containers has been set at Store 3: Its wholesaler/distributor has been using returnable plastic totes for years to deliver health and beauty products and general merchandise to the store; using returnable plastic trays for bakery products; and using returnable plastic pallets for shipping goods. While the issues of using returnable plastic containers in produce and meat applications are more complex, these programs do demonstrate that returnable systems *can* be developed and work effectively in the grocery sector. (See Chapter 2, Lesson 5 for more information.)

Opportunities to Strengthen the Program

- Store 3 has a mature OCC recycling program that generates considerable revenue (at the high end for loose OCC), and the mechanics of the program appear to be working effectively. Therefore, there are no recommendations for improvement.

PLASTIC FILM

Store 3 currently generates three types of plastic film: (1) stretch wrap, which is used primarily to secure loads of goods to pallets, (2) shrink wrap, which is used primarily to secure smaller quantities of like goods together or to corrugated trays, and (3) plastic bags, which are collected from the public. At Store 3, the first two types of plastic film are handled together and the latter is handled separately.

Stretch and Shrink Wrap

At present, Store 3 does not recycle its stretch and shrink wrap. Instead, when pallets are unwrapped, the stretch film is thrown into the garbage compactor along with the store's waste. Similarly, when shrink wrap is removed from products or corrugated trays, it is thrown into the garbage compactor and picked up by UWS for disposal.

To better understand the quantities of stretch and shrink wrap generated, the project team asked the store to collect a sample of the material, which Store 3 did for two days. When analyzing that sample, it was found that the store generated a total of 27.5 pounds of plastic film. That equates to an average of 13.8 pounds of film per day, or 5,037 pounds (or 3 tons) per year. Of that amount, 73 percent was stretch wrap, 22 percent was shrink wrap, and 5 percent was contamination. The contaminants included such things as boxboard liners, wrapping paper, one plastic bottle, a polypropylene tray, paper labels, one candy wrapper, and a small amount of blue strapping.

Cost Benefit Analysis

- If Store 3 were to recycle its stretch and shrink wrap instead of disposing of it, it could save about $181 per year in avoided disposal costs (3 tons x $60.17 per ton disposal cost.) The actual savings, however, would likely be higher because the sample at Store 3 was very small, particularly when

compared to the two other stores in this project. One of those stores generated 6 tons of film per year (exactly twice that of Store 3) and the other generated 7 tons of film per year (more than twice that of Store 3). This leads the project team to believe that Store 3 did not capture most of the stretch and shrink wrap that was available for inclusion in its sample. Given that assumption, it is probably safe to say that Store 3 would realize at least double that amount—or $362—in avoided disposal costs if it were to recycle its stretch and shrink wrap.

- Another indication that the sample at Store 3 was problematic is that shrink wrap—at 22 percent—comprised a much smaller portion of the total sample than at the other stores. At Store 1, shrink wrap comprised 70 percent of the sample, and at Store 2 it comprised 54 percent of the sample. Again, this indicates that the sample at Store 3 probably did not accurately represent the store's actual film stream.

Opportunities for Establishing a Program

- As is true of most grocery stores, Store 3 generates a fairly small amount of film compared to other types of organizations and compared to other types of waste. According to its sample, the store generates only 5,037 pounds of stretch and shrink wrap per year. While that may seem like a lot from a store's perspective, it is a very small amount from a market's perspective. Only 9 of the 22 film markets surveyed for this project have no minimum load requirements. One market accepts loads of 1,000 pounds, another four accept minimum loads of 5,000 pounds, and two have 10,000-pound requirements. The remaining six markets require more material than a grocery store is likely to generate in one year. (See Appendix B for a list of those markets.) Thus, it may be difficult for Store 3 to try to recycle film on its own.

- Another option that Store 3 could explore is establishing a backhaul arrangement for plastic film with its wholesaler/distributor. It already has a backhaul arrangement for pallets and for plastic totes; therefore, a precedent exists that could work for film recycling. At present, Store 3's wholesaler/distributor is recycling the stretch wrap generated at its own facility, so it may not be that difficult to incorporate film coming back from its stores. (See Chapter 3, Lesson 3 for more information on the economics of recycling film at the wholesaler/distributor level.)

- Based on the small size of the sample, it appears that the first thing Store 3 would need to do to establish a film recycling program is to educate its employees about where they are likely to find film and what types of film should be collected for recycling. A start-up meeting at the commencement of the program to show samples of film that employees should collect would help, as would brief educational

brochures and clear signs near the film collection containers. Placing actual "acceptable" examples of film on or near the collection containers also would help employees make good decisions about what to collect and what not to collect.

- Another way to ensure participation in a film recycling program is to make it as easy as possible so that employees will want to participate and will not have to go out of their way to do so. Since employees already have to remove stretch wrap from pallets and shrink wrap from corrugated trays and take it to the store's garbage compactor, it would make sense to place collection containers as close as possible to the garbage compactor. That way, employees would simply have to place the film in the collection containers instead of in the trash.

- In order for a film recycling program to be successful, it also has to have support from the top down. Thus, if Store 3 wants to recycle plastic film, the store manager needs to be fully committed to the program, and one or two employees need to be put in charge of implementing and overseeing the program to make sure it works. Without this buy-in and accountability on the part of the employees—from the top down—a recycling program will not succeed.

Plastic Bags

Interestingly, while Store 3 does not recycle its stretch and shrink wrap, it does recycle plastic bags, which are collected by the public and returned to the store for recycling. A sample of bags collected at Store 3 shows that the store recovered 17.5 pounds of bags over a six-day period, which equates to 2.9 pounds per day or 1,059 pounds per year.

