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Order copies of the Tool Kit: Community Tools,
Participant Tools and Video by writing or calling:

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Solid Waste Policy & Programs Section
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Portland, OR 97204
Phone: (503) 229-5913, Fax: (503) 229-5830

Please specify whether you want the Community Tools,
Participant Tools or the video.

Note: Please contact the Public Affairs Office (503) 229-5317 (voice)
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Notes:

Introduction

Welcome to Resource Efficiency!

Welcome to an idea that can make your community a better place to live and work, and make your business more competitive and profitable. The idea is resource efficiency.

Resource efficiency means getting your job done by using energy, water, and materials as efficiently as possible. Whether you mill wood or serve meals, process medical claims, teach or assemble printers, you probably have opportunities to save money and help the environment.

In the big picture of Oregon's economy, recycling is a form of resource efficiency. But it's not the only example. Anything you send away for recycling is actually a discard, or a potential inefficiency — the resource efficiency only happens after the material leaves your facility, and displaces the use of raw natural resources.

Better examples of resource efficiency can be found at the point where resources are used in the first place. For example:

- A hospital in Portland saves \$9,200 and 175,000 pages of paper a year by not printing and sending daily financial reports to departments that don't read them.
- A 20-person insurance office in Corvallis cut its electricity bills 34 percent by simply installing brighter, more-efficient lights.
- A public library discovered it was overwatering its lawn and flower beds, and cut its outdoor use of water by 50 percent.

Resource efficiency is about: working smarter and returning the dividends to your community; a stronger, more competitive local economy; a healthy and sustainable environment; and that precious quality of life that makes Oregon such a special place to live.

What Does Resource Efficiency Have to do with My Quality of Life?

Consider the following:

1. **Competitiveness.** When a business redesigns a process to use fewer materials, it saves money. Those savings make the business more competitive in the regional and international economy.
2. **Efficient government.** Buying water and energy is not central to the purpose of our schools and public agencies. When expenses for these resources decrease, tax revenue is freed up to pay for more essential government programs, such as schools and emergency services.
3. **Community stability and prosperity.** Most money spent on energy and materials doesn't stay in your community. But the savings will! Keeping these savings in your community will free up money for family-level wages, stronger schools, economic diversification and job training, parks and other amenities.
4. **The environment.** Using fewer resources means less impact on the environment: less air and water pollution, acid rain and nuclear waste, fewer landfills, less impact on wildlife, less risk of widespread climate change, more resources for the future, and a healthier and more resilient environment.

5. **Fewer resource conflicts.** By being proactive in reducing our use of materials, energy, and water, we can reduce the kinds of conflicts between resource users that have troubled Oregon in recent years.

Notes:

How Do We Make Our Community More Resource Efficient?

An excellent approach to resource efficiency is to participate in the Oregon Department of Environmental Quality's (DEQ) Resource Efficient Model City Program — a voluntary, non-regulatory, community-based program.

The Resource Efficient Model City Program helps businesses and public facilities become more resource efficient. For a community to be successful it needs, at a minimum, the following:

- Businesses and public facilities willing to participate in resource assessments and implement recommended measures that are identified as being cost-effective.
- One or more service providers who can help the participants identify, evaluate, and implement specific material, energy, and water efficiency measures.
- A local program sponsor who helps to coordinate the program, including soliciting participants, coordinating the provision of material, energy, and water efficiency information and services, assisting the participants to implement resource efficiencies, and helping them to document and promote their successes.

Ready To Start? Grab Your Tool Kit!

To help your program begin, the DEQ has created this “tool kit.” The tools are based on the real-life experiences of businesses, schools, and public facilities here in Oregon. The tools are meant to supplement, not replace, a motivated program sponsor/coordinator and knowledgeable and experienced service providers. Some of the tools in the tool kit are described below.

Community Tools

These tools will help you to:

- **Organize a partnership** in your community to get the effort off to a sound start.
- **Identify goals** for your program.
- **Estimate costs** that your program might incur, and identify potential funding sources.
- **Promote your program** in your community.
- **Measure the impact** of the program on a community-wide scale.

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Participant Tools

These tools will help participants to:

- Secure the support of top management and involve co-workers throughout their organization.
- Identify baseline expenditures of resources, and set up resource accounting systems to monitor the costs and savings of new efficiency measures.
- Conduct self-assessments that result in “short-lists” of likely opportunities for resource efficiency in the areas of water, energy, and materials.
- Map out more complicated processes to identify inefficiencies which may be currently overlooked.
- Develop a resource efficiency plan.
- Obtain up-front capital and tax credits for specific types of resource efficiencies.

Case Studies

These will help your participants and the people who help them to identify some common opportunities for resource efficiency that have been implemented successfully by other businesses and public facilities.

Appendices

In this section, the tool kit contains additional resources specific to materials, energy, and water.

Video

A 12-minute video is available that introduces several examples of resource efficiency.

Additional Worksheets

Copies of worksheets are available in the rear notebook sleeve for use by Resource Efficiency Coordinators (REC) and participants.

Participant Tools: Overview

Notes:

These tools are intended to help a participant in the program identify, implement, and monitor resource efficiency measures. Most of the tools are designed to be used by a participant directly, or by a participant with the help of the program's Resource Efficiency Coordinator, who should be familiar with all of the tools and know how to apply those portions of those tools which are helpful on a case-by-case basis. In fact, some of the participant tools are pure discussion and information, and relevant portions can probably be relayed verbally to a participant by the Resource Efficiency Coordinator more quickly and efficiently than if a participant sat down and read the entire tool. The Resource Efficiency Coordinator may choose to provide participants with copies of some or all of these tools, depending on each participant's needs.

Please note that these tools are a supplement to, and not a replacement for, motivated and involved participants, knowledgeable service providers, and a Resource Efficiency Coordinator who can help the participant identify opportunities for resource efficiency and work through more technical and site-specific issues.

The tools are briefly described below, and are listed in the approximate order that a participant might use them.

- **Securing Management Support.** Without management support, most initiatives can struggle to succeed. This tool discusses strategies to obtain top management support for resource efficiency and provides sample company policy statements.
- **Involving Employees.** This tool suggests opportunities to involve co-workers in the resource efficiency efforts at your business or facility.
- **Whole Facility Assessment Overview.** This tool introduces the concept of the whole facility assessment, and serves as a springboard to jump to any one of the following eight participant self-assessment tools:
 - **Simple Energy Assessment.** This is a series of "yes-or-no" questions for a participant to ask itself about energy use. The questions are phrased so that any "yes" answer reveals a potential opportunity for energy conservation. The result is a "short list" of potential opportunities that can then be researched or explored further by the participant, Resource Efficiency Coordinator, or outside energy expert.
 - **Simple Water Assessment.** Using the same approach as the Simple Energy Assessment, above, this is a series of "yes-or-no" questions phrased so that any "yes" answer reveals a potential opportunity for water conservation.
 - **Simple Materials Assessment.** Again using the same approach as the energy and water assessments above, this series of "yes-or-no" questions is phrased to lead the participant to a short list of potential opportunities for waste prevention.
 - **Purchasing/Inputs Assessment.** This tool represents a different approach to looking at materials use than the Simple Materials Assessment tool. Using a participant-generated list of major material purchases and inputs, it leads the participant through a process of brainstorming creative solutions to use fewer materials.

