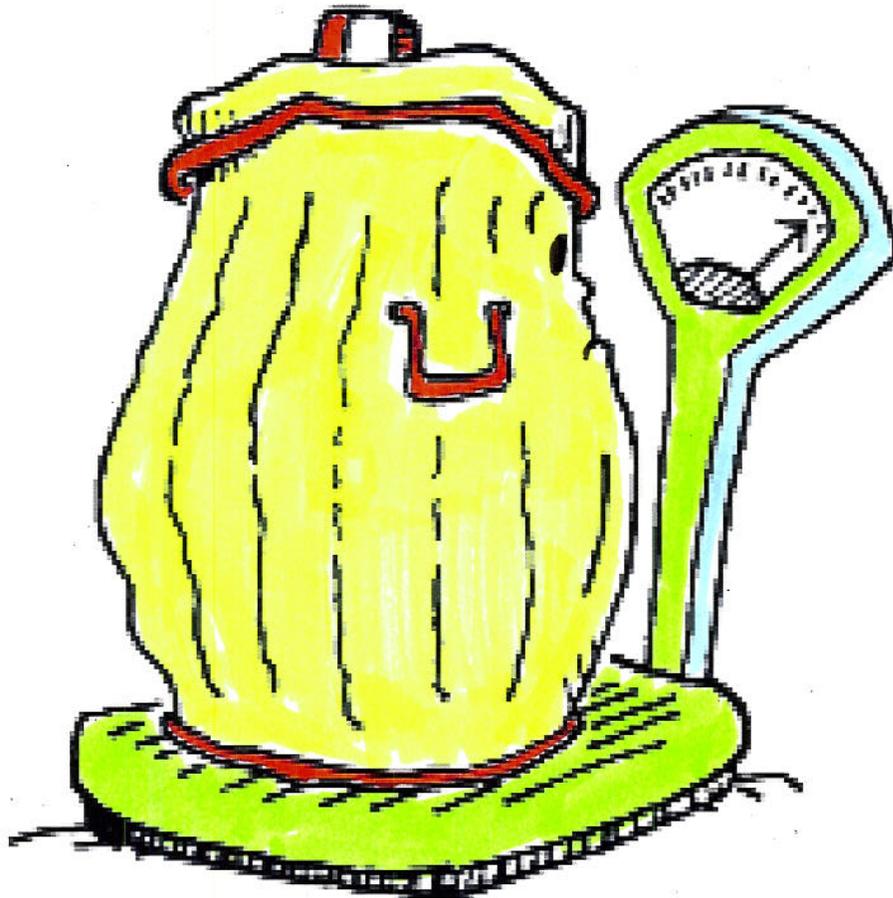




New York State Department of Environmental Conservation

Waste Audit Reference Manual



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About This Manual

This manual has been developed to assist businesses in conducting waste audits to identify and evaluate waste reduction opportunities. In particular, this manual provides guidance in the following areas:

1. Planning and organizing a Waste Audit Program.
2. Conducting Waste Audits.
3. Evaluating the Information Collected to Identify Waste Reduction Opportunities.
4. Identifying Available Resources.
5. Sample Audit Worksheets/Forms.



Check our website for more waste reduction, reuse, recycling, composting and buy recycled education materials:

www.dec.ny.gov/chemical/8801.html

If this workbook does not answer your questions about waste audits, please contact the New York State Department of Environmental Conservation, Bureau of Solid Waste Reduction and Recycling at (518) 502-8705, for more information.

Don't forget, a successful office recycling program has several key components:

- A dedicated, enthusiastic program coordinator;
- A convenient, organized collection system;
- A secure and dependable market; and
- An effective educational program.

Call us at (518) 402-8705
if you need any assistance!!

GOOD LUCK!

Section 1. Introduction



- What is a Waste Audit?
 - The Purpose of the Waste Audit.
 - Benefits and Obstacles to a Waste Audit Program.
 - Waste Reduction.
-

What is a Waste Audit?

A waste reduction/recycling program cannot succeed without initially conducting a waste audit to collect accurate information on the nature and quantity of wastes generated by your business. The waste audit alone will not reduce your waste, rather it is a starting point which will enable your business to make informed decisions on how to allocate resources for waste reduction and recycling programs.

The Purpose of the Waste Audit.

In today's competitive environment it is important for facilities to operate efficiently. Today more and more customers are taking environmental considerations into account when purchasing products and services. In response to these concerns, innovative companies are incorporating waste reduction principals into their daily operation. Waste reduction includes; actions taken to reduce the amount and/or toxicity of waste generated on-site which require disposal, reusing materials products and packaging and recycling as much of your waste materials as possible. In particular, waste reduction activities include:

- **Waste Prevention or Source Reduction** - The design, manufacture, purchase, or use of materials that prevent waste by not generating certain materials or by decreasing the use of certain materials that ultimately end up as waste.
- **Reuse** - Using an object or material again, either for its original purpose or for a similar purpose, without significantly altering the physical form of the object or material.
- **Recycling** - The collection and use of materials that would otherwise have been discarded and make the material into a new product or a package the product. Making a product out of recycled materials is better than using virgin materials, but waste prevention is best, since no wastes are created.
- **Composting** - Compost is a dark, crumbly, earthy-smelling mixture that consists mostly of decayed organic matter. Composting is a simple, natural process,

nature's way of recycling nutrients and returning them to the soil to be used again. By taking advantage of this natural recycling process, you can help lighten the load of waste that would otherwise go to a landfill.

- **Purchasing** - The procurement of products made from recycled materials and/or designed to result in less waste after their useful life.

In order to implement a successful waste reduction program, a facility must initially conduct a waste audit of its' activities. The waste audit serves two basic purposes:

- Establishes a facility's waste generation, waste management and current purchasing practices.
- Identifies potential waste reduction, reuse and recycling options.

An effective audit identifies wastes currently generated on-site, waste disposal practices and cost of managing the waste materials. In addition, the audit identifies and evaluates waste reduction opportunities to prevent the generation of waste, increase recycling of materials and the purchase of recycled materials.

Benefits and Obstacles to a Waste Audit Program

The waste audit should be viewed as a business plan with environmental benefits. The most common benefits and incentives for establishing a waste audit program are presented in Table 1. However, as with all activities, there are pluses and minuses, therefore, the obstacles that may hinder implementation or program development are presented in Table 2.

Waste Reduction

As mentioned in Section 1, waste reduction really consists of: waste prevention; reuse and recycling of materials; composting; and purchasing recycled products. In order to provide a greater understanding of these principals, each of the activities is discussed below in greater detail.

Waste Prevention

The most effective way to reduce your company's waste is to generate less in the first place. Companies can adopt a wide range of waste prevention strategies, including:

- ◆ **Using Minimal or Reusable Packaging**
Encourage or require suppliers to minimize the amount of packaging used to protect their products or seek new suppliers who offer products with minimal packaging. Work with suppliers to make arrangements for returning shipping materials such as

crates, cartons, and pallets for reuse. In restaurants and company cafeterias, using bulk food and beverage dispensers instead of individual-serving containers also will help prevent waste. (When opting for reusable containers, be sure to take steps to ensure proper hygiene is maintained.)

Table 1 Incentives for Waste Reduction	
Improved Company Morale	<p>A successful program encourages/requires all workers participate to achieve the same goals.</p> <p>Working together fosters an understanding of each worker's responsibilities and encourages a teamwork atmosphere.</p>
Reduced Operating Cost	<p>Money will be saved in the long-term.</p> <p>Many projects have good return on investment and short payback period.</p> <p>Savings in disposal and raw material costs reduce overall operating costs.</p>
Improved Worker Safety	<p>Reducing toxics improves working environment and decreases personal protective requirements.</p>
Reduced Compliance Costs	<p>Waste reduction projects can reduce regulatory exposure.</p> <p>Some projects may eliminate need for off-site disposal, permits, manifesting, monitoring, and reporting, thereby saving time and money.</p>
Increased Productivity	<p>Waste reduction can result in more efficient use of raw materials due to improved processes and operations.</p>
Increased Environmental Protection	<p>Reduction in waste generation, assuring improved long-term environmental protection and reduced future liability costs.</p>
Continuous Improvement	<p>Waste reduction can be an integral part of a company's Total Quality Management (TQM) or continuous improvement program.</p>
Enhance Consumer Acceptance	<p>Consumers have become keenly aware of "green products."</p>
Higher Product Quality	<p>Waste reduction requires increased control of process, which leads to improved product quality.</p>

Table 2. Obstacles to Waste Reduction	
Capital requirements	Some projects may require capital investments.
Specifications	Production materials may be toxic and/or hazardous and could be replaced with more environmentally sound alternatives, but contracts may specify that the toxic compounds be used. It may take time to revise and implement new specifications.
Regulatory issues	New or modified permits may be necessary.
Product quality issues	Waste reduction projects may change product quality.
Customer acceptance	Anything that affects quality or perceptions of quality may affect customer acceptance.
Immediate production concerns	Companies are often hesitant to admit that the "old way" may not have been the best way.
Available time and technical expertise	Time or sufficient expertise may be lacking.
Inertia	The "if it ain't broke, don't fix it" attitude may prevail.