Store 3 has four carts positioned at the front of the store—one to collect paper bags for recycling and the other three to collect plastic bags. Each cart has a sign on top indicating what type of bag should be included, and inside are large, black plastic collection bags. When the black bags are full, employees remove them, tie them off, and return them to the loading/unloading dock where the wholesaler/distributor loads them onto empty vehicles and returns them to the warehouse/distribution center. Store 3's wholesaler/distributor, however, does not recycle the bags. Instead, it has agreed to keep a trailer from Bunzl Recycling on site so that Store 3's chain can continue recycling bags. Bunzl, however, is solely responsible for making sure that the bags, which are consolidated in the trailer, are moved to market. Store 3 does not receive any revenue from its bag recycling program but considers it an important public service.

Cost Benefit Analysis

- It is difficult to connect any cost benefit to recycling plastic bags in terms of avoided disposal costs because the store would not be collecting bags from the public if they were simply going to throw them away. Similarly, the store does not generate

any revenue through the recycling of bags because Bunzl Recycling does not pass any revenue back down to the stores. Therefore, the only potential economic benefit to Store 3 from recycling bags is the service it provides for its customers, which may give the store a competitive edge in a highly competitive industry. Common thinking is that if you can increase store traffic by offering services that customers want, then you can potentially increase sales. Unfortunately, there are no available data to determine what such a service is worth to patrons or what it may translate into in terms of increased purchases.

- There also is some overall benefit to the surrounding community. If Store 3 did not collect the bags for recycling, consumers would presumably have to throw them away at home. By having the program, Store 3 is helping the community to divert 1,059 pounds of waste from area landfills.

PALLETS

According to estimates by the store manager, Store 3 currently receives about 100 standard 48" x 40" pallets each day. Of that amount, 75 percent are wood pallets, which come either from the wholesaler/distributor or directly from manufacturers, processors, growers, or farms. The remaining 25 percent of the pallets are plastic and are part of a pilot program implemented by Store 3's wholesaler/distributor to test the performance and economic viability of plastic pallets. Using these figures, it appears that Store 3 receives about 27,375 wood pallets and 9,125 plastic pallets on an annual basis. (See Table 7C.)

Once goods are removed from pallets (either wood or plastic), they are stacked in a designated place in the back storage area where the originators of the pallets take them back. (If the originator is the wholesaler/distributor, Store 3 pays a $3 deposit for the pallets when received and is given a $3 "credit" on monthly invoices when the pallets are returned. This transaction takes place on paper since no money ever changes hands.) If the pallets are broken or otherwise damaged, they either go back to the originator or are given to employees or customers to take home. Because of this fully returnable

TABLE 7C

Pallet System at Store 3

Pallet Type	*Per Unit Size (in inches)*	*Estimated Number of Units Rotating Per Year*	*Weight Per Unit (in pounds) [1]*	*Annual Tonnage [2]*
Wooden Pallet	48 x 40	75 x 365 = 27,375	46.5	637
Plastic Pallet	48 x 40	25 x 365 = 9,125	19.0	87
TOTAL		36,500		724

[1] Per unit weights for each pallet type are based on actual weights recorded during the on-site visit.
[2] The numbers in this column have been rounded.

pallet system, the store rarely throws any pallets away.

Cost Benefit Analysis

- By having a fully returnable pallet system, Store 3 is diverting 724 tons of waste from the landfill each year at the store level. That translates into $43,563 per year in avoided disposal costs for Store 3 (724 tons x $60.17 per ton disposal cost). This calculation assumes that UWS would charge Store 3 the same rate to dispose of pallets as it charges for disposing of municipal solid waste. This may or may not be the case, however, since some haulers have different fee structures for handling pallets.

- Since Store 3 does not buy pallets or dispose of them, the store would not realize any direct economic benefits from seeing more of its pallet inventory switched from wood to plastic. The store may, however, realize reduced "future" costs. For example, in Chapter 4 of this report, it was noted that SUPERVALU saved 63 cents per trip over three years for every plastic pallet in its inventory, and realized $556,000 per year in reduced workers' compensation, labor, and shipping costs (or $3.70 per pallet). If Store 3's wholesaler/distributor experienced similar savings, it is conceivable that some of those savings may be passed along to Store 3 in the form of lower future "passed on" costs.

- In addition, Store 3 may experience some indirect economic benefits. For example, data show that SUPERVALU could experience a one-cent cost reduction per pallet in workers' compensation claims as a result of switching from wood to plastic. If Store 3 saw its entire inventory of pallets switched from wood to plastic, it could expect to decrease its own workers' compensation claims by about $365 per year (36,500 pallets x $.01 = $365.00). It is possible that the store may also experience a decrease in labor costs as a result of switching from wood to plastic pallets, but supporting data currently are not available.

SOURCE REDUCTION BENEFITS AND OTHER ISSUES RELATED TO TRAY/SHRINK PACKAGING

BACKGROUND

In recent years, the grocery industry has started seeing a new transport packaging option emerge. It is called a "tray/shrink" package, and it has steadily been replacing the use of full corrugated containers in certain grocery applications. With this package, grocery items are stacked on a corrugated tray and sealed with shrink wrap. The shrink wrap typically is made of LDPE or a polyethylene blend and ranges in thickness from 1.5 mils (for lighter products) to 3 mils (for heavier products). Industry sources indicate that the tray/shrink package is used predominantly to transport canned goods, although it has been making headway into other product areas.

Industry sources indicate that consumer product manufacturers are making the switch from traditional corrugated containers to tray/shrink because the economics are appealing. They maintain that, by using tray/shrink packaging, manufacturers can

- reduce shipping costs (because tray/shrink packages weigh less than products packaged in full corrugated cases);
- reduce material costs (since the amount of film required to complete the package is much less than the amount of corrugated); and
- reduce processing costs (since it takes less time to shrink a package than it does to enclose it in a wrap-around corrugated case).