Participant Tools: Overview

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- **Discards Assessment.** This tool takes the same approach as the Purchasing/Inputs Assessment, except it helps the participant ask questions about materials in the garbage and recycling containers in order to help identify opportunities for material efficiencies.
- **Customer Impact Assessment.** Structured the same as the previous two assessments, this tool helps the participant look for resource efficiencies in the products and packaging it sends to its customers.
- **Asking Dumb Questions.** This tool discusses the merits of “dumb questions”, and includes some sample dumb questions that can be used in any of the other assessment tools.
- **Process Mapping.** The last tool in the participant self-assessment series, this describes the steps involved in using process mapping as a method to identify opportunities for efficiencies, and includes some sample process maps.
- **Planning and Getting It Done.** Once assessments have been completed, and recommendations have been made, it is up to the individual participant to decide to implement resource efficiency measures. A plan is sometimes helpful to keep decisions and implementation responsibilities from being forgotten in the overwhelming noise of other work requirements. This tool will help participants to formalize a resource efficiency plan.
- **Financing and Funding.** For participants looking at capital investments with up-front expenses, this tool suggests strategies to obtain approval for the investments from whoever holds the company’s (or agency’s) purse strings, and lists potential sources of financing to sweeten the deal, including rebates and tax credits.
- **Accounting Terms and Concepts.** For individuals struggling to justify or understand the financial impact of a proposed resource efficiency measure, this tool explains and illustrates three accounting terms and concepts that may be useful: simple payback, return on investment, and net present value.
- **Resource Accounting.** This tool helps participants set up a system for measuring the resources they use, and the savings achieved through resource efficiency measures.
- **Participant Promotion.** For participants that want to toot their own horn, this tool suggests some strategies to consider and pitfalls to avoid.

These tools were prepared by the Oregon Department of Environmental Quality for your use. Revisions are planned to improve the usefulness of these tools. Input on how useful you found these tools to be, including recommendations for improvement, is very much appreciated. Please direct comments and any questions you may have about these tools to:

Jan Whitworth or Marti Roberts Pillon
Oregon Department of Environmental Quality
811 S.W. 6th Avenue
Portland used by: 97204
(503) 229-5913 or 1 (800) 452-4011

Securing Management Support

Notes:

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Helps you to understand the importance of making a company-wide commitment to resource efficiency.
- Provides strategies to obtain management support.
- Describes the purpose of a corporate resource efficiency policy or mission statement.
- Provides examples of corporate policies and mission statements.
- Suggests ways to communicate the company's commitment to resource efficiency to all staff.

What this tool does not do:

- Identify cost impacts of resource efficiency to help you obtain management support.

How to use this tool:

- Read the description on the following page.
- Review the sample material that follows.
- Determine the best method for your business to obtain management support and communicate to staff.
- Draft a corporate policy for your business.

Related information can be found in the following tools:

- Business Case Studies (Case Studies).
- Video.
- Involving Employees (Participant Tools).
- Financing and Funding (Participant Tools).

Sources: "Minnesota Waste Wise Guidebook," Minnesota Chamber of Commerce in partnership with the Minnesota Office of Environmental Assistance, and the Metropolitan Council; "Small Business Reduce, Reuse, and Recycling Arizona Guide," Small Business Reduce, Reuse, & Recycle Project, Phoenix, Arizona; "Working Your Way to a Green Office," Canada's Green Plan; "Businesses Guide for Reducing Solid Waste," United States Environmental Protection Agency; and various publications and statements of Nike, McDonald's, Hewlett-Packard, 3M, Xerox, and the Social Investment Forum.

Notes:

Make a Company-Wide Commitment to Resource Efficiency

A company-wide commitment is essential for developing a lasting and successful resource efficiency program. Both management and staff must place importance on the program. The combination of “top-down” and “bottom-up” activities generally leads to the greatest improvements.

Management Support

The first step in gaining company-wide commitment to resource efficiency is to secure the support of senior management. When an effort has the backing of management, it is much easier to get things done because both staff time and resources can be allocated to the program. Demonstrated management support also lets the staff know that resource efficiency is an important work responsibility. If you don't have management support, the following strategies may help you obtain it:

- Explain that the program will reduce the use of materials, energy, and water and reduce waste, thus increasing business efficiency by reducing operating costs. In addition, it will protect the environment.
- Provide examples from other businesses (your community's Resource Efficiency Coordinator can provide you with case studies from other Oregon businesses).
- Convey employee interest in environmental projects.
- Explain that customers are attracted by environmentally-conscious businesses.
- Offer information about how resource efficiency can save your company money.

At the outset of a program, an endorsement from company management is needed to help establish a resource efficiency team or program coordinator. Throughout the program, management can support resource efficiency efforts by endorsing the program goals and implementation, communicating the importance of resource efficiency within the company, guiding and sustaining the program, and encouraging and rewarding employee commitment and participation in the effort.

Corporate Policy or Mission Statement

A corporate policy or mission statement, done in cooperation with management and staff, gives importance to the resource efficiency program and defines the direction of the effort. It is also an effective way to communicate to both staff and customers the company's commitment to the program. A corporate policy or mission statement is effective whether it is short or more detailed. In general, the shorter and more concise, the better. Remember, it is critical to the program that senior management endorse the policy or statement. Once you establish the policy, be sure that everyone is aware of it.

A number of corporate environmental policies are included at the end of this tool. Also included are the Valdez Principles, a voluntary set of environmental principles created by the Coalition for Environmentally Responsible Economies (CERES), a project of the Social Investment Forum. While these sample policies may not apply completely to your business, you may want to refer to them as examples as you write your own policy or statement.

Communicate Your Commitment to Staff

Once you have obtained management support and have drafted or discussed a corporate policy or mission statement, present the resource efficiency program to the rest of the company. This is a good opportunity to get co-workers excited and generate some momentum behind the effort. It is also critical to building company-wide commitment to the program. The first step is an announcement from the president or senior management, demonstrating that the program has full management support and is a high priority for the company. The announcement should:

- Introduce employees to resource efficiency.
- Explain how resource efficiency can benefit both the company and the environment.
- Outline the design and implementation stages of the program.
- Offer the resource efficiency team leader or program coordinator's name and number and encourage staff to contact him or her with any ideas or suggestions.

To reduce paper, the announcement should be posted in a prominent place, circulated, or distributed through electronic or voice mail, if available.

Throughout the duration of the program, periodic communications (in the form of centrally posted memos or announcements, for example) can help maintain staff support. More details about how to communicate to staff is contained in the Involving Employees tool.

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Samples

Announcement Memo

To: All Staff

From: President or Senior Management

Subject: Resource Efficiency Program

(_____) will begin a resource efficiency program on (_____). The purpose of the program is to make better use of our natural resources by using materials, energy, and water more wisely, reducing waste, and by recycling. Throughout the coming months a number of efficiency programs will be introduced. Each program will be simple and will require few changes in your daily habits. In fact, you may not even notice some of the programs.

Last year, our company spent \$_____ on (energy, water, garbage service, paper, packaging, etc.). Any savings we can realize will help the environment and free up operating funds for more important uses such as (computers, employee bonuses, advertising, etc.). Ten percent of all savings over the next three years will be provided to (local charity), so your support will help the company, the community, and environment.

Securing Management Support

Notes:

In the coming weeks, we will receive resource evaluations from (utility name, state agency, local government, chamber of commerce, etc.). (program coordinator) will coordinate (_____)’s efforts. If you have any questions about this program, or if you have any ideas about how we can make less waste, use paper, packaging and other materials more efficiently, and/or save energy and water, please contact (program coordinator).

The success of this program depends on you. Please join us!

The Valdez Principles

Introduction

By adopting these principles, we publicly affirm our belief that corporations and their shareholders have direct responsibility for the environment. We believe that corporations must conduct their business as responsible stewards of the environment and seek profits only in a manner that leaves the Earth healthy and safe. We believe that corporations must not compromise the ability of future generations to sustain their needs.

We recognize this to be a long-term commitment to update our practices continually in light of advances in technology and new understandings in health and environmental science. We intend to make consistent, measurable progress in implementing these principles and to apply them wherever we operate throughout the world.

1. Protection of the Biosphere

We will minimize and strive to eliminate the release of any pollutant that may cause environmental damage to the air, water, or earth or its inhabitants. We will safeguard habitats in rivers, lakes, wetlands, coastal zones, and oceans and will minimize contributing to the greenhouse effect, depletion of the ozone layer, acid rain, and smog.

2. Sustainable Use of Natural Resources

We will make sustainable use of renewable natural resources such as water, soils, and forests. We will conserve nonrenewable natural resources through efficient use and careful planning. We will protect wildlife habitat, open spaces and wilderness, while preserving biodiversity.

3. Reduction and Disposal of Waste

We will minimize the creation of waste, especially hazardous waste, and wherever possible recycle materials. We will dispose of all wastes through safe and responsible methods.