In addition, examine the packaging used for your own products to determine if it is possible to use fewer layers of materials or to ship merchandise in returnable or reusable containers.

◆ **Durable Equipment and Supplies**

Purchase quality, long-lasting supplies and equipment that can be repaired easily, and establish regular maintenance schedules for them. These items will stay out of the waste stream longer, and the higher initial costs are often justified by lower maintenance, disposal, and replacement costs.

◆ **Reusing Products and Supplies**

Using durable, reusable products rather than single-use materials is one of the most effective waste prevention strategies. Consider adopting simple, cost-effective measures such as washing and reusing ceramic mugs, plates and utensils in place of disposables. Another idea is to reuse common items such as file folders and interoffice envelopes.

◆ **Reducing the Use of Hazardous Constituents**

Often, substitutes for the standard cleaning solvents, inks, paints, glues, and other

materials used by graphics and maintenance departments are available free of the hazardous ingredients that otherwise could end up being disposed of with the rest of your company's solid waste. Ask suppliers to direct you toward reformulated products such as toners with no heavy metals and water-based paints and cleaning solutions.



◆ **Using Supplies and Materials Efficiently**

There are many strategies that your company can adopt to reduce waste and conserve materials, including double-sided copying. In addition, purchasing and inventory practices that generate waste unnecessarily can be eliminated. For example, some companies might order large quantities of an item to receive a discounted unit price, only to have a portion of the order end up unused and discarded. Be cautious about over-ordering products with a limited shelf life.

◆ **Eliminating Unnecessary Items**

When reviewing your company's operations for opportunities to reduce waste, don't overlook the obvious. Your company may routinely use items that contribute little or nothing to your product or service. A number of effective waste reduction measures may involve simply eliminating the use of unnecessary materials and supplies.

While most of these waste prevention strategies involve daily facility operations, manufacturers also can consider lowering costs and preventing waste by altering the design of products or changing manufacturing processes. Among the strategies to consider in your manufacturing processes are:

- Using less raw material in a product that you manufacture.
- Avoiding or minimizing the use of hazardous substances in your manufacturing processes.
- Increasing the life span of your products by making them more durable and easier to repair.
- Cutting back on the amount of packaging associated with your products.
- Making your products' packaging reusable.

Reuse

The next preferred alternative for waste reduction is reuse. Reusing items is another way to stop waste at the source because it delays or avoids that item's entry in the waste collection and disposal system.

Recycling

Recycling offers businesses a way to avoid disposing of the waste that cannot be prevented. Many businesses are collecting plastic, metal, paper, corrugated cardboard, glass, and other materials for recycling. If your company is interested in recycling, you will need to design a system to collect the recyclable materials. In many cases, these items also must be sorted and stored. It might be possible, to contract with your waste hauler or a local recycling company to sort, clean, and transport your recyclables. Participation in existing municipal collection efforts also might be an option. Check this website for more information on setting up a recycling program - www.nyrecycles.org

And it's the Law! Each municipality was required by Chapter 70, Laws of 1988, to have a recycling law or ordinance requiring source separation of recyclables by September 1, 1992. The municipalities developed a recycling program that fit their needs and met the goals established by the State. Each municipality has their own penalties or fines for those people who do not recycle.

Recycling is required for everyone who generates garbage in New York State. Recycling is one part of a total solid waste management program, waste reduction and reuse take precedence in a comprehensive solid waste management program.

Composting

There are various methods for composting. For offsite composting, your food scraps and even paper towels can be collected and sent to a composting facility. For onsite, you can try vermicomposting. Vermicomposting means composting with worms. Using a worm bin has several advantages. The composting material does not need to be turned; the worms do it for you. The bin is often located inside so you don't have to take a trip to the compost pile.

Purchasing Recycled Products

Many waste prevention activities will invariably change the way you purchase supplies and equipment. For example, a switch to reusable plates in your cafeteria will eliminate the need to buy - single-use plates. In addition, purchasing products with recycled content is another important element of waste reduction. An important part of your recycling efforts is to buy recycled products to help ensure that collected recyclables will actually be used in new products and kept out of disposal facilities.

Furthermore, when your company buys a product or package that was manufactured with recycled material, natural resources and energy often are conserved. Many companies have found that recycled products are now priced competitively with products made from virgin materials. To be sure your company is purchasing recycled products whenever possible, it might be necessary to periodically review purchasing specifications to ensure

that they do not unnecessarily discriminate against products made from recycled materials.

Section 2. Waste Audit Planning and Organization

- Selecting a Champion.
- Getting Top Management and Facility Support.
- Developing a Waste Audit Team.
- Setting Program Goals.



A successful waste audit requires planning, top management and employee commitment, and one or more persons to champion the effort. In addition, the participants must have a "can-do" attitude since waste reduction usually results from a continuous trial, error and correction process rather than instant success. The various components of a successful waste audit program are discussed below:

Selecting a Champion

Depending on the size and nature of your business, choose one or more persons to champion the waste audit process. The selected champion(s) must be motivated, personally interested and committed to getting the facts with the intention of completing the waste audit. In particular, the champion must select a waste audit team, get top management support, ensure the audit team meets regularly, encourage ideas from the audit team and employees, evaluate the selected waste reduction projects, overcome the inertia protecting existing practices and keep management and employees up to date on waste reduction progress.

Getting Top Management and Facility Support

Management commitment to waste reduction provides the support upon which an enduring waste reduction program can be built. At the beginning, management support is needed to establish the audit team. Throughout the program, management support is needed to endorse goals, communicate the importance of reducing waste, guide and sustain the program, and encourage and reward employee commitment.

Developing a Waste Audit Team

A Waste Audit Team needs to be organized prior to beginning the waste audit process. The team should not be assigned from any one department but rather the team should include a cross-section of the facility. Some suggested key personnel to include are representatives (both supervisors and line workers) from maintenance, production, environmental, health and safety, facility operations, purchasing, shipping and receiving,

legal, and engineering departments. Plant and executive managers should also be included. Not every company will have all these designations; the point is to include those individuals knowledgeable about the processes generating wastes and involve them from the beginning.

The initial Waste Audit Team meeting should be an informal session to discuss the concept of waste reduction, how the company can be expected to benefit, and where and how to begin. General information about the company's processes and operational procedures should be reviewed. The team will be responsible for developing the formal waste reduction plan as discussed later. The team should also discuss if they wish to include the waste hauling companies in the recycling program. Many waste hauling companies have operated or assisted businesses in designing and operating recycling programs.

Setting Program Goals

Waste audit goals are unique to each facility. While the objective of a waste audit is to reduce the amount and/or toxicity of waste, your first task as a team member will be to work with management to establish and record specific measurable goals. The goals may include:

- reducing waste disposal costs;
- increasing the amount of recyclable materials collected;
- reducing the need for single use products and packaging;
- increasing the purchasing of recycled materials; and
- eliminating the use of toxic substances.

The goals should be based primarily on how much waste reduction is possible, given the level of effort the company is willing to dedicate. In addition, it is important to establish reasonably obtainable goals, especially in the early stages of the program. Early success will ensure the commitment of the staff since every one loves a winner. Your goals should be enhanced and expanded over time as your earlier goals are reached.

Section 3. Conducting the Waste Audit and Identifying Opportunities

- Reviewing Available Facility Information.
- Facility Tour.
- Waste Sort - Determining Waste Composition.
- Documenting the Waste Audit.



Once the Waste Audit Team is established and your goals are determined, the next step is to conduct a waste audit of the facility. Your waste audit should:

- Determine the type and amount of waste generated on-site.
- Determine costs associated with disposing of the waste.
- Identify and evaluate various waste reduction and recycling options to reduce the amount of waste generated.

The types of materials which should be reviewed include but should not be limited to:

Paper	Packing Materials	Toxic Chemicals
Plastics	Toner Cartridges	Wood Pallets
Newsprint	Tires	Cafeteria Waste
Glass	Scrap Metal	Obsolete Furniture
Cardboard	Wood Scrap	Obsolete Equipment
Batteries	Magazines	Plastic Film
Oil Paints	Envelopes	
Yard Waste	Aluminum Cans	

To assist you in conducting the waste audit, worksheets for each of the tasks noted below are included in Attachment A.

Reviewing Available Facility Information

Initially, it is important to gain an understanding of the amount of wastes generate onsite and the costs to dispose of these wastes. To assist in completing this task there are a number of records at your facility which provide information on waste generation and waste disposal costs. Provided on Table 3 is a list of records commonly available at a facility.

By reviewing these records, the team should be able to complete Worksheet 1 which identifies waste haulers, amount of waste materials hauled off-site and cost of disposal. In order to collect the information required to complete Worksheet 1, the team may be required to interview facility personnel.