The project team tried to quantify these benefits, but consumer product manufacturers were unwilling to share such information due to its proprietary nature. Equipment manufacturers also maintain that it would be too difficult to estimate potential cost savings since the amount would vary depending on the size of the product, the speed of the packaging line, the resin and mil thickness of shrink wrap used, the current costs of corrugated, and the current costs of film. ***One industry source said that consumer product manufacturers could expect to reduce packaging costs by about 25 percent by making the switch to tray/shrink packages***, but that was the most detailed estimate that any contact would provide.

SOURCE REDUCTION BENEFITS OF TRAY/SHRINK

The tray/shrink package also has environmental benefits—particularly in the area of source reduction. At Store 2, the project team weighed a corrugated box that had been used to ship twelve jars of peanut butter and a tray/shrink package that had been used to ship twelve similarly sized jars of peanut butter. The corrugated box weighed .40 pounds, and the tray/shrink package weighed .20 pounds, or half as much as the full corrugated container. ***Thus, tray/shrink has the potential to cut the weight of a transport package in half.*** It should be noted that, on the tray/shrink package, the corrugated tray accounted for 90 percent of the total package weight (at .18 pounds) and the shrink wrap accounted for 10 percent (at .02 pounds).

To get a sense of the prevalence of tray/shrink packages in the grocery industry, the project team asked two wholesaler/distributors headquartered in Minnesota what percentage of their canned goods currently come packaged in tray/shrink. The first wholesaler/distributor reported that 10 percent of its canned goods currently come in tray/shrink, 90 percent come in full corrugated containers, and 70 percent of those still coming in corrugated containers would be "good candidates" for tray/shrink packaging (i.e., they were not too heavy or tall). The second wholesaler/distributor reported that 35 percent of its canned goods currently come in tray/shrink, 65 percent come in full corrugated containers, and 20 percent of those still coming in corrugated containers would be "good candidates" for tray/shrink packaging. Thus, if all of the remaining canned goods that were "good candidates" for tray/shrink were actually converted from corrugated containers to tray/shrink, it appears that the grocery distribution system would realize a significant reduction in the amount (by weight) of transport packaging.

To determine the potential reduction in these two systems, the wholesaler/distributors would need to (1) ascertain the total number of canned goods coming into their facilities, (2) multiply that amount by 90 percent and 65 percent respectively, and (3) multiply those amounts by 70 percent and 20 percent respectively to determine the remaining number of canned goods that could likely be converted from cor-

rugated containers to tray/shrink packaging. Then they would need to (1) determine how many corrugated containers would be needed to transport those remaining canned goods from the manufacturer to the wholesaler/distributor, (2) multiply that amount by the average weight of a standard corrugated case, and (3) divide that number by two to determine how much less material could be generated if tray/shrink packages were substituted for full corrugated boxes.

While that calculation may appear simple, the project team and one of its wholesaler/distributors tried to do it for this project and ran into several stumbling blocks. First, without doing considerable investigative work, the wholesaler/distributor could not estimate, with any certainty, how many canned goods it purchases. Second, the industry ships in several different sized cases (predominantly 24-packs, but also 12-packs, 48-packs, and a few odd-sized packs for small cans). Thus, there is no "average" or "standard" corrugated case to weigh.

Despite these problems, the project team and the wholesaler/distributor attempted to make a rough calculation by making some very broad assumptions. Using the number of cases as a proxy for the number of canned goods, the wholesaler/distributor estimates that it brings in 48,000 cases of canned goods per week or 2,496,000 cases per year (48,000 x 52). If 10 percent of its canned goods are already in tray-shrink (2,496,000 x .10 = 249,000), and 70 percent of the remaining 90 percent are "good candidates" for tray/shrink, that leaves 1,572,480 cases of canned goods that could be converted.

If you assume that all of those canned goods would be coming in 12-pack cases (which we know is not accurate, but it is the only size case for which we have a corrugated and tray shrink comparison), then the wholesaler/distributor would be generating 628,992 pounds of corrugated cases per year (1,572,480 x .40 pounds). ***If it were to fully convert those corrugated cases to tray/shrink packaging, the change would result in 314,496 fewer pounds (or 157.3 fewer tons) of transport packaging being generated per year (628,992 divided by 2) by that wholesaler/distributor alone.***

ECONOMIC EFFECTS OF TRAY/SHRINK ON THE GROCERY DISTRIBUTION SYSTEM

When looking at any transport packaging change, it is important to understand how such a change will affect each component within the grocery distribution system, because it will determine (1) where the impetus for change is likely to come from within the system, and (2) how readily and by whom the change will be embraced. As the following analysis shows, switching from full corrugated cases to tray/shrink packaging may be very attractive for product manufacturers and wholesaler/distributors, but not for individual grocery stores.

Product Manufacturers

As mentioned above, it appears that product manufacturers have the most to gain by switching from corrugated boxes to tray/shrink packages. ***With an estimated packaging cost reduction of 25 percent and an estimated raw material reduction of 50 percent (by weight), tray/shrink appears to be an ideal transport package from a product manufacturer's perspective.*** It also makes sense that if product manufacturers can be more efficient by transporting their goods in tray/shrink, then wholesaler/distributors and grocery stores will benefit economically as well through lower "passed on" costs.