4. Wise Use of Energy

We will make every effort to use environmentally safe and sustainable energy sources to meet our needs. We will invest in improved energy and conservation in our operations. We will maximize the energy efficiency of products we produce or sell.

5. Risk Reduction

We will minimize the environmental, health and safety risks to our employees and the communities in which we operate by employing safe technologies and operating procedures and by being constantly prepared for emergencies.

6. Marketing of Safe Products and Services

We will sell products or services that minimize adverse environmental impacts and that are safe as consumers commonly use them. We will inform consumers of the environmental impacts of our products or services.

7. Damage Compensation

We will take responsibility for any harm we cause to the environment by making every effort to fully restore the environment and to compensate those persons who are adversely affected.

8. Disclosure

We will disclose to our employees and to the public incidents relating to our operations that cause environmental harm or pose health or safety hazards. We will disclose potential environmental, health or safety hazards posed by our operations, and we will not take any action against employees who report any condition that creates a danger to the environment or poses health and safety hazards.

9. Environmental Directors and Managers

At least one member of the Board of Directors will be a person qualified to represent environmental interests. We will commit management resources to implement these Principles, including the funding of an office of vice president for environmental affairs or an equivalent executive position, reporting directly to the CEO, to monitor and report upon our implementation efforts.

10. Assessment and Annual Audit

We will conduct and make public an annual self-evaluation of our progress in implementing these Principles and in complying with all applicable laws and regulations throughout our worldwide operations. We will work toward the timely creation of independent environmental audit procedures which we will complete annually and make available to the public.

For more information on the Valdez Principles, contact CERES at 711 Atlantic Avenue, Boston, MA 02111, 617-451-3661 or 617-451-3252.

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Sample Environmental Statement: Hewlett-Packard

“Our Approach to Environmental Management*:

Hewlett-Packard conducts its business worldwide in an environmentally responsible manner. That means our operations have been designed to meet or exceed all applicable local, national, and international laws governing workplace safety and ecological protection. Our sites also adhere to HP’s own rigorous environmental management standards, ensuring sound practices where no regulations exist.

But Hewlett-Packard isn’t satisfied with just fulfilling our legal obligations. We also are working to incorporate sound environmental practices into our daily business decisions. Our long-term goal is to provide products and services that are environmentally sound from the day they are first developed to the end of their useful lives.

These principles guide us toward achieving that goal:

- Recognize that excellence in environmental performance is consistent with our corporate objectives and essential to our continued business success.
- Ensure that environmental policies, programs and performance standards are an integral part of our planning and decision-making processes.
- Regard sound environmental management as an integral part of our total quality commitment and apply the principles and practice of continuous improvement accordingly.
- Be open and responsive to the environmental expectations and concerns of our employees, customers, government agencies, and the public by providing clear and candid information about the environmental impact of our products, services, and operations.
- Design and construct our facilities to minimize waste generation and promote energy efficiency and ecosystem protection.
- Design our products and services and their associated manufacturing and distribution processes to be safe in their operation, minimize the use of hazardous materials, make efficient use of energy and other resources, and enable recycling and reuse.
- Pursue a strategy that substantially reduces or eliminates the generation of chemical and solid waste.
- Proactively address environmental contamination resulting from any HP operation.
- Foster environmental responsibility among our employees and encourage their initiative and involvement.
- Contribute constructively to the shaping of public policy based on sound business and scientific principles.
- Ensure our suppliers support our environmental management policy and encourage them to adopt similar principles.

*The term “Environmental Management” encompasses the areas of occupational health, safety, industrial hygiene, and ecological protection.”

Excerpted from “Hewlett-Packard’s Commitment to the Environment,” Copyright Hewlett-Packard Co. 1994.

Sample Policy Statement: McDonald's Corporation

“McDonald's believes it has a special responsibility to protect our environment for future generations. This responsibility is derived from our unique relationship with millions of consumers worldwide whose quality of life will be affected by our stewardship of the environment. We share their beliefs that the right to exist in an environment of clean air, clean earth, and clean water is fundamental and unwavering.

We realize that in today's world, a business leader must be an environmental leader as well. Hence, our determination to analyze every aspect of our business in terms of its impact on the environment, and to take actions beyond what is expected if they hold the prospect of leaving future generations an environmentally sound world.

We will lead, in both word and in deed. Our environmental commitment and behavior are guided by the following principles:

Effectively Manage Solid Waste. We are committed to taking a “total life cycle” approach to solid waste, examining ways of reducing materials used in production and packaging, and diverting as much waste as possible from the solid waste stream. We will follow three main courses of action: reduce, reuse, and recycle.

Reduce. We will take steps to reduce the weight and/or volume of packaging we use — eliminating packaging, adopting thinner and lighter packaging, changing manufacturing and distribution systems, adopting new technologies, or using alternative materials. We will continually search for materials that are environmentally preferable.”

Excerpted from “McDonald's Commitment to the Environment,” Copyright McDonald's Corporation 1994.

Sample Environmental Goals: NIKE

“Reduce NIKE's impact on the environment.

Share our efforts with our employees, consumers, business partners and competitors.

Focus our attention on the common ground where NIKE and the environment meet:

- NIKE Policy: research, develop and implement procedures that meet both the strictest environmental regulations of today and the foreseeable needs of the future. (compliance)
- NIKE Operations: minimize waste and conserve natural resources in facilities, while elevating the environmental awareness and actions of our employees.
- NIKE Products: address the environmental impact of each stage of our products' life cycle — from design to development to manufacturing to post consumer use (the Product Life Cycle).”

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Sample Environment, Health, and Safety Policy: Xerox Corporation

“Xerox Corporation is committed to the protection of the environment and the health and safety of its employees, customers and neighbors. This commitment is applied worldwide.

The following principles shall govern all business practices.

1. Protection of the environment and the health and safety of our employees, customers and neighbors from unacceptable risks takes priority over economic considerations and will not be compromised.
2. Xerox operations must be conducted in a manner that safeguards health, protects the environment, conserves resources, and minimizes risk of asset losses.
3. Xerox is committed to designing, manufacturing, distributing and marketing products and processes to optimize resource utilization and minimize environmental impact.
4. All Xerox operations and products are, at a minimum, in full compliance with applicable government requirements and Xerox standards.
5. Xerox is dedicated to continuous improvement of its performance in Environment, Health and Safety.”

Sample Environmental Policy: 3M Corporation

“3M will continue to recognize and exercise its responsibility to:

- Solve its own environmental pollution and conservation problems.
- Prevent pollution at the source wherever and whenever possible.
- Develop products that will have a minimal effect on the environment.
- Conserve natural resources through the use of reclamation and other appropriate methods.
- Assure that its facilities and products meet and sustain the regulation of all federal, state, and local environmental agencies.
- Assist, wherever possible, governmental agencies and other official organizations engaged in environmental activities.”

Involving Employees

Notes:

To be used by:

- Participants.

What this tool does:

- Helps you involve employees in the design and implementation of your program.
- Helps to educate employees about resource efficiency operational changes.
- Helps employees make resource efficiency an important part of their job.

How to use this tool:

- As you think about your program, think about how best to involve employees.
- Continue to use the tool after you have completed the initial program to ensure that efficiency becomes a part of everyone's job.

Related information can be found in the following tools:

- Securing Management Support.
- Whole Facility Assessment Tools.
- Asking Dumb Questions.

Notes:

Why Involve Employees?

No one knows how a business or organization works, or the materials and labor involved, better than the person who is doing the job every day. The employee is also the person who can tell you why a certain function or process is being done. Employees are key to making resource efficiency changes work.

But remember, employees will be resistant if they feel that looking for efficiencies and reducing waste means they are not already doing a good job. To encourage enthusiasm about the effort, reflect on the impact of the following messages:

Positive: “Resource costs are going up, let’s see if we can use our resources better and help the environment at the same time.”

Negative: “We are wasting money and resources and you need to look for efficiencies.”

Put together a list of opportunities before you begin to talk about the barriers. When you do talk about barriers, encourage people to think of them as challenges and think creatively about how they can be overcome.