Table 3 Facility Records Facility Records	
Accounting Department Invoices	<ul style="list-style-type: none"> • Amount and type of materials purchased • Amount of material dispensed • Costs of materials purchased and disposal of

Table 3 Facility Records Facility Records	
Environmental Department Forms Permits Waste Manifests Waste Disposal	Toxic emissions Quantity of material use, waste, and release Amount of hazardous waste shipped off-site Amount of solid waste hauled off-site
Production Department Purchasing Records Production Records Inventory Records	Amount of supplies and products purchased Amount of material consumed in production Amount of material on-site

Facility Tour

After reviewing facility records, it is time to conduct a facility tour to observe the various department activities, types of waste generated, waste disposal practices, and current waste reduction activities. This should also confirm the information collected in the previous step. During the facility tour, Worksheet 2 should be completed.

Specifically, the facility tour will enable the team to:

- Observe the types and relative amounts of wastes produced.
- Identify waste-producing activities and equipment.
- Detect inefficiencies in operations or in the way waste moves through the organization.
- Observe the layout and operations of various departments.
- Assess existing space and equipment that can be used for storage, processing recyclables, and other activities.
- Assess current waste reduction and recycling efforts.
- Collect additional information through interviews with supervisors and employees.

Waste Sort - Determining Waste Composition

If during the record review and facility tour, the team has not been able to fully identify the types of waste and relative amounts of waste generated on-site, it will be necessary to conduct a waste sort and complete Worksheet 3.

A waste sort involves the physical sorting and review of representative samples of your facility's waste. The goal of the waste sort is to evaluate the effectiveness of current reduction programs, and identify each waste component and collect, as precisely as possible, the percentage of the various waste types your facility generates.

Prior to conducting a waste sort, it is important to determine the flow of waste so that the team is reviewing representative containers. For example, all waste at a facility may end up in a dumpster, therefore, the dumpster is representative of the facility's waste stream. However, at another facility, certain waste streams may be handled separately and bypass the dumpster. Therefore, the dumpster may not be a complete representation of the waste stream. The advantages and disadvantages of reviewing the various types of waste containers are listed on Table 4.

Table 4 Waste Container Types		
Container	Advantages	Disadvantages
Waste Basket	Small Easy to determine contents	May not be representative Too numerous to audit All waste may not fit into basket
Collection Container (generally used by cleaning staff to empty waste baskets)	Representative of department	Wastes may bypass container
Dumpster	Usually contains most of the facility's waste	Wastes may bypass dumpster

Once you have determined the type of container to be audited, it is time to determine the facility's waste composition. The waste composition is evaluated by inspecting each container or a representative number of containers if you have a large facility.

Here are the steps:

- Since this exercise will require the team to physically sort through waste, puncture resistant gloves and old clothes are a must.
- Assign each container a unique number and complete Worksheet 3 for each waste container inspected.
- Break open each bag and use a stick to poke around the container so that you can determine the containers contents and estimate the volume of each material. For example, the container may contain 80% office paper, 10% food waste, 5% wood, 5% plastic.
- Conduct the audit just before the containers are emptied.
- Complete a copy of Worksheet 3 for each container audited.

Documenting the Waste Audit

Be sure to document all information gained through the waste audit. Documenting your findings serves several purposes, including:

- Providing a record of the company's efforts to reduce waste.
- Developing a recordkeeping system so that costs, savings, and waste reduction quantities can be more easily tracked and recorded.
- Obtaining baseline data from which to investigate economic and technical feasibility of waste reduction options.

Obtaining baseline data from which to evaluate the impact of these options once implemented. Be sure to keep with the worksheets any related information you recorded during your waste audit.

Section 4. Identify and Implementing Waste Reduction Opportunities

Brainstorming - Identifying Waste Reduction Ideas.

Waste Reduction, Reuse and Recycling Ideas.

Evaluating Waste Reduction Opportunities.

Once the waste audit is completed, the collected information will be used to identify and evaluate waste reduction ideas. Initially, a brainstorming session must be completed to generate as many waste reduction ideas as possible, then all of the ideas must be evaluated and the selected ideas implemented. Each of these tasks is briefly discussed below. Additional information, contained in Worksheet 9, details how to complete an economic and feasibility analysis of waste reduction ideas.

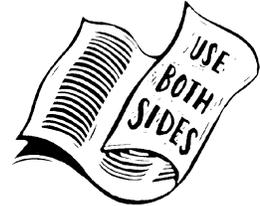
Brainstorming - Identifying Waste Reduction Ideas

A waste reduction program can be simple involving low-cost techniques such as improved quality control, stopping junk mail, double-sided copies, purchasing reusable items for employees such as coffee mugs, lunch bags, etc. In the initial stages of identifying waste reduction ideas, it is important to promote green light thinking and list as many waste reduction ideas as possible. After everyone has run out of ideas, a preliminary screening should be conducted. First, any unclear ideas should be clarified and similar ideas merged. The remaining ideas should be divided into source reduction, recycling and purchasing. Finally, the remaining ideas should be assessed and prioritized. Worksheets 4 and 5 will assist you in organizing waste reduction, reuse and recycling opportunities, respectively.

Several waste reduction and recycling ideas are as follows.

Waste Reduction, Reuse and Recycling Ideas

- Store documents on computer disks instead of making hard files copies.
- Route memos instead of making duplicate copies for each person.
- Utilize electronic mail.
- Develop purchasing specifications to reduce waste.
- Use double-sided copying.
- Use reverse side of drafts for note paper.
- Reuse file folders by reversing them.
- Instead of a separate cover sheet for faxing documents, use a "post-it" note on the main document. This will save waste on both the sending and receiving ends.
- Stop receiving junk mail.
- Avoid using soft wood pallets. Hardwood pallets can be reused five or six times. Plastic pallets can be reused hundreds of times.
- Reduce packaging materials or use reusable packaging.
- Require your vendors to use less packaging materials.
- Purchase coffee mugs or reusable lunch bags for employees to reduce coffee cup and paper waste.
- Use two-way envelopes.
- Donate old magazines and journals to hospitals, etc.
- Avoid ordering excess material.
- Use outdated letter head for internal purposes or note paper.
- Use hot air hand dryers.
- Collect paper, oils, coolants, plastic, glass, and metals for recycling.
- Donate or sell obsolete office equipment and furniture.
- Return copier and printer toner cartridges for refilling.
- Encourage suppliers to use reusable containers.
- Shred mixed paper and use as packing material.
- Compost cafeteria and yard wastes.
- Repair broken pallets for reuse.
- Develop recycling programs and reusable containers with major vendors.



Purchasing Recycled Products

The following reasons reinforce why buying recycled is important.

- **Reduces waste going to landfills.** Diverted materials are made into new products and not disposed of, so landfill space is conserved. For example, one ton of recycled paper saves 3.3 cubic yards of landfill space.

- **Reduces greenhouse gases, water pollution, and manufacturing waste.** In most cases, making products from recycled materials creates less carbon monoxide, methane, and nitrous oxide, three major contributors to greenhouse gases. Many of the products that are recycled are used locally to make new products, limiting the distance of transporting the product, thus less air pollution. Water pollution and manufacturing waste are decreased, as well. Such is the case of using recycled-content paint--not only does it cost less than non-recycled, it is just as good and requires very little processing (screening) to manufacture it. Recycled-content paint can be manufactured locally, so there is less air pollution caused by long-distance shipping.
- **Reduces energy consumption.** Recycled products usually take less energy to make. Recycled aluminum, for example, takes 95 percent less energy to make than new aluminum from bauxite ore. In the process of making paper, using recycled paper saves 22-64 percent of energy costs over virgin paper production.
- **Creates jobs.** The manufacturing process for recycled products creates far more jobs than landfills or incinerators, and recycling can frequently be the least expensive waste management method for cities and towns. For every position held at a landfill, recycling creates four positions, which increases the job market.
- **Improves markets.** When you buy goods made from recycled-content material, your purchases help to create a demand for materials collected in local government recycling programs.
- **Helps attain procurement goals.** This helps every department, board, commission, office, agency-level office, and cabinet-level office.
- **It's easy.**

Evaluating Waste Reduction Opportunities

Once the waste reduction ideas have been consolidated, the team should begin deciding which ideas are most appropriate, based on your goals and commitment. To facilitate the review of waste reduction options, Worksheet 6 should be completed.

Section 5. Educating and Training Employees

For a waste reduction program to be successful, it is important that all employees be aware of the program and the importance of their cooperation and involvement.

All employees should be periodically updated regarding the success of waste reduction programs, new waste reduction techniques being evaluated, expected benefits, equipment and process modification and expected employee involvement. These updates can be passed along to employees by:

- staff meetings and training sessions;
- employee newsletters;
- posters, signs, or flyers;
- bulletin boards;
- notices on electronic mail;
- special events like Earth Day (April 22) or New York Recycles! (November 15), slogan contests, cash awards, or other recognition for waste reduction activities;
- new employee orientation; and
- job performance standards.



One of the best methods to educate, train and keep employees interested in waste reduction is to periodically ask for suggestions from the employees and implement the best suggestions. Also, proper credit should be given to the employee for successful suggestions.

Section 6. Available Resources

Listed within this section are various waste audit materials and sources of assistance from the EPA, state and other agencies which may be valuable for facilities in developing a waste reduction program.