Wholesaler/Distributors

From the perspective of the wholesaler/distributor, tray/shrink packages should have at least one positive economic effect—if their products are transported in lighter packages, then they should experience lower shipping costs (particularly since transportation costs are based on weight). Tray/shrink packages also will not add to the waste stream of the wholesaler/distributor because the packages are simply passed through from the manufacturer to the store—that is, they are not broken down and repackaged like full corrugated cases. Wholesaler/distributors may, however, experience a decrease in their OCC recycling revenue because the amount of corrugated available in their facilities for recycling will decrease as the use of tray/shrink increases.

Some of the wholesaler/distributors that the team met with during the project raised the following concerns regarding the performance of tray/shrink packages.

1. Wholesaler/distributors prefer greater mil thickness in shrink wrap because they need the wrap to act as a handle when they pull packages off pallets.

2. Wholesaler/distributors prefer greater mil thickness because film must be strong enough to withstand repalletization.

3. While tray/shrink packaging is ideal for most canned goods, it does not work as well on products packaged in paperboard cartons. It needs to be used with goods that are structurally sound.

4. When tray/shrink packages are palletized, they require more pallet wrap than full corrugated boxes because the containers are no longer square.

5. While shrink wrap adds stability to pallet loads during transport because there is greater friction with the film than with corrugated boxes, that same friction increases labor time because the products tend to stick together and, thus, make loading and unloading more difficult.

6. Tray/shrink packages have rounded corners and nonuniform tops which make stacking more difficult. Stacking would be easier for wholesaler/distributors if manufacturers used corrugated trays on both the top and bottom of tray/shrink packages, although that may decrease their economic and source reduction benefits.

Grocery Stores

For an individual grocery store, any growth in tray/shrink packaging may have a negative economic effect. From a waste disposal perspective, the effects of the tray/shrink package will be negligible since the corrugated trays can be recycled along with traditional corrugated boxes and, if a store has a film recycling program, the shrink wrap can be recycled along with its stretch wrap.

If, however, grocery stores do not have film recycling programs, then the shrink wrap will add somewhat to their waste disposal costs. Using averages from the three stores studied in this report, a typical suburban grocery store might expect to generate 4.3[1] tons of shrink wrap per year at an average disposal cost of $89.98 per ton, which equates to $386 in annual disposal costs.

Grocery stores also can expect to see a decrease in their corrugated recycling revenues because the stores will be generating smaller quantities of OCC. Using Store 1 as an example, it currently generates 269.25 tons of OCC per year, and receives revenue of $65 per ton for recycling it. If its OCC quantities were reduced by 15 percent (as an example) as a result of manufacturers switching from full corrugated containers to tray/shrink packages, it could expect its annual OCC recycling revenue to decrease by $2,625.

These costs may, however, be offset somewhat by the improved efficiency in the overall grocery distribution system which, in turn, should enable product manufacturers and wholesaler/distributors to limit future cost increases that typically are "passed on" to the stores.

In addition, store managers reported that tray/shrink packages were (1) faster to open and stock, (2) required fewer trips to the storage room to empty waste into the baler, and (3) resulted in fewer injuries (as compared to opening corrugated boxes). The store managers participating in this project estimated their labor savings (as a result of tray/shrink packaging) at 10 percent, which may further offset any recycling revenue losses due to decreased OCC quantities.

[1]*This amount is based on actual quantities generated at Store 1 and Store 2. It also includes twice the quantity found in the sample at Store 3 because, as was discussed in the full report, the sample at Store 3 was very small compared to what that store could realistically expect to generate.*

MARKETS FOR OCC AND PALLETS

The following information has been excerpted from the 1997 Edition of the "Minnesota Reycling Directory." Grocers can use the information to identify potential markets for their OCC, wood pallets, and plastic pallets.

Recycling Markets for Old Corrugated Containers

COMPANY	LOCATION	PHONE NUMBER
All Paper Recycling	New Prague, MN	612-758-6577
American Paper Recycling	St. Paul, MN	612-644-7806
Certainteed	Shakopee, MN	612-445-6450
Channelled Resources, Inc.	Chicago, IL	312-733-4200
Chicago Paperboard	Chicago, IL	312-997-3131
D & M Recycling	Onalaska, WI	608-783-3030
Dave's Disposal & Recycling	Owatonna, MN	507-455-2437
Fort Howard Company	Green Bay, WI	414-435-8321
Future Companies Corporation	St. Paul, MN	612-647-5594
Goodhue Company	Red Wing, MN	612-385-3109
Green Bay Packaging, Inc.	Green Bay, WI	414-433-5014
Hennepin Paper Company	Little Falls, MN	612-632-3684
Howard Wastepaper, Inc.	Duluth, MN	218-628-2388
International Bildrite, Inc.	International Falls, MN	219-293-3900
J & M Fibers, Inc.	Sun Prairie, WI	608-837-5409
Ken's Sanitation & Recycling	Fargo, ND	218-236-7940
LDI Fibers, Inc.	New Hope, MN	800-559-5343
Magnuson Trucking & Leasing	Bemidji, MN	218-751-1668
Mason City Recyclers	Mason City, IA	515-423-1531
Menominee Paper Company	Menominee, MI	906-864-3291
Miller Waste Mills	Winona, MN	507-454-6906
Miller, Wm. Scrap Iron & Metal	Winona, MN	507-452-2067
National Recycling, Inc.	Wyoming, MN	612-462-5072
Otter Tail Company Recycling	Fergus Falls, MN	218-736-4400
Phillips Recycling	St. Cloud, MN	320-251-5980
Pioneer Paper Stock Company	Minneapolis, MN	612-374-2280
Poly Film	Minneapolis, MN	612-721-4064
Poor Richards, Inc.	St. Paul, MN	612-774-7733
Python's	St. Cloud, MN	320-253-3127
Recovered Materials Management	St. Paul, MN	612-891-8565
Recycle Minnesota Resources/SuperCycle	St. Paul, MN	612-224-2666
Recycled Fibers Division	Milwaukee, WI	414-271-9030
Rock-Tenn Company	Maple Grove, MN	612-391-8080
Rock-Tenn Company	St. Paul, MN	612-641-4874
Rohn Industries, Inc.	St. Paul, MN	612-647-3442
SMC Compost Services	Rosemount, MN	612-322-2622
Schaaps Recycling	Worthington, MN	507-376-3298
Stempf's Auto	Onamia, MN	612-532-3987
Strege's Recycling Center, Inc.	Ortonville, MN	320-839-6203
VIM Recyclers LP	Glen Ellyn, IL	630-858-5180
Voyageur Disposal & Processing	Canyon, MN	218-345-6302
Waste Management of MN, Inc.	Circle Pines, MN	612-784-8349
Weyerhaeuser	Roseville, MN	612-631-1693
Wisconsin Tissue Mills	Menasha, WI	414-725-7030