It is wise to involve as many employees as possible, particularly when you are identifying potential opportunities for resource efficiencies. But beware of “death by committee.” When it is time to evaluate your options and make some decisions, a big team may slow things down. Generally, people show greater support for changes when they have been involved in the origination and implementation processes, but it may be more practical to have (or be) a “benevolent dictator” at times in order to move the process along.

Listed below are a number of ideas to get employees involved. There are no set rules. Create an atmosphere where people feel free to contribute their ideas.

Support From The Top

If there is one rule to follow, this is it. Employees know that supervisors, managers and top executives must support their efforts for changes to really happen. You have heard terms like “buy-in” and “ownership” and they make sense here. **If you want real change, the persons at the top must make a strong commitment and work to build the employees’ commitment.** That means encouraging employees to work as a team, supporting their ideas, showing the willingness to try new things and to take risks, recognizing their efforts and making the effort part of everyone’s day-to-day activities.

When To Involve Employees?

From day one. Changes happen faster when all employees are enthusiastic and involved as soon as possible in the process. Following are some ways to get and keep people involved:

- Hold an awareness session/event or send out an announcement to describe your program, to identify present efficiencies and the need to add new ones.
- Ask employees for their help to identify resource efficiencies.
- Use ongoing communication through staff meetings, e-mails, newsletters, or posted updates on what has been achieved. Support continued improvement.
- Promote awareness of general environmental issues.
- Select a team of people to review suggestions, develop a plan, and determine how best to implement it, monitor and institutionalize the effort.

Keeping Everyone Rolling

Education, recognition and motivation are key to maintaining participation.

Try some of the following:

- The first step is to identify processes that generate waste, or use materials, energy, and water inefficiently. Then estimate the annual volumes and communicate the numbers.
- Encourage employees to suggest what would motivate them.
- When employees are working hard to save resources and money, try to share some of the benefits. Provide awards and recognition.
- Make it part of everyone's job and make sure employees are allowed some dedicated work time.
- Develop policies to reinforce positive changes.
- Hold contests for the best suggestions and the most successful implementations.
- Put up displays and posters to make sure ideas are shared with others.
- Hold a resource efficiency event so employees and groups can demonstrate their ideas to other employees, customers or the community.
- Get used to saying "Great job, keep up the good work!"
- Remember not all ideas are successful, but be willing to keep looking.
- Publicly support what you and your employees are doing. Employees appreciate it when the company becomes known for its commitment to efficiencies and improving the environment.

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Develop a Team

Another approach is to create a core team of people who can carry the effort and message to others. The team is brought together to improve the quality of your products and the environment by focusing on needs and eliminating waste. Employees are in a position to drive improvement long before an auditor or customer ever identifies a problem. The best group is a diverse one. Try to include:

- People who know the system, the product or the process.
- Co-workers who work on related parts of the products (for example, procurement, marketing, shipping, billing, etc.).
- Someone within the organization that works in a different department.
- Others who have a “fresh eye” can come from a number of sources and can participate at different phases. They may assist in providing assessments, technical assistance, facilitating brainstorming or helping to find additional resources or expertise as needed. Some examples are:
 - Your community’s Resource Efficiency Coordinator.
 - Technical Assistance staff from DEQ, ODOE, Water Resources Department.
 - Utility Providers.
 - Someone within the community who is good at asking questions.
 - Others in the community that have participated in The Resource Efficiency Program.
 - Consultants that specialize in material, energy, water efficiencies or recycling.

The process begins by looking for “maybes.” A maybe is anything that could be an opportunity for energy, water, material use or recycling improvement. The Whole Facility Assessment tool is a good place to start (see the Participant Tools Overview for a list). Come up with a long list of possibilities. This is not the time to discourage or rule out ideas. Remember, you want a list of possibilities.

After the team evaluates the possibilities, then it can help develop a plan, educate and train other employees and figure out ways to monitor progress. As the program continues, you may want to rotate the members of the team to expand input and get new ideas.

It’s Part of The Job

In-house programs are often ineffective because it is easy for people to classify the activities as “not part of my job.” Allow resource efficiencies to be a part of every employee’s job description and performance evaluation.

- Make sure that employees are updated on progress. Use the Resource Accounting tool to help quantify progress.
- Resource efficiency should be a continuing process. Make this part of the way you do business and make a special effort to renew energy and enthusiasm annually.

Whole Facility Assessment Overview

Notes:

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

Provides an overview of the whole facility assessment approach, how it fits into a comprehensive resource efficiency program, and the various assessment tools that follow.

How to use this tool:

- Read the following information and select the assessment tools you want to use.
- Conduct assessments. All assessments should lead to recommendations and decisions. Assessments by themselves are not enough to get things done.

Related information can be found in these other participant tools (Check table of contents for page numbers):

- Securing Management Support.
- Involving Employees.
- Simple Energy Assessment.
- Simple Water Assessment.
- Simple Materials Assessment.
- Purchasing/Inputs Assessment.
- Discards Assessment.
- Customer Impact Assessment.
- Asking Dumb Questions.
- Process Mapping.
- Resource Accounting.

Notes:

Overview

Whether you manage or work for a business, school, non-profit organization, or public agency, finding more efficient ways to make products or deliver services is a day-to-day challenge. With tightening financial constraints and the increasing costs of acquiring the materials, products, energy and water to do business, organizations that work to upgrade efficiencies are organizations that are able to sustain and grow their operations.

One important link between healthy business, a healthy environment, and community quality of life is using resources wisely. To start you need to ask yourselves this simple question, “How can I make this product or provide this service with less material, energy, or water?” That’s resource efficiency — business and natural resources.

What’s a Whole Facility Assessment?

A whole facility assessment is a comprehensive look at the materials, energy, and water that enter your facility, how these resources are used, and finding opportunities to use these resources more wisely.

You’re not conducting an assessment just for the sake of an assessment — the result should be real changes in the way your facility uses resources. The table on the next page illustrates the steps in a whole facility assessment. The first step may be to identify how many resources you use, and how much you spend on them. The next steps are to conduct the assessments, using yourself, co-workers, some of the other tools in this tool kit, and outside experts. But completing the assessment is only half the work — the next steps are to make a plan for how you will implement these changes. Then make the changes, and monitor and evaluate the results.

Summary of Resource Efficiency Steps

Notes:

Resource Efficiency Step	Summary	Where to Go for More Information
<p>How many resources do you use and how much do they cost?</p>	<p>Knowing how much you spend on resources can help you focus your research on areas that may have the greatest opportunity for cost savings.</p>	<p>A discussion at the end of this tool presents a simple method of estimating how much you spend on resources.</p>
<p>How to find resource efficiencies: using employees and self-assessments.</p>	<p>No one knows your operation better than you and your employees. Management support is usually needed to change business operations. Wonderful results can happen when employees are involved in the search for efficiencies.</p>	<p>The Securing Management Support tool discusses strategies to obtain management support and provides sample company policy statements.</p> <p>The Involving Employees tool suggests opportunities to involve co-workers in your efforts.</p> <p>The Simple Energy Assessment, Simple Water Assessment, and Simple Materials Assessment tools are a series of “yes-or-no” questions phrased so that any “yes” answer reveals a potential opportunity for efficiencies.</p> <p>The Purchasing/Inputs Assessment, Discards Assessment, and Customer Impact Assessment tools guide you through the process of looking for inefficiencies in what you purchase, discard, and send/sell to customers.</p> <p>The Asking Dumb Questions tool discusses the merits of “dumb questions” and includes some sample questions that can be used throughout the assessment process.</p> <p>The Process Mapping tool describes the steps involved in using process mapping as a method to identify opportunities for efficiencies.</p> <p>You may gain inspiration, creativity, or ideas by reading what other businesses have done. Watch the video, review case studies of other businesses, and look at more extensive lists of conservation opportunities for energy, water, and materials. Your community’s Resource Efficiency Coordinator has copies of all of these materials.</p>

Whole Facility Assessment Overview

Notes:

Summary of Resource Efficiency Steps

Resource Efficiency Step	Summary	Where to Go for More Information
How to find resource efficiencies: using other sources of information.	By participating in this program, you have access to people and information sources who have experience with energy, water, and material efficiencies. Don't hesitate to call on them — they can help you identify opportunities you might overlook. Knowing in advance how to work with them can make your effort easier.	Your lighting, energy, plumbing, or landscaping contractors and suppliers may be able to provide you with information directly.
Evaluate opportunities	Evaluate the opportunities identified in the assessments. Can you implement them now? Do you need more information? If costs are involved, how much, and how will it be paid for? Whose operations could be impacted by this change? Who do you need to talk with?	Whoever will be involved in the efficiency measure can help evaluate it. This could include co-workers, suppliers and contractors (plumber, electrician, etc.). Other businesses with similar experience, or your utilities, community REC and/or local or state government may also be able to help.
Make a plan.	After you've identified and evaluated opportunities to use resources more efficiently, planning can be an efficient way to change. A plan can be an informal verbal agreement, or a structured, written document listing activities, timelines, and responsibilities.	The Planning and Getting It Done tool describes the planning process and provides a sample plan.