NOTE: The lists of companies/organizations in this section may be incomplete. The NYS DEC does not endorse or recommend any listed or unlisted company/organization.

Auditing Methodology Publication

This section provides a list of auditing methodology publications which will be of assistance in the completion of a waste reduction audit of your facility.

USEPA

Records examinations, facility walk-throughs, and waste sorts are three common approaches to conducting a waste assessment. Your assessment might require just one of these activities or a combination of approaches.

www.epa.gov/osw/partnerships/wastewise/approach.htm

The Environmental Self-Audit for Small Business

New York State Environmental Facilities Corp.
625 Broadway, Albany, New York 12205-2603
518-457-4100

This "Environmental Self-Audit for Small Business" serves as a diagnostic tool for companies about to begin operations, for the business that has never examined its environmental impact before, and for the firm that is about to relocate, expand or embark on a new business venture. It can identify possible compliance problems relating to air, water, land use, solid waste and hazardous materials. Through early identification, companies can address these issues before entering the formal permit application process, thereby reducing approval delays.

Financing Pollution Prevention Investments, A Guide for Small and Medium-Sized Businesses

NEWMOA, 129 Portland Street, Suite 502 Boston, Massachusetts 02114-2014
617-367-8558

The aim of the Guide is to help businesses who are actively pursuing P2 projects to effectively present their financing needs, and ultimately to maximize their chances of obtaining financing.

Pennsylvania Waste Audit

www.dep.state.pa.us/dep/deputate/airwaste/wm/recycle/FACTS/ComRec.htm

Rutgers, State University of New Jersey

www.aesop.rutgers.edu/~envpurchase/basics_cycle_audits.htm

LePorte County, Indiana

www.solidwastedistrict.com/projects/waste_audit.htm

Attachments

Worksheet 1	Waste Generation and Disposal Costs
Worksheet 2	Facility Walkthrough
Worksheet 3	Waste Sort/Waste Composition
Worksheet 4	Waste Reduction Opportunities
Worksheet 5	Recycling Potential Conversion Table
Worksheet 6	Evaluating Waste Reduction Options
Worksheet 7	Waste Audit Form
Worksheet 8	General Composition Form
Attachment 1	Evaluating Waste Reduction, Recycling and Purchasing Opportunities
Attachment 2	Waste Audit Procedures - Schegel Corporation
Attachment 3	Waste Audit Procedures - Columbia Presbyterian Medical Center
Attachment 4	Waste Audit Procedures - Joe Bruno Stadium

**Worksheets 7 & 8 are examples.
Choose which ever Worksheet works for you and meets your needs!**



WORKSHEET 2

FACILITY WALKTHROUGH

① Department Name _____

② Department Activities _____

③ Waste Material Generated _____

④ Waste Disposal Practices _____

⑤ Current Waste Reduction Activities _____

⑥ Comments _____

① List department by name.

② Briefly describe the department's activities.

③ List waste material generated in the department noted during the facility tour.

④ Briefly describe the department's waste disposal practices/actions.

⑤ Briefly describe any waste reduction activities that the department is currently conducting.

⑥ List any comments such as inefficiencies in waste handling.

WORKSHEET 3

TRASH-SORT/WASTE COMPOSITION

① DATE:	TIME:	INSPECTOR:
② CONTAINER TYPE:	CONTAINER NUMBER:	CONTAINER LOCATION:
③ LIST OF DEPARTMENTS USING CONTAINER:	1.	2.
	3.	4.
④ CONTAINER VOLUME:		
⑤ % OF CONTAINER FILLED:		
⑥ NET VOLUME:		
⑦ MATERIALS	PERCENTAGE OF TOTAL VOLUME	ACTUAL VOLUME
TOTAL		

- ① Date that container was inspected.
Time that container was inspected.
Name of person who inspected the container.
- ② Type of container (dumpster, waste basket).
Assign each container a unique number.
List where the container is located.
- ③ List the departments serviced by the container.
- ④ List the total volume of the container.
- ⑤ Estimate the percentage that the container is filled.
- ⑥ Multiply ④ by ⑤ to determine the total waste volume within the container.
- ⑦ List the material noted within the container.
List the percentage of each material within the container.
Multiply the net volume by the percentage of total volume to determine the actual volume of each material within the container.

WORKSHEET 4

WASTE REDUCTION OPPORTUNITIES

ITEM①	REUSABLE ITEM②	WASTE REDUCTION③

- ① List discarded items noted during audit.
- ② List possible reuses of items noted in column 1, if any. For example, single sided paper may be used on the second side, obsolete office furniture may be donated or sold, Styrofoam cups may be replaced with porcelain mugs.
- ③ List waste reduction ideas.

WORKSHEET 5

RECYCLING POTENTIAL

Name _____

Date _____

① Total Waste Volume _____ (cy)

② Material	③ Volume (cy)	④ Percent = (①/③)	⑤ Conversion	⑥ Weight = (③x⑤)

- ① Compute your total waste volume by adding all the values for ③ on each Worksheet 1.
- ② List any materials your company discards which could be marketed to recyclers.
- ③ For each material, add all of its volumes listed on each Worksheet 3.
- ④ Divide ③ by ② get the percent each material is of your total waste.
- ⑤ List the appropriate conversion factor from the attached table.

CONVERSION TABLE

This table allows you to convert volume to weight. Multiply your volume for each material by the conversion factor to calculate either pounds or tons for the material. If your material is loosely compacted, use the lower of the two numbers listed for the material. If your material is tightly compacted, use the higher number. If you are unsure, use an average of the two numbers.

Volume to Weight Conversion Factors

MATERIAL	Volume - EQUIVALENT	Weight
GLASS-whole bottles	1 cubic yard	0.35 tons
GLASS-semi-crushed	1 cubic yard	0.70 tons
GLASS-crushed mechanically	1 cubic yard	0.88 tons
GLASS-uncrushed-manually broken	55 gallon drum	0.16 tons
NEWSPRINT-loose	1 cubic yard	0.29 tons
NEWSPRINT-compacted	1 cubic yard	0.43 tons
CORRUGATED-loose	1 cubic yard	0.15 tons
CORRUGATED-baled	1 cubic yard	0.55 tons
PAPER-high grade loose	1 cubic yard	0.18 tons
PAPER-high grade baled	1 cubic yard	0.36 tons
PAPER-mixed loose	1 cubic yard	0.15 tons
PLASTIC-PET-whole	1 cubic yard	0.015 tons
PLASTIC-PET-flattened	1 cubic yard	0.04 tons
PLASTIC-PET-baled	1 cubic yard	0.38 tons
PLASTIC-HDPE-whole	1 cubic yard	0.012 tons
PLASTIC-HDPE-flattened	1 cubic yard	0.03 tons
PLASTIC-HDPE-baled	1 cubic yard	0.38 tons
PLASTIC-mixed	45 gallon bag	0.01 tons
PLASTIC-grocery bags	45 gallon bag	0.01 tons
PLASTIC-styrofoam*	45 gallon bag	0.01 tons
PLASTIC-styrofoam*	1 cubic yard	0.02 tons
ALUMINUM-cans-whole	1 cubic yard	0.03 tons
ALUMINUM-cans-flattened	1 cubic yard	0.125 tons
FERROUS METAL-cans-whole	1 cubic yard	0.08 tons
FERROUS METAL-cans-flattened	1 cubic yard	0.43 tons
WHITE GOODS-uncompacted	1 cubic yard	0.10 tons
WHITE GOODS-compacted	1 cubic yard	0.5 tons
YARD WASTE-grass-clippings-loose	1 cubic yard	0.3 tons
YARD WASTE-grass-clippings-compacted	1 cubic yard	0.6 tons
YARD WASTE-leaves-loose	1 cubic yard	0.125 tons
YARD WASTE-leaves-vacuumed	1 cubic yard	0.15 tons
YARD WASTE-leaves-compacted	1 cubic yard	0.25 tons
YARD WASTE-brush-loose	1 cubic yard	0.25 tons
YARD WASTE-brush-compacted	1 cubic yard	0.5 tons
WASTE OIL	1 gallon	0.004 tons
ANTIFREEZE	1 gallon	0.005 tons
WASTE TIRES-passenger cars	one	0.01 tons
WASTE TIRES-trucks	one	0.03 tons
WOOD-pallets	one	0.14 tons
WOOD-loose dimensional	1 cubic yard	0.12 tons
WOOD-compacted dimensional	1 cubic yard	0.35 tons
WOOD-other	1 cubic yard	0.18 tons
TEXTILES-loose	1 cubic yard	0.10 tons

NOTE: * Plastic-styrofoam is rarely recycled because markets for this item is almost nonexistent.