Recycling Markets for Pallets

COMPANY	LOCATION	PHONE	WOOD	PLASTIC
Ceres Environmental Services, Inc.	Brooklyn Park, MN	612-425-8822	X	
Consolidated Container Corp.	Minneapolis, MN	612-338-0753	X	X
D & M Recycling	Onalaska, WI	608-783-3030	X	X
East Central Pallet, Inc.	Rush City, MN	612-358-4590	X	
Eco-Tech	McHenry, IL	815-363-8570		X
Future Companies Corporation	St. Paul, MN	612-647-5594	X	X
Goodhue Company	Red Wing, MN	612-385-3109	X	X
Gruber Pallets, Inc.	Lake Elmo, MN	612-436-1912	X	
Hammer's Plastic Recycling	Iowa Falls, IA	515-648-5073		X
J & B Pallet Recycling	Lake City, MN	612-345-3854	X	
JB Pallets, Inc.	Newport, MN	612-459-5111	X	
Lavico Polymers (USA), Inc.	Ottawa, IL	814-433-1368		X
Magnuson Trucking & Leasing	Bemidji, MN	218-751-1668	X	X
Materials Recovery Ltd.	Newport, MN	612-437-8618	X	
Miller, Wm. Scrap Iron & Metal	Winona, MN	507-452-2067	X	
Norske Wood Works	Black Earth, WI	608-767-3994	X	
Orbis	Oconomowoc, WI	800-999-8683		X
Ostrom's Auto Parts	Grasston, MN	320-396-2567	X	
Otto Packaging Pallet Recycling Division	St. Paul, MN	612-488-0474	X	X
Pallet Service Corp.	Maple Grove, MN	612-391-8020	X	X
Phoenix Recycling Corp.	Roseville, MN	612-635-0112		X
Poly Film	Minneapolis, MN	612-721-4064		X
Poor Richards, Inc.	St. Paul, MN	612-774-7733	X	
Quality Checked Plastics, Inc.	Paynesville, MN	320-243-7267		X
R & W Roll-off Service, Inc.	Carver, MN	612-368-4970	X	X
SMC Compost Services	Mankato, MN	507-388-3122	X	
SMC Compost Services	Rosemount, MN	612-322-2622	X	
Salco	Milwaukee, WI	414-643-0038	X	
Stempf's Auto	Onamia, MN	612-532-3987	X	X
T & O Auto Parts	Howard Lake, MN	612-543-2521	X	
TS Investment Co.	Eden Prairie, MN	612-432-4446		X
Tilsner Carton Co.	St. Paul, MN	612-227-8261	X	
VIM Recyclers LP	Glen Ellyn, IL	630-858-5180	X	
Voyageur Disposal & Processing, Inc.	Canyon, MN	218-345-6302	X	
Wadena Hide & Fur Co.	Wadena, MN	218-631-2617	X	
Wales Pallet Co.	St. Paul, MN	612-647-0496	X	
Wood Recyclers of America	St. Paul, MN	612-437-4307	X	

POTENTIAL MARKETS FOR PLASTIC FILM

The following market listing is based on the Minnesota Office of Environmental Assistance's "Minnesota Recycling Directory (1997 Edition)," and includes companies that accept stretch and/or shrink wrap for recycling. The companies on this list were contacted by the project team to determine (1) whether they currently accept film from the grocery industry, (2) what quantities of film they require, (3) what form they want the material in, (4) whether they accept both stretch and shrink wrap (and/or all forms of polyethylene film), (5) their general specifications for film, and (6) pricing information where available. A symbol has been included after the name of each company indicating what type of maket it is: B = broker, P = processor, R = reclaimer, and/or E = end-user/ manufacturer.

If you are interested in recycling the stretch and/or shrink wrap generated at your grocery facility, you should look through this list to determine which companies may be viable markets for you. It probably is best to start by looking at the quantities they require first (if you cannot meet their requirements they will not be viable outlets), the form they want their material in (if they want it baled and you do not have a baler, you will need to talk with them about whether they can provide one or help you locate one), and their location (the closer they are, the lower your transportation costs will be).

Once you have identified several companies that may be viable markets for you, you should call them directly to discuss how their programs work and whether you may be able to work together to start a successful plastic film recycling program.