Summary of Resource Efficiency Steps

Notes:

Resource Efficiency Step	Summary	Where to Go for More Information
Action.	Some of the changes you identify will be simple changes, while others may require larger investments of time and money. How can you involve your co-workers to participate in new activities? What kind of funding is available for capital investments?	See the Involving Employees tool and the Financing and Funding tool.
Monitor and evaluate.	Now that you've made some changes, you might want to track the results. Are they working? Do they need to be fine-tuned? Are they saving (or costing) as much as expected?	The Resource Accounting tool contains simple guidelines for monitoring results, as well as sample worksheets. The Participant Promotion tool gives some ideas about promoting the results of your efforts to your customers.

Whole Facility Assessment Overview

Notes:

Some key points to remember as you conduct your whole facility assessment:

- Management must make it a priority to improve efficiencies.
- Pull together a diverse group of people to act as an efficiency team.
- Don't hesitate to bring in outside help (such as your community's Resource Efficiency Coordinator) to walk through your facility and lend a new eye to the way things are being done.
- Don't be afraid to ask dumb questions.
- Learn what other businesses have done. Your community's Resource Efficiency Coordinator can provide you with copies of case studies. There may be activities which can be directly copied in your facility, or it may get your creative juices flowing.
- Make a list of ideas and evaluate them against criteria such as cost, difficulty to change, etc.
- Research the ideas that look like they will save the most money and resources.

How Much Do You Spend on Resources?

Why do you want to know how much you're spending on resources?

- You will be able to decide where to start looking for efficiencies.
- You can see what you are actually spending money on, and how your bill is calculated.
- You can see if you are being billed for what you expected.
- In the future you will be able to measure the changes you have been able to make and plan for future efficiency measures.

Most importantly, after you've figured out how much you spend on resources, you can ask yourself "If I could reduce the amount of material I use, and reduce my costs of energy, water, and materials, is it worth the time and effort needed to participate in this resource efficiency program?"

Step 1). List the Resources You Use

Nearly all businesses use water and electricity. Some use natural gas or oil for heating. Most businesses dispose of garbage and waste water.

List the top two-through-ten materials that you use the most, or that cost you the most. For offices, this may be photocopy paper, envelopes, and continuous feed computer paper. For a food processor, it might be foods, barrels, plastic liners, pallets, plastic pails, gloves, gowns, and hairnets. A restaurant might purchase a lot of food, "to go" containers, and paper towels.

While listing major materials, don't overlook packaging and other materials that you send out to your customer. Are these a cost to you? Are they non-recyclable for your customer, or will they become your customers' wastes (these are called "transferred inefficiencies")? Reducing your customers' costs as well as your own can make your product more marketable.

Step 2). Get the Real Numbers

To get a clearer picture of where the water, energy, and material efficiencies can be found, it is helpful to gather real numbers on how much you spend and how much of these resources you are currently using. Since these costs can fluctuate, it is best to get at least a full year's worth of information. And since some resource uses are seasonal, it's a good idea to look at cost for each month.

You can do this by proceeding as follows:

- Obtain your billings for energy, water and garbage costs for the past year. If you can't reconstruct this information yourself you may be able to get the information by asking your electric utility, gas company, city water or water district and your garbage company.
- Review your purchasing records for the materials you identified in Step 1.
- Look at case studies to see what other businesses have discovered.
- Create a chart or graph with your actual annual costs and usage. In addition to cost, other information to track may include kWh (kilowatt-hours) of electricity, therms or Btu (British Thermal Units) of natural gas, gallons of fuel oil, hcf (hundred cubic feet) or gallons of water, pounds of material, cubic yards of dumpster capacity, etc.

Step 3) (optional). Refine Your Data

One year's data is the minimum amount you need to figure out how much you spend on resources. Acquiring and analyzing more data might tell you more, but it will also take more time. Here are some possible approaches to refining your data:

- Collect several years worth of data, broken out by month, if possible. Create a line graph of each resource use expense by month, or by year.
- Make a list of any factors that may have impacted the costs including:
 - Increase or decrease in business or operating hours
 - Increase or decrease in employees
 - Increase or decrease in energy, water or disposal rates
 - Changes in the materials used or their costs
 - Weather or climate
- Normalize your monthly data by accounting for any of the changes listed above.
- Recreate your line graph using constant dollars.

For more information, check out the Resource Accounting tool.

Notes:

Notes:

Simple Energy Assessment

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Helps you identify some possible opportunities for common energy efficiency measures that may be cost-effective by type of energy use (lighting, heating, etc.).

What this tool does not do:

- Identify all possible energy-efficiency measures.
- Identify how much energy your facility uses, where energy is used, or where the greatest potential for energy efficiency is to be found.
- Identify cost impacts of specific efficiency measures.
- Tell you which measures are appropriate for your site.

How to use this tool:

- Ask yourself the questions in the assessment. Take basic measurements, as indicated. Circle “Y” for yes or “N” for no for each question.
- For every question you answered “yes,” there may be an opportunity for energy efficiency. See the accompanying “Opportunity” note for that question.
- All of the questions you answered “yes” to can serve as a “short list” of potential opportunities. In the “notes” margin, write the next step (do it now, do it later, research it, call in the experts).
- For measures that don’t require additional study, go directly to implementation.
- For measures that do require additional study, determine what information you need in order to make a decision and where you will obtain the information. You may want to involve a lighting or heating, ventilation, and air conditioning (HVAC) contractor, your energy utilities, and/or your community’s Resource Efficiency Coordinator.
- Use the “Notes” column to keep track of any ideas or write down possible next steps.
- Find out if your building has had an energy assessment performed before. What were the results? What recommendations were and weren’t implemented, and why?

Additional information can be found in the following tools (Check table of contents for page numbers):

- Whole Facility Assessment Overview.
- Asking Dumb Questions.
- Planning and Getting It Done.
- Financing and Funding.
- Resource Accounting.

Sources: “Business Focus,” “Technology Focus,” and “Energy Guide for Oregon Grocers,” Oregon Department of Energy; various publications, Oregon State University Extension Service; “How to Reduce Your Energy Costs,” Portland General Electric and the Center for Information Sharing; “The Energy Finanswer,” Pacific Power; “Tips for Saving Energy in Small Businesses,” Maine Energy Conservation Division; “Community Energy Workbook,” Rocky Mountain Institute.