WORKSHEET 7 WASTE AUDIT

Estimate the amount of paper your office will generate using the following formula:

Number of employees (A)	X	Number of working days per year (B)	X	Average waste paper generated 0.5 pounds a day	-	Pounds of waste paper generated by your office (C)
	x		x	0.5	-	
<p>Use the spaces above to fill in your office's numbers. Divide the last number above (C) by 2000 to determine the tons of recyclable paper your office generates each year.</p>						
Pounds of waste paper generated by your office (C)		Divided by 2000	-	Tons of waste paper generated by your office (D)		
		÷ 2000	-			

~~~~~  
The above calculations tell you how much office paper your office may generate, and can theoretically be recycled. But in the real world, not all the paper will be recycled. Some batches of paper will be contaminated, and sometimes employees forget to recycle.

To get an accurate idea of how much paper your STOP program will be handling, you need to estimate a capture rate. This is the percentage of the paper your office can realistically be expected to recycle. A 65 to 80% capture rate is typical for STOP programs. We have used an average 70% rate for the formula below. Use a different rate for your office if you wish.

|                                                           |   |                                 |   |                                                                               |
|-----------------------------------------------------------|---|---------------------------------|---|-------------------------------------------------------------------------------|
| Tons of waste paper<br>generated by your<br>office<br>(D) | x | Estimate capture rate<br>(0.70) | - | Tons of waste paper<br>captured by your<br>office recycling<br>program<br>(E) |
|                                                           | x | 0.70                            | - |                                                                               |

The number of tons in (E) is the amount of good quality used office paper you estimate your office will be able to provide to a marketer for recycling. Use this information to help you acquire a marketer and plan pickup and handling.

\*Use your number from your waste audit calculations or if no waste audit was done, use 0.5 pounds a day as an estimate.

WORKSHEET 8

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Location: \_\_\_\_\_

Number of Employees: \_\_\_\_\_

Waste Hauler: \_\_\_\_\_

Participants in Audit:

| Location | Deposit Cans & Bottles* | Paper** | Plastic, Glass, Metal** | Compostables** | Garbage** | Comments |
|----------|-------------------------|---------|-------------------------|----------------|-----------|----------|
|          |                         |         |                         |                |           |          |
|          |                         |         |                         |                |           |          |
|          |                         |         |                         |                |           |          |
|          |                         |         |                         |                |           |          |
|          |                         |         |                         |                |           |          |
|          |                         |         |                         |                |           |          |
|          |                         |         |                         |                |           |          |

\* can count number of bottles and cans

\*\* pounds of materials

# ATTACHMENT 1

## EVALUATING WASTE REDUCTION, RECYCLING, AND PURCHASING OPPORTUNITIES

### 1. Technical Evaluation

"Will it work" is always an important point. Depending on the option, you may want to conduct a pilot study if it requires an expensive piece of equipment, or you may want to consider leasing the unit for a period of time.

A checklist of technical consideration is provided below:

| <b>TECHNICAL FEASIBILITY</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Is this option available?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <ul style="list-style-type: none"> <li>• Is this option "off-the-shelf" technology with demonstrated successful use?</li> <li>• What is the likelihood of widespread commercialization?</li> <li>• How reliable is the new technology?</li> <li>• What is the vendor's track record?</li> </ul>                                                                                                                                                                                                                                             |
| <b>Is this option applicable to my firm?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <ul style="list-style-type: none"> <li>• Is the option compatible with existing process technology?</li> <li>• Are equipment, materials or processes used in the option compatible with current procedures, work flows, and production rates?</li> <li>• How much downtime will interfere with production while the system is installed?</li> <li>• How complex are the new operations and maintenance requirements?</li> <li>• Is floor space available?</li> <li>• Are utilities available, or will they have to be installed?</li> </ul> |
| <b>Will product quality be affected?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <ul style="list-style-type: none"> <li>• Will the defect rate increase?</li> <li>• Will the finished product still comply with customer specifications?</li> <li>• Will the option affect the product cosmetically?</li> </ul>                                                                                                                                                                                                                                                                                                              |
| <b>Will this option be sustainable?</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>• What is the toxics use reduction potential of this option?</li> <li>• Will this option remain viable despite market and regulatory changes?</li> <li>• Is it flexible enough/durable enough for the firm's anticipated needs?</li> </ul>                                                                                                                                                                                                                                                           |

## 2. Economic Analysis

In addition to the technical evaluation, you must also conduct a thorough economic evaluation which includes:

- Gathering complete relevant cost information for current processes
- Estimating relevant cost for pollution prevention options

### a. Direct Costs

Direct Costs are those costs that are directly associated with a projects delivery, installation and operation. These include the following:

- *Capital expenditures:* costs of buildings, equipment, raw materials, utility connections, site preparation, installation, engineering and procurement.
- *Operation and maintenance expenses:* labor costs, disposal costs, transportation and storage associated with disposal, maintenance costs.

### b. Indirect and Hidden Costs

Indirect costs are those which are not directly associated with a production line, or product, such as the costs of administration, housekeeping, and general plant operation. Hidden regulatory costs are a type of indirect cost, and may include the costs of permitting and monitoring. These costs are frequently subsumed under the category of factory overheads.

### c. Sample Environmental Indirect Costs include:

- Spill/Leak Incident Reporting
- Monitoring
- Manifesting
- Right-To-Know Training
- Labeling
- Inspections
- Permitting
- Machine O & M
- Disposal Costs

- Laboratory and Other Analytical Fees
- Insurance
- Protective Equipment
- Labeling Supplies
- Chemical Use Fees/Taxes (i.e. TURA Fees)

d. Financial Analysis Techniques

The four most widely used analyses in capital budgeting practices are:

- Payback Period
- Accounting Rate of Return (unadjusted ROR)
- Net Present Value
- Internal Rate of Return (IRR)

A brief description of each is provide below:

**Payback Period** is the simplest calculation for evaluating capital investments. Payback refers to the investment/inflow ratio or the number of years over which the investment outlay will be recovered or paid back from the cash inflows resulting from the project. For example, a proposed \$1,200.00 investment with an estimated cash inflow of \$400.00 per year is as follows:

$$\text{Payback Period} = \frac{\text{Initial Investment Amount}}{\text{Expected Annual Savings}} = \frac{\$1,200.00}{400}$$

$$\text{Payback Period} = 3 \text{ years}$$

If the payback period is equal to or slightly less than the economic lifetime of the project, then the proposal is financially unacceptable. If the payback period is considerably less than the economic lifetime, then the project looks attractive.

Payback should be used only has a quick and unrefined appraisal. One disadvantage of payback period as a decision criterion that it gives no consideration to differences in the length of the estimated economic lives of various projects. Payback is useful for a preliminary assessment but should not be the sole method for evaluation.

**Accounting Rate of Return** (or unadjusted ROR), like payback period, does not incorporate the time value of money. The accounting rate of return (ROR) represents the ratio of annual net income (minus depreciation) over the initial investment amount. For example, a purchase of equipment involving \$2,100.00 in annual after-tax savings over its

five year lifetime and an initial investment of \$18,000.00 has the following ROR:

$$\text{Accounting ROR} = \frac{\$2,100.00}{\$18,000.00} = 11.67 \text{ percent}$$

If after tax annual savings over the five years is expected to be variable, then an average would be calculated and placed in the numerator. This is a simplistic method which makes use of readily available accounting information, but ignores the time value of money. In other words, cash inflows received at the end of the project's lifetime are valued the same as the inflows from the first years of its life. This calculation usually results in an understated return because it does not adjust for the present value of cash inflows.

Net present value (NPV) and internal rate of return (IRR) are referred to as discounted cash flow methods. Both analyses incorporate the concept of the time value of money - or that money received at different points in time cannot be compared directly to the initial capital investment or outflow.

**Net Present Value (NPV)** analysis renders an objective, undistorted view of the future returns from a project. The discount rate accounts for the timing of cash inflows and outflows.

Net present value is the difference between the present value of the cash inflows and the initial investment amount. To obtain a project's NPV, multiply each of the cash inflows over time by the appropriate discount factor. All of the discounted amounts for the inflows are summed up and subtracted from the initial investment amount.

For example: A proposed project will cost a plastics manufacturer \$9,000.00. This project, if implemented, will result in savings (cash inflows) of \$4,000.00 per year for the next three years. The company's cost of capital is 14%. The present value of the cash inflows can be compared to the initial investment amount by applying the appropriate discount factor.

|         | Year | Amount     | Discount Factor | Total PV   |