COMPANY	LOCATION	PHONE	ACCEPTS FILM FROM GROCERY INDUSTRY	QUANTITIES REQUIRED	GENERAL SPECIFICATIONS	PRICING
Carlisle Plastics [E]	Minneapolis, MN	612-884-7281	Yes, although not directly. Usually it comes through a processor.	1,000 pounds. Prefers baled material.	Accepts both stretch and shrink. Clear must be separated from color. Must be free of tape, labels, and moisture.	$.02 to .10 per pound depending on quality.
Corta Corp. Plastic Recyclers [P]	Hamel, MN	612-478-3135	Yes	5,000 pounds. Must be baled.	Accepts both stretch and shrink. Also accepts bags. No paper or lables. Must be dry.	Varies depending on quality and current market prices.
D & M Recycling [B,P]	Onalaska, WI	608-783-3030	Yes (from warehouse/ distribution centers)	10,000 to 15,000 pounds preferred, but can work with smaller loads.	Accepts LDPE and HDPE film. Moderate amounts of labels are acceptable. Must be clean and dry.	$.02 to .04 per pound picked up.
Discover Plastics, Inc. [B,P,R]	Minneapolis, MN	612-593-0160	No	Not Applicable	Not Applicable	Not Applicable
Eaglebrook Plastics [B,E]	Chicago, IL	773-638-0006	Yes	Truckload quantities required (35,000 - 40,000 pounds)	Accepts both stretch and shrink. No tape or labels. Must be contaminant free.	Varies with quality.

COMPANY	LOCATION	PHONE	ACCEPTS FILM FROM GROCERY INDUSTRY	QUANTITIES REQUIRED	GENERAL SPECIFICATIONS	PRICING
Eco-Tech [B,P,E]	McHenry, IL	815-363-8570	Yes	If Eco-Tech pays the freight, it requires loads of 20,000 pounds or more. If supplier pays, there are no minimum requirements. Must be baled.	Accepts both stretch and shrink. Also accepts PE bags. Prefers clear. Must be dry. Labels and tape are not a problem unless there is a significant quantity.	Varies depending on quality and quantity.
Hammer's Plastic Recycling [E]	Iowa Falls, IA	515-648-5073	Yes	Prefers truckload quantities. Must be baled.	Accepts both stretch and shrink. Must be clean and dry. Labels and tape are acceptable.	Determined on case-by-case basis.
Lavico Polymers (USA) [B,P]	Ottawa, IL	814-433-1368	Yes	Prefers truckload quantities if material is from out of state.	Accepts both stretch and shrink, mixed or separated. Must be dry. Lables and tape are acceptable.	Determined on case-by-case basis.
Maine Plastics, Inc. [B,P]	Chicago, IL	847-473-3553	Yes	If supplier pays freight, no minimum. If Maine pays, 5,000 pounds are required. Must be baled.	Accepts both stretch and shrink, but prefers that it be spearated. No tape or labels. Also accepts bags.	Vaires with time, quality, and quantity.
Monarch Plastic Processing [P,E]	Little Falls, MN	320-632-3625	Yes	No minimum quantities. Prefers loose (boxed or bagged).	Accepts both stretch and shrink. No tape or paper. Must be dry.	Does not pay for material, but will accept it if delivered.
National Recycling, Inc.	Wyoming, MN	612-462-5072	No	Not Applicable	Not Applicable	Not Applicable
Poly Film [P]	Minneapolis, MN	612-721-4064	Yes	No minimum. If picked up, must be baled. If delivered, can be loose or baled.	Accepts both stretch and shrink. Prefer no tape or labels. Must be dry.	$.03 to .10 per pound depending on quality.
Python's, Inc. [B,P]	St. Cloud, MN	320-253-3127	Yes	No minimum. Prefers baled material, but will accept in boxes or bags.	Accepts both stretch and shrink. Also accepts bags. Limited printing acceptable, no paper or labels, must be clean.	Varies with quality, quantity, and time. Will pay more for baled material. Bags accepted but not paid for.
Recovered Materials Mngt. [B]	St. Paul, MN	612-891-8565	Yes	Must be baled. Minimum of six bales required in any one pick up.	Accepts both stretch and shrink. Bags should be kept separate.	Varies with time and quality.

COMPANY	LOCATION	PHONE	ACCEPTS FILM FROM GROCERY INDUSTRY	QUANTITIES REQUIRED	GENERAL SPECIFICATIONS	PRICING
Schaaps Recycling [B,P]	Worthington, MN	507-376-3298	Yes	No minimum. Accepts baled, loose, or boxed.	Accepts both stretch and shrink. Clear only. Remove as much paper as possible.	Varies with time and quality.
Silvercrest Recycling, Inc. [P]	Des Moines, IA	515-266-7306	Yes	No minimum. Prefers baled, but will accept loose or boxed.	Accepts both stretch and shrink. Clear only. Will accept colored bags.	$.00 to .06 per pound for baled material delivered. Not paying for loose material.
Strout Plastics [P,E]	Lakeville, MN	612-469-1771	Yes	No quantity requirements. Any form accepted (loose, baled, boxed, rolls).	Accepts LDPE & LLDPE film. Must be clear, dry, free of labels.	$.00 to .05 per pound.
TS Investment Co. [B,P]	Eden Prairie, MN	612-432-4446	Yes	Within 50 miles, accepts minimum loads of 5,000 pounds. Within 100 miles, accepts 10,000 pounds. Beyond needs 25,000 pounds. Prefers bales.	Accepts LDPE & LLDPE film, and small amounts of HDPE film (primarily bags). Prefers clear. Must be free from other plastics and non-film contaminants.	Varies with time and quality.
Tenneco Packaging [E]	Jacksonville, IL	217-479-1249	No	Not Applicable	Not Applicable	Not Applicable
Trex Company, LCC [E]	Wichester, VA	800-742-1035	Yes	Prefers and will pay freight for full truckloads. Will work with smaller loads if needed. Material must be baled.	Prefers stretch. (Will consider shrink on case-by-case basis.) Good faith effort to eliminate contamination.	Straight stretch wrap = $.05/lb; straight grocery sacks = $.03/lb; mixed = $.04/lb
Up North Plastics [P,E]	Cottage Grove, MN	800-527-3322	Yes	Within 200 miles, 10,000 pounds required. 25,000 pounds required otherwise. Accepts loose, baled, and rolls.	Buys all forms of PE clear film. No dirt, rocks, other plastics, metal, food, moisture, or paper.	Depends on quality and quantity.
VIM Recyclers, LP [B]	Glen Ellyn, IL	630-858-5180	Yes	Material must be baled. No minimum quantities if VIM provides baler. Requires full truckloads otherwise.	Accepts both stretch and shrink. No other specifications.	Up to $.05 per pound depending on quality.