Notes:

Simple Energy Assessment

Notes:

Lighting Worksheet

Question	Answer	Opportunity
If you use fluorescent lamps, are they “T-12s”? (T-12 lamps are 1.5 inches (12/8) in diameter. T-8 lamps are skinnier, only 1 inch (8/8) in diameter.)	Y N	Changing to energy efficient T-8s and electronic ballasts can cut electricity use as much as 40%, while reducing flicker and improving color rendition. Since some T-8s are brighter than T-12s, you may also be able to save even more money and electricity by “delamping” (removing lamps from fixtures). Retrofit payback for a typical office is usually 1 to 4 years
If you use T-12s, are they 40-watt lamps? (The wattage is labeled on the lamp.)	Y N	Even without a retrofit to T-8s, T-12s are also available in 34 and 32 watts. These use 20% less energy and emit about 5 - 10% less light.
Are your fluorescent light fixtures covered with a bumpy, textured sheet of opaque plastic?	Y N	A grid reflector could replace the plastic sheet, and will direct more light down onto work areas, where light is needed, and direct less light onto walls and the ceiling. This may increase comfort, and may allow you to switch to a lower wattage lamp, or remove some lamps, without decreased light levels.
Do you use incandescent “screw-in” light bulbs?	Y N	Over its 10,000-hour life, one compact fluorescent can net you savings of \$7 (at electricity rates of \$0.05/kWh). Many compact fluorescents have the same yellowish “glow” associated with incandescent light bulbs.
Does your facility have recessed downlights (also called “can lights”)?	Y N	Conventional incandescent light bulbs and even flood lights in a recessed downlight are inefficient, because much of the light is trapped inside the fixture. Incandescent halogen lamps, or compact fluorescents with a reflector, are preferable for recessed downlights, since they use 20- 70 percent less energy.
Do you light parking lots, sidewalks, other outside areas, warehouses, gyms, or other large rooms, or use floodlights?	Y N	High intensity discharge (HID) lights, including metal halide and sodium, are more energy efficient than standard fluorescent lights.
Does your facility have warehouses or other areas with high ceilings?	Y N	Bringing lights closer to work areas may allow you to switch to a lower wattage lamp, with no loss of light level
Are your exit signs lit with incandescent bulbs?	Y N	When you go to replace your exit lights, use a LED or compact fluorescent replacement kit. Payback is typically 1 to 5 years, not including labor savings, and the compact fluorescents have a much longer life.

Lighting Worksheet (continued)

Notes:

Question	Answer	Opportunity
Has it been more than 2 years since your lighting fixtures were cleaned?	Y N	Dirt and dust can accumulate on lights and reflectors, reducing light levels up to 25%. Cleaning lights and fixtures every two years keeps light output high, and may allow you to change to lower wattage bulbs or delamp some lamps with no loss of light level.
Are lighting levels in your work areas bright?	Y N	Your facility may, in fact, be over-lit. You may be able to gradually delamp or retrofit with lower wattage lamps in some areas. Use a light meter to measure lighting levels at various work surfaces, and compare to standards that your utility or community's Resource Efficiency Coordinator can provide.
Do you have areas which are not used all of the time (closets, conference rooms, bathrooms, storage areas, etc.)?	Y N	Occupancy/motion sensors and/or crank timers may keep lights off when these areas are not in use.
Do you have work areas which are lit sometimes by natural light?	Y N	Day lighting controls, such as a photoelectric sensor, are available to turn lights on only when needed.
Are all lights on a floor or in a large area activated by one or two switches?	Y N	This means the entire area is lit, even if the entire area isn't being used. Rewiring lights to add more switches or motion or daylight sensors may be a cost-effective option.
When your facility is being cleaned, do cleaning staff turn on all of the lights?	Y N	If possible, ask them to light only the areas where they are working and turn off the lights when they leave.
Are lights left on when your building is unoccupied (evenings, weekends)?	Y N	Consider occupancy sensors or a 7-day, 24-hour timer/clock with an override mechanism.

Simple Energy Assessment

Notes:

Heating, Ventilation, and Air Conditioning (HVAC) Worksheet

Question	Answer	Opportunity
Is your facility unoccupied for 8 or more hours per week?	Y N	A programmable thermostat or energy management system will reduce heating and air conditioning bills during unoccupied times (nights/evenings, weekends, etc.)
Was your heating and/or air conditioning unit installed more than ten years ago?	Y N	Replacement with a high-efficiency heater, air conditioner or chiller may be cost-effective. An air economizer, that uses cool outside air to meet part of the cooling load, rather than recooling interior air, is another option.
Has it been more than 2 months since air filters were replaced?	Y N	Clogged air filters can reduce the efficiency of your HVAC system. Clean filters can improve indoor air quality and employee health. Check your owner's or maintenance guide or with your HVAC contractor for the recommended frequency to change filters.
Has it been more than 1 year since your HVAC system was professionally checked/adjusted?	Y N	A professional HVAC specialist can fine-tune HVAC systems to make them run more efficiently.
Is one thermostat used for each building or floor of your facility?	Y N	Zoned controls allow heating and cooling to be delivered to those areas that need it, rather than the entire floor or building.
Are only some areas of your facility connected to air conditioning?	Y N	Keeping doors between these and unconditioned areas shut will save energy.
Does your facility have a vestibule or "air lock" at any doors? Is this vestibule heated or cooled?	Y N	The air lock of two doors often provides much more comfort against outside air than heating or cooling the space between the doors. You may be able to stop heating or cooling that space without any loss of comfort to those inside.
Does your facility have a loading dock or other doors which are open for more than a few seconds?	Y N	A curtain of plastic strips or special "air curtain" system on the loading dock may protect against some heating/cooling loss. Swinging doors or an enclosed staging area are even more energy efficient.
When exterior doors are closed, can you feel a draft of cold or hot air from the outside?	Y N	A 1/8" crack between two doors has the same area as a hole the size of a fist. Weather-stripping can reduce heating and cooling loss.
Do employees complain about feeling cold near exterior walls and windows?	Y N	Caulking cracks, weather-stripping doors, and adding insulation or new windows may save energy and increase comfort.

Heating, Ventilation, and Air Conditioning (HVAC) Worksheet continued

Notes:

Question	Answer	Opportunity
Does your building use cooling towers?	Y N	During times of lower outdoor temperature, your cooling tower may be able to provide enough cold water to cool the building, allowing the chiller to be turned off. This is sometimes called “tower free cooling”.
Does your building use a chiller?	Y N	A “heat recovery chiller” may be an option. Heat extracted from the building by the chiller can be used for space or water heating.
Are there cracks or gaps where outside or rooftop equipment enters your building, such as electrical conduits or pipes? Are there cracks around doors, windows, and the foundation?	Y N	Caulking or sealing cracks may be cost-effective.
Is there insulation missing from exterior walls, ceilings, or floors?	Y N	Adding insulation may be cost-effective and make your building more comfortable.
Is there insulation missing from heating ducts and hot water pipes?	Y N	Adding insulation may be cost-effective.
Does your facility have single-pane windows (or skylights), or windows (or skylights) that were installed prior to 1965?	Y N	Retrofitting with high-efficiency windows or applying a reflective/solar window film may be cost-effective and make your building more comfortable.
Do employees ever complain of being hot in front of windows?	Y N	Solar/reflective films, awnings, and shade curtains may reduce your cooling bill and make your building more comfortable.
Place one thermometer each in the return grill and supply grill closest to the air handler. When heating or cooling equipment is operating, is the temperature change outside of the following ranges? <ul style="list-style-type: none"> • Gas Heat: +45° to +65° F • Air Conditioner: -17° to -20° F • Heat Pump only: +17° to +20° F 	Y N	You need to have your system inspected by an HVAC specialist.

Simple Energy Assessment

Notes:

Hot Water Worksheet

Question	Answer	Opportunity
If your water is heated by gas or oil, has it been more than 12 months since your water heater was inspected, cleaned, and tuned?	Y N	Fuel-fired water heaters waste energy if fuel is not burning properly.
If your water is heated by electricity, do you use more than 100 gallons of water a day?	Y N	Converting to natural gas may be more efficient.
Are your hot water heater, hot water tank, water or steam pipes missing insulation?	Y N	Adding insulation may be cost-effective.
Was your hot water heater installed prior to 1980?	Y N	Retrofitting with a high-efficiency heater may be cost-effective.
Is your facility an office or other type of building which is routinely closed for one or more days?	Y N	A 7-day time clock on your water heater and/or recirculating pump will reduce heating and stand-by losses.
Using a thermometer, is hot tap water at bathroom sinks hotter than 130 degrees Fahrenheit?	Y N	You may be overheating your water. Note that temperature requirements will be higher for laundry and dish washing.
Does your facility require two different temperatures of hot water (for example, hot water for hand washing and 180 degrees for dish washing)?	Y N	A hot water booster for the highest-temperature application may allow you to avoid overheating all water to meet the highest temperature requirement.
Does your facility use a commercial dishwasher?	Y N	You may be able to install a heat recovery unit to use waste heat from wastewater to pre-heat fresh water. Alternatively, a new energy efficient dishwasher may be cost-effective.
Do you use a boiler?	Y N	You may be able to cut boiler energy costs 5 to 15 percent by insulating bare steam pipes, repairing steam leaks, regularly tuning the boiler, reducing steam pressure, and setting the blowdown rate based on TDS (total dissolved solids) level. If your stack temperature is 400 degrees Fahrenheit or above, recovery of stack heat to pre-heat boiler feedwater or washdown water may also be cost-effective.