|---------|------|------------|-----------------|------------|
| Savings | 1    | \$4,000.00 | .877            | \$3,508.00 |
|         | 2    | \$4,000.00 | .769            | \$3,076.00 |
|         | 3    | \$4,000.00 | .675            | \$2,700.00 |

|                   |                       |            |      |              |
|-------------------|-----------------------|------------|------|--------------|
| Inflows           | Present Value of Cash |            |      | \$9,284.00   |
| Less Investment   | 0                     | \$9,000.00 | 1.00 | (\$9,000.00) |
| Net Present value |                       |            |      | \$284.00     |

The decision rule for NPV is that an investment is acceptable if the sum of the discounted cash flow is zero or more; if not, the proposal is financially unacceptable. The discount rate utilized in the calculation is the company's cost of capital (if known).

**Internal Rate of Return (IRR)** for an investment proposal is the discount rate that equates the present value of the expected cash outflows with the present value of the expected inflows. It is the balance point between the current outflow and the inflows over time.

Solving for the IRR involves an iterative procedure in which various discount rates are plugged in to find the rate at which the present value of the cash inflows equals the present value of the cash outflows.

The IRR of the project, once calculated, is compared to the company's required rate of return. A company's in-house rate of return for projects is referred to as a **hurdle rate**. Hurdle rates differ from company to company and depend on each company's underlying capital structure, financial strategies and investment priorities.

**The decision rule for IRR:**

If the IRR is greater than the company's hurdle rate, then the project is acceptable.

If the IRR is less than the company's hurdle rate, then the project is unacceptable.

IRRs and hurdle rates were popular as project evaluations in companies in the 1960s and 1970s. Currently, net present value is becoming the more widely used discounted cash flow method for a number of reasons related to the shortcomings of IRR.

**3. Selection of Options/Allocating Resources**

At this point in the process, you have assessed the technical and economic feasibility of the various pollution prevention options. In many cases, the decision to select a particular option may be straight forward. However, if you need further justification, you may want

to construct a matrix and rank each option based on your company's criteria.

A list of criteria and suggestions for scoring each are provided below:

**Future Liability:** Give a high score to an option that reduces liabilities associated with environmental issues.

**Toxic Chemical Use and Toxicity Reduction (Pollution Prevention):** Give high scores to options that reduce the quantity or toxicity of materials used in an operation. Options which do both receive the highest score.

**Health and Safety:** If options reduce the exposure level and toxicity of process materials for employees and the public, assign a high score.

**Input Costs:** Options that result in low input costs receive a high score.

**Extent Used in Industry:** Off-the-shelf technologies or other options already widely used in industry can be less expensive and more readily available, and receive a high score.

**Quality:** Options which maintain a high level of quality will be given a high score.

**Low Capital Cost:** Options that can be implemented with low capital outlays should receive high scores.

**Low Operating Cost:** Options with low operating costs, including low maintenance costs, should receive a high score.

**Ease of Implementation:** Operations requiring little additional employee training, minimal changes in operating procedure, readily available materials and equipment, reducing downtime, little impact on quality, and minimal research and development needs should be given high scores. If regulatory or delivery deadlines demand speedy implementation, these factors may be especially important, and perhaps should receive even greater scores.

**Operating Personnel:** Options which do not require additions or reductions in personnel, new training efforts and no changes in shifts and procedures should receive a high score.

**Level of Change Required:** Extensive changes may only be possible in a new facilities. Options which match a facility's ability to change will receive a high score.

**Local Supplier:** If transportation is a large element of supply costs or if laws require the use of specified products, options that reduce these costs should receive a high score.

**Worker Acceptance:** Options which can be introduced easily to employees and do not violate any contracts or understandings should receive a high score.

**Flexibility:** Options which are adaptable to changes in the product, the process, delivery deadlines, or raw materials, or to existing equipment or employee turnover should be highly scored.

#### 4. Measuring Progress in Pollution Prevention

Measuring progress in pollution prevention is important for a number of reasons:

- Feedback will help in making future pollution prevention decisions.
- Feedback will justify the work of pollution prevention team.

##### Measurement Methods

There are a number of different approaches to measuring pollution prevention progress.

**Descriptive** State what was done and the results of the change. This may include limited use of numerical descriptions. It is often used as part of a measurement method which does include numerical descriptions.

**Change in Quantity of Toxic Chemicals Released** This could be drawn directly from TRI reporting data. Comparisons could be made of year-to-year changes, corrected for production changes.

**Change in Chemical Generated** Using this measurement method assumes that you are able to monitor for that specific chemical in releases or wastes, as is done in stack or effluent monitoring.

**Process-Level Measurement** This goes a step further than the previous method, and is based on monitoring at the process level, or at steps in the process, for a specific chemical or release.

**Change in Quantity Used** As an overall means of measurement, this method is based on purchasing records. This method is more difficult to apply at the process level, and requires considerable monitoring and record keeping.

**No Control for Production Changes** The Act does not define pollution prevention progress as reductions resulting from changes in production. This is noted to highlight that a

decrease in production can affect measurement and can obscure accurate evaluation of implemented pollution prevention options.

**Control for Production Change** This is another approach, along with the descriptive method, which will probably be included in most measurement methods. Only in the case of complete use elimination would controlling for changes in production be irrelevant.

# WASTE AUDITING PROCEDURES

Schlegel Corporation  
Rochester, New York

## *Introduction*

---

Schlegel Corporation which employs approximately 500 people in its Rochester, New York facility manufactures decorative plastic trim, for the auto industry, brushes for copiers, and urethane foam products including weatherstripping for doors and windows. In the 1980s, Schlegel began recycling office wastes such as paper and cardboard by placing collection containers throughout the facility and contracting a local hauler to transport the collected recyclable material off-site. The program met with limited success and was viewed as an environmentally responsible disposal solution rather than a profit generating solution to a disposal problem.

In 1991, Monroe County passed its Resource laws requiring that businesses recycle paper, cardboard, plastic, and metal. Since Schlegel was already conducting a limited recycling program, they formalized and expanded their program to develop Schlegel's current Recycling Program. With this, Schlegel began their in-depth journey of studying the wastes generated on-site and opportunities to reduce the cost associated with its wastes.

## *Auditing Activities*

---

Schlegel formed its Recycling Committee in 1991 which consists of 8-12 people including management and production workers. Initially, Recycling Committee meetings were performed irregularly, however, since 1993 the committee has met every four to six weeks to discuss new waste reduction and recycling opportunities, as well as, obtain updates on current projects. Mr. Tracy L. Pope, Environmental and Safety Officer, and Mr. Stephen Hakes, Purchasing Agent, serve as champions for the committee and provide direction to the committee's activities and report progress to senior management.

To identify opportunities for a waste reduction and evaluate the progress of Schlegel's waste reduction program, the recycling committee conducts quarterly audits of the wastes generated on-site. The recycling committee is responsible for auditing waste products (i.e., glass, paper, cardboard, etc.). The quarterly audits include:

1. a visual inspection of recyclable containers to ensure that the materials are not intermixed;
2. the weighing of each recyclable container (or in the case of pallets, counting) prior to off-site shipment;
3. a summary of each quarter's shipment of materials;
4. a comparison of the previous quarter's results, noting and discussing any abnormalities, and presenting any ideas to further reduce waste.

The collected information is summarized on spreadsheets and presented to the Recycling Committee Champions. The Champions then compile a quarterly summary on all waste and recyclables generated on-site as well as projected cost savings. An example of a completed quarterly audit is attached.

During each Recycling Committee meeting, the group reviews:

- the status of the program;
- any new manufacturing processes and solid wastes generated by the process;
- new ways to reduce or reuse packaging from suppliers; and
- delegation of new projects.

Since 1992, through auditing procedures, Schlegel has expanded its recycling activities from typical office wastes to include:

- Sending their polypropylene plastic shavings to be recycled into pellets at Schlegel's Canadian facility and reused
- Changing pallet design to reduce raw material usage and encourage supplier reuse
- Storing polypropylene pellets in reusable and collapsible plastic containers wherever possible (this option already saved a significant amount of floor space)
- Substituted boxes with reusable plastic containers whenever possible
- Redesigned corrugated core to encourage reuse
- Repackage polyethylene liner rolls to reduce cardboard
- Recycle magnets from weather stripping scrap waste
- Sending scrap to the Red Cross to be recycled into products by overseas Russian Workers (product on hold)
- Purchasing of post-consumer office paper

### ***Employee Participation***

---

The biggest key to a successful program at Schlegel has been the employee participation. The recycling program has been well received. Employees are encouraged to give suggestions at all times.

Discussions with Mr. Tracy Pope indicated that strong employee participation involves employee awareness, constant reminders, and most importantly allowing employees to see the fruits of their labor. To promote employee awareness, Schlegel established a recycling bulletin board in the Fall of 1994. The recycling bulletin board is maintained by the Recycling Committee and posted materials include charts promoting Schlegel's recycling efforts, notes promoting office and home recycling, and any awards received through Schlegel's efforts.