APPENDIX C

PUBLICATION RESOURCE LIST

AUTHOR	TITLE	PHONE	COMMENTS
Raymond Communications/IOPP	1997 Transportation Packaging & the Environment	301-345-4237 (Raymond)	An in-depth study that examines the trends that will impact the use of transport packaging. Includes brief case studies and cost estimates.
State of Michigan Departments of Commerce and Natural Resources	Case Studies: Hudson's Department Store and People's Food Cooperative (PFC)	517-335-1178 (MI DNR)	Describes efforts by the PFC to reduce disposal including establishing a reuse program to eliminate packaging discards. The Dayton Hudson example describes efforts to eliminate the purchase of packaging materials by using office paper instead. Also describes the OCC recycling program.
Jens-Christian Sorenson	Danish Packaging and Transportation Research Institute	45-4350-4465	The Institute offers assistance with optimizing packaging and logistical solutions, including evaluation of packaging materials and transport cost analysis.
David Sapphire, INFORM, Inc.	Delivering the Goods: Benefits of Reusable Shipping Containers	212-361-2400	Comprehensive report on the benefits and barriers associated with reusable shipping containers. Includes comparisons of various options and lifetime costs. Also provides case studies from various industries.
Daniel Goodwin, Chair, Transport Packaging Committee, IOPP	Performance Testing of Shipping Containers; Integrated Packaging Systems for Transportation and Distribution; Performance and Evaluation of Shipping Containers; Design and Production of Corrugated Packaging and Display	716-475-2278 (Goodwin); 800-432-4085 (IOPP)	The IOPP Transport Packaging Committee has a fairly lengthy publication list targeted at packaging professionals. These are titles that appeared pertinent to this study.
Minnesota Office of Environmental Assistance	Fact Sheet: Source-Reduced and Reusable Transport Packaging: Saving Money and Reducing Waste	800-877-6300	Quick overview of steps that corporations can take to source-reduce and/or switch to reusables. Includes examples of cost-savings achieved locally. (A 12-minute video also is available.)
Minnesota Office of Environmental Assistance	Report on Packaging Discards	800-877-6300	A study measuring the quantity of packaging in the state's waste stream. According to the study, transport packaging accounts for more than 20% of Minnesota's MSW discards.
Minnesota Office of Environmental Assistance	Resource Efficiency Efforts for the Grocery Industry	800-877-6300	This study evaluated the most effective methods for grocers to reduce energy and water consumption, waste, and toxicity. The project involved surveying Minnesota grocers about their environmental practices, conducting a training program with grocers, and setting the stage for the formation of an Environmental Task Force.
Minnesota Office of Environmental Assistance	Fact Sheet on Pallets	800-877-6300	Includes information on pallets and how they are used in common distribution systems.
Minnesota Office of Environmental Assistance	Directory of Pallet Recyclers and Remanufacturers	800-877-6300	This directory includes contact information for companies that recycle and/or remanufacture pallets. It can be used by any organization that wants to identify potential outlets for damaged pallets.
Minnesota Office of Environmental Assistance	Reusable Transport Packaging Directory	800-877-6300	A guide that describes reusable packaging containers and sources for purchasing these containers.

AUTHOR	TITLE	PHONE	COMMENTS
Franklin Associates	Foodservice & Packaging in Municipal Solid Waste	913-649-2225	Report prepared for the Foodservice and Packaging Institute which looks at the contribution of foodservice disposables to the nation's solid waste problem.
Franklin Associates	Grocery Packaging Database	913-649-2225	Database containing information about grocery packaging as a percentage of MSW as well as total generation, disposal, and recycling of grocery packaging.
Grocery Manufacturers of America	Grocery Packaging in Municipal Solid Waste: 1995 Update	202-337-9400	Documents the amount of packaging waste generated and discarded by the grocery industry.
Grocery Manufacturers of America	Progress & Performance	202-337-9400	Provides information on the steps that grocery manufacturers have taken to reduce, reuse, and recycle products and packaging.
Snohomish County Solid Waste Management Division	Prevent Packaging Waste: A Practical Guide for Cost Savings and Environmental Benefits of Re-Evaluating Business Packaging	206-388-3425	This study looked at the role of packaging in the distribution of consumer goods and made recommendations on how to minimize the use of packaging. The study also includes several case studies.
Tim Bernthal	Produce Waste Reduction Project	NA	Report on Puget Consumer's Coop pilot efforts to reduce packaging associated with produce delivery by implementing reusable container programs with certain growers. Estimates that a positive return on investment is achieved after 3.5 months of using reusable containers.
Clean Washington Center	Recycled Product Guide	206-464-7040	A reference guide listing national manufacturers and distributors of recycled products (including pallets and shipping containers)
Grocery Manufacturers of America, ECR Best Practices Operating Committee	Pallet Leasing: A Pilot Test	202-337-9400	Provides efficient consumer response information and several case studies on wood pallet leasing programs and options.
Grocery Industry Pallet Subcommittee by Cleveland Consulting Associates	Pallet System Cost Analyzer	800-333-3856	Software tool to analyze pallet system costs and alternatives. The corresponding report also discusses the costs to operate the grocery industry pallet system.
W. Thomas Bird	Evaluating Plastic Shipping Platforms: Downstreaming in a Closed-loop System	NA	Case study of cost savings and benefits associated with Price Chopper Supermarkets' decision to incorporate plastic pallets in its warehouse distribution operation.
Institute of Scrap Recycling Industries	Scrap Specifications Circular 1998: Guidelines for Paper Stock: PS-98 Domestic Transactions	202-737-1770	Provides standard guidelines and grade definitions for recycled paper.
American Plastics Council	Plastic Film: Its Uses, Benefits, and Waste Management Options	202-974-5400	Provides general information on plastic film, such as the resins with which it is made, how much is generated, its source reduction benefits, and barriers to recycling.
American Plastics Council	Stretch Wrap Recycling: A How-To Guide	202-974-5400	A step-by-step guide to establishing stretch wrap recycling programs in warehouse/distribution centers. Includes case studies and cost estimates for programs.
American Plastics Council	Recycled Plastic Products Source Book	202-974-5400	A list of manufacturers and distributors of recycled plastic products (including pallets and shipping containers).