Hot Water Worksheet continued

Notes:

Question	Answer	Opportunity
Are drips, water stains or steam visible anywhere in your hot water distribution system?	Y N	Repairing leaks may be cost-effective.
Does your facility include showers? If so, use a bucket and stopwatch to measure flow rates.	Y N	Retrofit shower heads with a flow rate of 2.5 to 3.0 gallons per minute are almost always cost-effective.
Does your facility have restrooms or hand-washing sinks?	Y N	Self-closing and/or aerated hot water faucets are an option.
Do you have unused space on your roof and no buildings or shade trees to the south?	Y N	Solar hot water heating systems can supply part of your hot water requirements.

Simple Energy Assessment

Notes:

Refrigeration and Freezers Worksheet

Question	Answer	Opportunity
Remove access panels and look at the refrigerator coils. Are there significant amounts of dust?	Y N	Vacuuming coils will allow the refrigerator to operate using less energy.
Does your facility a) use more than 50 gallons of hot water per day, and b) have a refrigeration compressor larger than 1 horsepower that runs at least 12 hours per day, year round?	Y N	Recovering waste heat from the compressor for use in heating water may be cost-effective
Has it been more than 3 months since you checked the temperatures of your refrigerators and freezers?	Y N	Check actual temperature against health codes and any standards provided by your refrigeration contractor. You may be over-cooling.
Are refrigerators or freezer display cases “open air”?	Y N	Doors or windows to reduce cooling loss will most likely be cost-effective.
Are refrigerated products above the marked product load lines in display cases?	Y N	This may be forcing your refrigerators to waste energy.
Do you utilize door defoggers?	Y N	Consider turning defoggers off during times of low customer traffic.
Do you have a walk-in refrigerator or freezer?	Y N	Look for the following signs of energy inefficiency: ice on doors or walls; visible openings at seals or joints; lights not on timer; doors open for extended periods of time without air curtain.
Has it been 6 months or more since a professional serviced, tuned, or adjusted your refrigerators or freezers?	Y N	Keeping refrigeration units tuned will help conserve energy.
Are boxes, shelves, or other items stacked next to the refrigeration units?	Y N	These may be impeding air flow, forcing the refrigerator’s fans to work harder than necessary.
Is your refrigeration equipment water cooled?	Y N	You may have an opportunity to conserve energy and water through a heat recovery system.

Other Motors, Office Equipment, Irrigation, etc. Worksheet

Notes:

Question	Answer	Opportunity
As motors wear out, do you rewind them?	Y N	Rewinding motors reduces their efficiency. It is often more cost-effective to replace them with new high-efficiency motors.
Do you have motors larger than 5 horsepower used for fans and pumps?	Y N	Variable speed drives control the speed of the motor to match its loading requirements, thus saving energy.
Does your facility have any large exhaust hoods, such as over a grill?	Y N	Rather than exhausting 100 percent conditioned air to the outside, it may be more cost-effective to mix conditioned and unconditioned (outside) air in the exhaust hood.
Do you use air compressors?	Y N	Checking for leaks can be very cost-effective.
Are you purchasing computers, printers, fax machines or monitors in the near future?	Y N	Look for products with "Energy Star" certification.
Do you have laser printers that are infrequently used?	Y N	Unless they have a "standby" option or are "Energy Star" rated, it is typically more cost-effective over the typical life of a laser printer to turn it off between print jobs unless you are printing regularly.
Do you irrigate?	Y N	Consider the following energy saving improvements: replace worn or inefficient pumps; convert to low pressure systems; install pressure compensating equipment on hilly ground; convert to drip irrigation; install a gravity-fed system; install a water-management system.

Notes:

Simple Water Assessment

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Helps you identify some possible cost-effective opportunities for common water efficiency measures by type of water use (restrooms, kitchens, landscaping, cooling, etc.).

What this tool does not do:

- Identify all possible water efficiency measures.
- Identify how much water your facility uses, where water is used, or where the greatest potential for water efficiency is to be found.
- Identify cost impacts of specific efficiency measures.
- Tell you which measures are appropriate for your site.

How to use this tool:

- Ask yourself the questions in the assessment. Circle “Y” for yes or “N” for no for each question.
- For every question you answered “yes”, there may be an opportunity for water efficiency. See the accompanying “Opportunity” note for that question.
- All of the questions that you answered “yes” to can serve as a “short list” of potential opportunities. In the “notes” margin, write the next step (do it now, do it later, research it, call in the experts).
- For measures which don’t require additional study, go directly to implementation.
- For measures which do require additional study, determine what information you need in order to make a decision, and where you will obtain that information. You may want to involve your plumber, irrigation/landscaping contractor, HVAC contractor, water utility, and/or your community Resource Efficiency Coordinator.
- Use the “notes” margin to keep track of any ideas or write down next steps.

Additional information can be found in the following sections:

- Whole Facility Assessment Overview.
- Asking Dumb Questions.
- Planning and Getting It Done.
- Financing and Funding.
- Resource Accounting and Measurement.

Sources: “Water Efficiency Guide for Business Managers and Facility Engineers,” California Department of Water Resources; “Save Some for Tomorrow Water Conservation” fact sheets, Los Angeles Department of Water and Power; “Water Saving Ideas for Business & Industry,” Texas Water Development Board; “Helping Businesses Manage Water Use,” American Water Works Association; “Water Conservation Guide(s) for Hotels & Motels/New Construction/Computer & Electronics Manufacturers/Printed Circuit Board Manufacturers/Cooling Towers/Hospitals,” City of San Jose Environmental Services Department.

Restrooms Worksheet

Notes:

Question	Answer	Opportunity
Were toilets installed prior to 1993?	Y N	<p>All new toilets installed beginning in 1992 are ultra low flush (ULF) toilets that use 1.6 gallons per flush. Older toilets use 3 to 7 gallons per flush. A retrofit to a ULF toilet may be cost effective if toilet use (and thus water use) is high, and your facility is billed for water and waste water fees.</p> <p>If you choose not to replace toilets with ULF models, there are some low-cost opportunities to reduce water use, although these are less effective. You can reduce the use of water by installing valve replacements or displacement devices (If your toilets have tanks, use bags or dams; don't use bricks, as they deteriorate).</p> <p>If your toilets have flushometer valves (tankless), flushometer retrofit kits are available that reduce consumption by about 1 gallon per flush.</p>
Has it been more than 6 months since you tested your tank toilets for leaks?	Y N	Put 10 drops of food coloring in the tank and wait 10 minutes. Color will appear in the toilet bowl if a leak exists.
Does your facility have urinals installed prior to 1993?	Y N	Flushometer kits are available that reduce consumption by about .5 gallons per flush.
Are your facility's toilets set to flush at regular intervals?	Y N	Consider disabling this device, or installing a time clock so that they don't flush during hours when the facility is not in use.
Does your facility have showers?	Y N	Low flow shower heads and on-off interrupters are a low-cost method to reduce your energy, water, and waste water bills.
Do your faucets have threaded nozzles?	Y N	Low flow faucet aerators are a low-cost, easy to install method to reduce your energy, water, and wastewater bills.