### ***Employee Incentives***

---

Every year since 1993 Schlegel has provided its employees with an environmentally friendly gift, purchased with proceeds from waste reduction effects. The gifts acknowledge and thank employees for participating in the recycling program, as well as promote further waste reduction due to the environmentally friendly nature of the gifts.

Since 1993 the following gifts have been awarded to employees:

- |      |                                            |
|------|--------------------------------------------|
| 1993 | Cloth Lunch Bag (reduces paper bag wastes) |
| 1994 | Coffee Mug (reduces styrofoam cup wastes)  |
| 1995 | Plastic Thermos (reduces paper wastes)     |

In addition, to assist in the reduction of general refuse, the Schlegel cafeteria reduced beverage prices if the plastic reusable coffee mugs, presented as gifts in 1994, are used.

### ***Conclusions***

---

Through continuing auditing, employee participation and management support, the Schlegel Corporation has saved over \$400,000 in waste disposal costs since 1992 and has significantly reduced the amount of wastes required for off-site disposal.



## SCHLEGEL CORPORATION RECYCLING PROGRAM

| MATERIAL REUSED<br>ITEM/DESCRIPTION                                                                                                                                                                                                      | 1st Qtr     | 2nd Qtr      | 3rd Qtr     | 4th Qtr | Weight of<br>Material | Annual<br>Savings | Disposal<br>Avoidance | Total<br>Savings |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|--------------|-------------|---------|-----------------------|-------------------|-----------------------|------------------|
| <b>Pallets</b><br>All wooden pallets are sent off-site for sorting and reuse. Raw material suppliers have changed pallet size and stencil with Schlegel part numbers for reuse.                                                          | 850 PALLETS | 1100 PALLETS | 800 PALLETS | 700     | 138000                |                   | 4830                  |                  |
| <b>Return Empty Plastic Buckets</b><br>All materials received in plastic buckets are collected and sent off-site for recycling or returned to the vendor for reuse.                                                                      |             |              | 200 LBS     |         | 200                   |                   | 7                     |                  |
| <b>Wooden Packaging Boards</b><br>Boards which are used to divide up containers and materials are collected and returned to the vendor for reuse. EMI packaging end-caps, cores and the box the material comes in, polycarbonate spools. |             |              | 420 BDS     | 600 BDS | 1020                  |                   | 35                    |                  |
| <b>Metal 55-Gallon Drums</b><br>All 55-gal. drums are stored and sent to an off-site drum recycler or returned to the vendor for reuse.                                                                                                  |             | 1800         | 2000 LBS    | 2250    | 8050                  |                   | 210                   |                  |
| <b>Plastic Collapsible Gaylord Containers</b><br>These are collected and returned to the vendor for reuse.                                                                                                                               |             |              | 225 PC      | 213     | 438                   |                   | 15                    |                  |
| <b>TOTAL SAVINGS - MATERIAL REUSED</b>                                                                                                                                                                                                   |             |              |             |         |                       |                   |                       |                  |

| WASTE REDUCTION<br>ITEM/DESCRIPTION                                                                                                       | 1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr                    | Weight of<br>Material | Annual<br>Saved | Disposal<br>Avoidance | Total<br>Savings |
|-------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|----------------------------|-----------------------|-----------------|-----------------------|------------------|
| <b>Recycled Computer and Office Paper</b><br>Purchasing all computer paper with a minimum of 50% recycled content (Rochester and Canada). |         |         |         | 25 CTNS<br>(14,000 SHEETS) |                       |                 |                       |                  |
| <b>Reamless Copy Paper</b><br>Purchasing copy paper packaged in boxes as opposed to wrapped in 500-sheet bundles.                         |         |         |         |                            |                       |                 |                       |                  |
| <b>Product Rotation</b><br>Better inventory control of raw materials reduced the amount of waste material sent off-site for disposal.     |         |         |         |                            |                       |                 |                       |                  |
| <b>Purchase of Janitorial Chemicals</b><br>Purchase some chemicals in 55-gallon drums instead of 5-gallon pails                           |         |         |         |                            |                       |                 |                       |                  |
| <b>Use More Electronic Mail</b><br>Require the use of more electronic mail to reduce the number of paper reports and memos.               |         |         |         |                            |                       |                 |                       |                  |
| <b>TOTAL SAVINGS - WASTE REDUCTION</b>                                                                                                    |         |         |         |                            |                       |                 |                       |                  |

### SUMMARY

| ITEM/DESCRIPTION               | 1st Qtr | 2nd Qtr | 3rd Qtr | 4th Qtr | Weight of<br>Material | Annual<br>Saved | Disposal<br>Avoidance | Total<br>Savings |
|--------------------------------|---------|---------|---------|---------|-----------------------|-----------------|-----------------------|------------------|
| <b>TOTAL MATERIAL REUSED</b>   |         |         |         |         |                       |                 |                       |                  |
| <b>TOTAL WASTE REDUCTION</b>   |         |         |         |         |                       |                 |                       |                  |
| <b>TOTAL MATERIAL RECYCLED</b> |         |         |         |         |                       |                 |                       |                  |
| <b>GRAND TOTAL</b>             |         |         |         |         |                       |                 |                       |                  |

# WASTE AUDITING PROCEDURES

Columbia Presbyterian Medical Center  
New York, New York

## *Introduction*

---

The Columbia Presbyterian Medical Center includes a hospital and college located in an urban setting. The Medical Center employs 9,000, provides medical care for 800 to 900 people and services hospital visitors as well as ambulatory patients. In total, the Medical Center services approximately 15,000 people per day which generates a wide range of waste including medical waste, food waste, paper, cardboard, aluminum cans, linens, etc.

The Medical Center initiated a recycling program in the early 1990s by establishing a Recycling Committee and placing containers to collect and sort recyclables throughout the facility. After implementing the recycling program, the committee noted several shortcomings of the recycling program including:

- redundancy in the trash haulers (different haulers were handling the same waste stream);
- poor source segregation; and
- overcompensation for medical wastes.

## *Auditing Activities*

---

To address these shortcomings, Mr. Richard Parillo championed an audit of the Medical Center's wastes. Initially, a review of the facility's records was conducted to identify the facility's haulers, amount and type of waste disposed, and the cost of disposal. Once an overall understanding of the facility's waste was obtained, a trash sort was conducted to evaluate the type and amount of each waste item generated on-site.

First, the flow of waste through the facility was evaluated to determine the most representative containers to inspect. The Medical Center utilizes numerous two-cubic yard waste containers located throughout the facility to collect waste. These containers are transported to and emptied into trash compactors on a daily basis. Due to the size of the facility and the large number of containers, it was decided to review a representative number of waste containers. Each of the selected containers was emptied and each of the waste types within the container were identified and weighted.

The trash sort determined that:

- 70-80% of the material being handled as medical waste was solid waste;
- 50% of the solid waste stream was paper or cardboard; and
- little recycling was completed.

The audit findings were summarized and presented to the Medical Center Director of Environmental Services, whom upon review, granted approval to implement a program which included:

- conducting mini-seminars throughout the facility to educate employees about recycling and how it works;
- re-engineering the facility's disposal practices to remove solid waste from the medical waste stream and improve the collection of recyclable products;
- eliminating duplicate haulers;
- negotiating with haulers who receive payment for recyclable wastes;

- allowing City Harvest (a local food bank) to take excess cafeteria foods; and
- donating unused operating room equipment to the Remedy Program which sends the equipment to third world countries.

To highlight the effectiveness of this program, the amounts of waste generated and recycled, and the facility's waste disposal costs are provided below.

| Year        | Total Solid Waste Generated (lbs.) | Amount Recycled (in lbs.) | Amount of Solid Waste Disposed (lbs.) | Waste Disposal Cost |
|-------------|------------------------------------|---------------------------|---------------------------------------|---------------------|
| 1992        | 9,000,000                          | 42,000                    | 8,958,000                             | \$2,500,000         |
| 1993        | 9,000,000                          | 426,000                   | 8,574,000                             | \$2,100,000         |
| 1994        | 9,000,000                          | 1,200,000                 | 7,800,000                             | \$1,700,000         |
| 1995        | 9,000,000                          | 1,700,000                 | 7,300,000                             | \$1,300,000         |
| 1996        | 9,000,000*                         | 2,000,000*                | 7,000,000*                            | \$ 950,000*         |
| *Estimated. |                                    |                           |                                       |                     |

# New York State Department of Environmental Conservation

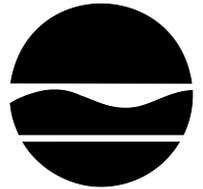
## Division of Solid and Hazardous Materials

Bureau of Solid Waste, Reduction and Recycling, 9<sup>th</sup> Floor