AUTHOR	TITLE	PHONE	COMMENTS
Food Marketing Institute	Supply Chain Management: Logistics in the Future	202-452-8444	A study that discusses the current grocery distribution system and innovations that will transform that system in upcoming years.
Rolan Winkler	"Jugs to Pellets to Pallets," Enviro	206-582-0644	This 1994 article describes Perstorp Xytec's operations and how they manufacture plastic crates and pallets using old milk jugs.
Matthew MacDermott	"Postal Service to Use More Plastic Pallets," Plastics News		This short 1997 article desribes how the use of robotics at mail distribution centers will increase demand for plastic pallets.
Dr. Ed Brindley	Pallet Recycling - The World of Pallet Expansion	804-740-1567	This 1995 report presents results from the fourth annual pallet recycling survey, conducted by Industrial Reporting, Inc. Respondents indicated a leveling off in terms of growth, a trend toward total disassembly of pallets, and growth in third party pallet management services.

SUPERVALU PLASTIC PALLET PROGRAM: PAYBACK ANALYSIS

	YEAR 1 [1]	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL
Inital Cost (150,000 Pallets) [2]	$3,150,000	$0	$0	$0	$0	$3,150,000
State Sales Tax @ 6.5% [3]	$204,705	$0	$0	$0	$0	$204,750
Replacement Cost [4]	$1,050	$1,087	$1,125	$1,164	$1,205	$5,631
Tax on Replacements	$68	$71	$73	$76	$78	$366
Total Cost	$3,355,868	$1,158	$1,198	$1,240	$1,283	$3,360,747
Wood Pallet Replacement Costs [5] [6]	$7,560,000	$7,824,600	$8,098,461	$8,381,907	$8,675,274	$40,540,242
Savings @ 8.3% [7]	$627,480	$649,442	$672,172	$695,698	$720,048	$3,364,840
Wood Pallet Repair Cost [8]	$2,214,000	$2,291,490	$2,371,692	$2,454,701	$2,540,616	$11,872,499
Savings @ 28.3% [9]	$626,562	$648,492	$671,189	$694,680	$718,994	$3,359,917
Total Annual Cost	$3,355,868	$1,158	$1,198	$1,240	$1,283	$3,360,747
Total Annual Savings	$1,254,042	$1,297,934	$1,343,361	$1,390,378	$1,439,042	$6,724,757
Accumulated Net Savings	($2,101,826)	($805,050)	$537,113	$1,926,251	$3,364,010	$2,920,498

Table 1: Notes

[1] The project team realizes that replacement costs for plastic pallets will not likely be incurred in the first year, but the purchase prices and replacement for both wood and plastic pallets have been included in Year 1 to keep the table as simple and straightforward as possible.

[2] This is based on an initial plastic pallet inventory of 150,000 pallets purchased at an average cost of $21.00 per pallet by SUPERVALU in calendar year 1994. SUPERVALU reports a total non-leased pallet inventory of 16.5 million pallets.

[3] Minnesota state sales tax is 6.5 percent.

[4] SUPERVALU indicates that 50 additional plastic pallets are purchased each year for replacement purposes.

[5] SUPERVALU estimates the corporation's total wood pallet inventory at 16.35 million (see Footnote 2.) The Grocery Industry reports that approximately one-third of the total number of wooden pallets in the industry are annual replacement purchases ("Review of Costs to Operate the Grocery Industry Pallet System," written for the Grocery Industry Pallet Subcommittee by Cleveland Consulting Associates.) This analysis assumes SUPERVALU's replacement rates to be similar to the industry average. SUPERVALU's actual average wood pallet replacement cost is $7 per pallet. An escalation factor of 3.5 percent was used to complete the analysis for year's 2 through 5.

[6] Tax on replacements was not included for wood pallets since the majority of pallets in the SUPERVALU system come from manufacturers as opposed to actual purchases.

[7] Assumes savings at 8.3 percent (total plastic pallet purchase cost divided by total wood pallet replacement cost).

[8] The Grocery Industry reports that approximately one-third of the total number of wood pallets in the industry are used pallets re-introduced into the system annually and that wood pallet repairs cost $2.05 each at the wholesaler/distributor level ("Review of Costs to Operate the Grocery Industry Pallet System," written for the Grocery Industry Pallet Subcommittee by Cleveland Consulting Associates.") This analysis assumes SUPERVALU's repair rates and costs to be similar to the industry average.

[9] Assumes savings at 28.3 percent (total plastic pallet purchase cost divided by total wood pallet repair cost).