625 Broadway, Albany, New York 12233-7253

Phone: (518) 402-8705 • FAX: (518) 402-8681

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Alexander B. Grannis  
Commissioner

### ATTACHMENT 4 Joe Bruno Stadium Waste Audit July 21, 2008 12:00 - 2:15 pm

The Department of Environmental Conservation (DEC), Bureau of Solid Waste Reduction and Recycling (Bureau) was requested to evaluate Joe Bruno Stadium's (Stadium) recycling program. Staff conducted a waste audit on July 21, 2008.

#### **Participating in the Audit**

Staff from the Bureau conducted the audit. Several staff members are new and were brought along to observe and learn.

DEC staff - Jen Kruman, Gary Feinland, Betty Jo Daly, Debbie Jackson, Andrew Spink and Jeff Mapes.

Valley Cats staff - Vic Christopher, Assistant General Manager and Keith, Operations Manager

#### **Background**

The Stadium and the offices have been recycling since Spring 2006. Waste Management picks up their recyclables and waste every two to three games. DeCresente takes the deposit cans and bottles. The Valley Cats are recycling paper and cans and bottles in the offices and cans and bottles in the Stadium. They are also recycling corrugated cardboard. Recycling containers in the offices are a green bin and barrel with a cut round hole. Recycling containers in the Stadium are 95 gallon toters (Figure 1) with a round hole and are labeled (Figure 2). See Figure 3 for the locations of recycling and garbage cans in the Stadium.

At the time of the audit, a baseball game was in progress with approximately 4,000 people (mostly children for "Camp Day") in attendance. Keith indicated that attendance at many of the baseball games is approximately 4,000.

We separated the garbage into two categories, garbage and compostables. Most of the garbage was compostable - paper trays, paper cups, napkins and food waste. The non-compostable garbage consisted of plastic straws, forks, cups and lids; Styrofoam cups; snack bags; a few reusable water bottles and liquids.

The Stadium does not have garbage and recycling containers in the stands, which means a high percentage of garbage and recyclables are being collected and disposed of by the cleaning crews after the game. The deposit cans and bottles are separated out during the cleaning.

The office recycling program had one paper recycling bin located near the copier in the Ticket Office and a can and bottle recycling container in the main office. There are no desk side paper bins, just garbage cans and these garbage cans contained recyclable paper and cans and bottles.



Figure 1  
Recycling & Garbage Cans



Figure 2  
Recycling Sign on the toter

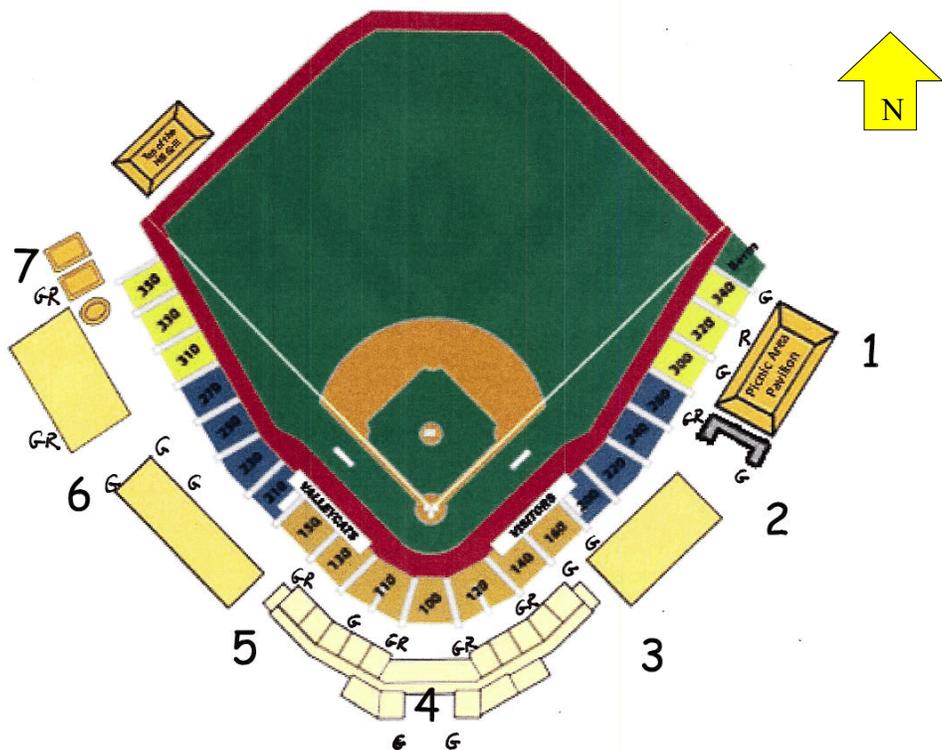


Figure 3

## Waste Audit

Several garbage cans and recycling containers in the Stadium and the offices were opened and the contents separated by material and weighed. Table 1 are the results from the Stadium recycling and garbage containers.

| <b>Table 1</b>                                 |                                             |                                      |                          |                |
|------------------------------------------------|---------------------------------------------|--------------------------------------|--------------------------|----------------|
| <b>Location</b>                                | <b>Number of Deposit Cans &amp; Bottles</b> | <b>Number of Non-Deposit Bottles</b> | <b>Compostables</b>      | <b>Garbage</b> |
| <b>Stadium</b>                                 |                                             |                                      |                          |                |
| Entrance (E & W)<br>(no recycling containers)  | 10                                          | 15                                   | 2 pounds                 | 17 pounds      |
| 4E -Recycling Container                        | 67                                          | 49                                   | -                        | 0.5 pound      |
| 4E - Garbage Can                               |                                             |                                      | 6 pounds                 | 4 pounds       |
| 4W - Recycling Container                       | 134                                         | 70                                   | -                        | -              |
| 4W - Garbage Can<br>(no recycling container)   | 1                                           | 2                                    | 0.25 pound               | 0.5 pound      |
| 3 - Garbage Can<br>(no recycling container)    | 4                                           | 2                                    | 2 pounds                 | 1 pound        |
| 2N - Recycling Container                       | 65                                          | 7                                    | -                        | -              |
| 2N - Garbage Can                               |                                             |                                      | 2.5 pounds               | 1 pound        |
| 2 - Garbage Can<br>(no recycling container)    | 5                                           | 4                                    | 9 pounds                 | 2 pounds       |
| Bathroom (Women's)<br>(no recycling container) | -                                           | -                                    | 4 pounds<br>paper towels | -              |

There are no garbage or recycling containers in the Stadium stands. It is estimated that there are 20 bags of garbage generated in the stands that are swept up after each game.

Table 2 are the results from the two offices; the Ticket Office and the Main Office.

| <b>Table 2</b>                   |                                                                                        |                                      |              |                                               |
|----------------------------------|----------------------------------------------------------------------------------------|--------------------------------------|--------------|-----------------------------------------------|
| <b>Location</b>                  | <b>Number of Deposit Cans &amp; Bottles</b>                                            | <b>Number of Non-Deposit Bottles</b> | <b>Paper</b> | <b>Garbage</b>                                |
| <b>Ticket Office</b>             |                                                                                        |                                      |              |                                               |
| Paper Recycling Container        | -                                                                                      | -                                    | 11 pounds    | -                                             |
| Garbage Can 1                    | 3                                                                                      | -                                    | 1.5 pounds   | 0.75 pounds                                   |
| Garbage Can 2                    | -                                                                                      | 1                                    | 0.25 pounds  | 1 pound                                       |
| Garbage Can 3 - Empty            |                                                                                        |                                      |              |                                               |
| <b>Main Office</b>               |                                                                                        |                                      |              |                                               |
| Can & Bottle Recycling Container | 10                                                                                     | 20                                   | -            | -                                             |
| Garbage Can                      | 1                                                                                      | 4                                    | 0.5 pounds   | 7 pounds - compostables<br>3 pounds - garbage |
| Desk Garbage Cans                | Visual inspection showed cans contained recyclable paper, cans and bottles and garbage |                                      |              |                                               |

### **Summary**

The Stadium recycling containers were well used. Most contained cans and bottles with little contamination. The most prevalent contamination were plastic cups. Recycling at large public events is not easy and the program in place is functioning pretty well. The areas that worked the best were locations that had both a garbage can and a recycling container. Adding more recycling containers (next to every garbage can) will help.

We separated out the compostable materials to give the Valley Cats an idea of how much they could further reduce their garbage generation if in the future they added composting to their program.

The office recycling program needs some tweaking. Desk side garbage cans contained recyclable paper and cans and bottles. Attached for your use is our STOP - Save That Office Paper booklet and a list of our other educational materials.

### **Recommendations for the Stadium**

1. There should be a recycling container next to every garbage can.
2. The sign on the recycling container top is a little confusing - too much detail. A simple sign that says

#### **Cans and Bottles Only**

#### **No Cups**

would work better. The signs should be on the top and the front of the container.

3. Announcements during the games to remind people to recycle would be beneficial.
4. Signs in the stands requesting fans to bring their garbage and recyclables to the nearest collection container. We realize that fans have always thrown their wastes under the seats but some gentle prodding to change their ways is a good thing.
5. Print materials for the fans on, at a minimum, 30 percent post consumer recycled content paper. Also, note on these materials that it is printed on \_\_\_ % post consumer recycled content paper.
6. Contracts with food service vendors should require the purchase of recycled content paper products and require the recycling of food preparation recyclables (cans, etc.)
7. Convert to air hand dryers for the restrooms.

### **Recommendations for the Offices**

1. Provide waste reduction, reuse and recycling information to all employees.
2. In the Ticket Office - remove two (2) garbage cans and add one more paper recycling bin.
3. Add a recycling container to the Ticket Office for cans and bottles.
4. In the main office, remove the desk side garbage cans. Have several larger garbage cans and several paper recycling containers in the common office area.
5. The offices should purchase at a minimum, 30 percent post consumer recycled content copy paper. Also, note on these materials that it is printed on \_\_\_ % post consumer recycled content paper.
6. Staff should be encouraged to make two-sided copies.
7. Recycled content paper towels, toilet paper and napkins should be purchased.

### **Additional Recommendations**

This was just a waste audit, but here are several suggestions to save energy (the Valley Cats may be doing some of these already):

1. Turn off computers and printers at the end of the day.
2. Convert to fluorescent lights.
3. Use low flow toilets.
4. Encourage staff to carpool.
5. Conduct an energy and water use audit.

If you have any questions, please call Debbie Jackson at (518) 402-8705.