Simple Water Assessment

Notes:

Kitchens Worksheet

Question	Answer	Opportunity
Does your kitchen have a commercial dishwasher?	Y N	<p>Several water-saving options may exist:</p> <p>Recirculate rinse water to the initial wash cycle.</p> <p>Recirculate rinse water to the garbage disposal.</p> <p>Wash full loads only.</p> <p>Check flow rates and reduce them if higher than the manufacturer's specifications.</p> <p>Be sure that the flow of water through the dishwasher stops when the flow of items being washed stops.</p> <p>Replace spray heads to reduce water flow.</p> <p>Turn dishwasher off when not in use.</p>
Are you planning to replace the dishwasher?	Y N	Newer high-efficiency models can save you money on energy, water, and waste water bills.
Does your kitchen use a commercial garbage disposal?	Y N	<p>Several water-saving options may exist:</p> <p>Use rinse water from the dishwasher.</p> <p>Reduce water flow rate to the disposal.</p> <p>Turn off water flow when disposal motor is turned off. Use a solenoid valve for water supply lines to both the bowl and the grinding chamber.</p> <p>Replace the disposal with a garbage strainer.</p> <p>Scrape food into barrels.</p>
Does your facility have water-cooled ice machines?	Y N	Air cooled ice machines will use less water (but may use more energy). If you choose to stay with the water-cooled ice machine, check flow rates (at the drain) and reduce using a flow restrictor if flow is higher than manufacturer's specifications. Also, be sure that cooling water shuts off when the compressor isn't running.
Are there sinks used for washing produce, dishes, and hands?	Y N	<p>Consider installing faucet aerators, "closing" faucet aerators, or hand-held spray nozzles unless large, fast flows of water are needed.</p> <p>Higher pressure water will perform the same job, and reduce water and energy bills.</p>
Does your facility have coffee, milk, or soda dispensers with drain trays?	Y N	Consider turning off the continuous flow used to rinse the drain trays.

Landscaping Worksheet

Notes:

Question	Answer	Opportunity
Does water from irrigation run off onto streets, parking lots, or storm drains?	Y N	Soil is saturated and watering time should be shortened and/or sprinklers adjusted. Soil may also be compacted; aerate lawn areas and till or loosen planting beds.
Do you use an automatic sprinkler system?	Y N	<p>Consider installing automatic soil moisture overrides.</p> <p>Check to see if spray heads are delivering water to sidewalks, walls, parking lots, or other non-landscaped surfaces.</p> <p>Check to see if spray heads overlap; you may be over watering some areas in order to deliver enough water to all areas. Consider realigning sprinkler heads.</p> <p>Consider putting turf and shrub areas, varying exposures, and sloped and flat areas on separate zones (valves), allowing you to water each area according to its needs.</p> <p>Clean sprinkler heads periodically to remove mineral deposits (if you are in an area with hard water).</p> <p>Inspect the system for leaks in pipes, couplings, and faucets.</p> <p>Adjust sprinkler timing cycles with the seasons.</p>
Are your irrigation timers set by guesswork?	Y N	You may be over watering, and inflating your water and waste water bills. Try reducing irrigation times and/or frequency, or consult with a landscape architect.
Do you water during the day?	Y N	Watering early in the morning or around sunset will reduce evaporation loss. Morning is preferred for plant health.
At the time you normally begin irrigating, dig a hole or stick a probe an inch into the soil. Is it damp?	Y N	You may not need to water again until the top inch is dry.
Do you have small, oddly sized pieces of turf grass?	Y N	Turf typically requires more water than other types of landscaping. Small, odd sizes are extremely difficult to water efficiently. Consider replacing the turf with landscaping that is more tolerant of drier soils.
Do you have large areas of turf grass or non-native flowers and shrubs?	Y N	Consider reducing the area of turf and landscaping with native plants. This can reduce water consumption, fertilizer, herbicide, and pesticide use, and provide food and shelter for native song birds.

Simple Water Assessment

Notes:

Landscaping Worksheet continued

Question	Answer	Opportunity
Do you have beds of shrubs and trees?	Y N	Drip irrigation will deliver water more efficiently than spray nozzles or sprinklers.
Is the soil around shrubs, flowers and trees bare?	Y N	Two to three inches of mulch will help to conserve water (reducing irrigation needs) and reduce weed growth, erosion, and soil loss.

Cooling Towers/Evaporative Coolers Worksheet

Notes:

Question	Answer	Opportunity
Do you have a cooling tower?	Y N	<p>Measure or estimate the cycle of concentration, which is defined as the volume of makeup water divided by the volume of bleed-off water. You can do this by measuring water flows or by using a conductivity meter. The lower the cycle of concentration, the less efficiently the cooling tower uses water. Higher cycles of concentration reduce water use. For example, for a 500-ton cooling tower operating at 60 percent capacity for 365 days a year, increasing the concentration ratio from 2 to 4 will save 2.5 million gallons of water a year.</p> <p>Methods to achieve higher cycles of concentration include:</p> <p>Control bleed-off based on conductivity by allowing bleed-off within a high and narrow conductivity range, or set the bleed-off timer for a short duration.</p> <p>Implement measures to remove or compensate for minerals which may form scale.</p> <p>Consider alternative water treatment technologies, such as softening of make-up water, side stream filtration, sulfuric acid treatment, and ozonation.</p>
Has it been more than 6 months since float controls for makeup water were checked?	Y N	Check for stuck float controls, a common problem.
Do you work with chemical service vendors to maintain your cooling tower?	Y N	<p>Prepare performance specifications, or consider purchasing dry chemicals and adding them to the water yourself. Require potential chemical vendors to:</p> <p>Submit projections of quantities and costs of treatment chemicals and volumes of bleed-off water.</p> <p>Comply with the performance specifications and commit to a predetermined level of water efficiency based on projections of water use, chemical use, and costs.</p> <p>Demonstrate competence and references in water conservation options.</p>
Can you recover blowdown water for lower grade, non-potable applications (such as landscaping)?	Y N	Blowdown water is not potable.

Simple Water Assessment

Notes:

Boilers, Hot Water and Steam Worksheet

Question	Answer	Opportunity
Has it been more than 12 months since your steam traps and lines were checked for leaks?	Y N	Worn traps allow steam to escape, wasting energy and water.
Does your steam system have continuous blowdown?	Y N	Check to make sure that excessive water is not being discharged. Consider conductivity meters and controls so that blowdown is limited to meet water quality requirements.
Has it been more than six months since your boiler has been tuned and inspected for proper operation?	Y N	Regular maintenance can cut energy and water bills.
Does your facility have large losses of steam?	Y N	Consider recovering steam condensate and recycle it to boiler make-up water.

Equipment Cooling Worksheet

Question	Answer	Opportunity
<p>Do you use single-pass cooling (where water is used to cool equipment one time and then sent to the wastewater system)?</p> <p>Note: common uses of single-pass cooling include degreasers, hydraulic equipment, x-ray equipment, condensers, air conditioners, air compressors, welding machines, and vacuum pumps.</p>	Y N	Investigate closed-loop cooling systems. Alternatively, reuse water elsewhere, if water quality is good enough. Consider reusing water as make-up water for other equipment, or for irrigation. If water has been heated, consider using for warm/hot water applications (boiler make-up water, etc.) Also, consider air-cooled equipment. But beware of cost and resource trade-offs between energy and water.
Are your cooling systems non-contact?	Y N	Investigate using reclaimed or non-potable water, if appropriate. Alternatively, use potable water and then reclaim it as make-up water for boilers, equipment washing, etc.

Rinsing and Washing (Products, Laundry and Custodial) Worksheet

Notes:

Question	Answer	Opportunity
Do you use spray nozzles to rinse equipment and/or to perform custodial work (washing cars, sidewalks, etc.)?	Y N	High pressure, low volume nozzles can rinse more effectively and use less water. For stationary nozzles, make sure spray is directed appropriately. Use spring-loaded shut-off nozzles on all hoses.
Do you wash floors, sidewalks, driveways, etc.?	Y N	Consider a wet sweep instead, or use secondary/reclaimed water, if appropriate.
Are your windows washed on a regular schedule?	Y N	Review schedule for appropriateness. Consider switching to on-call service.
Will you have your facility's carpets cleaned soon?	Y N	Consider using dry powder methods rather than wet or steam carpet cleaning.
Do you operate a commercial laundry?	Y N	Several options to consider: Replace conventional washer-extractor with a continuous-batch washer. Be sure to wash full loads only. Install a rinse water reclamation system to divert rinse water to a storage tank for use as wash water. If you work with a chemical service vendor, require them to submit projections of quantities of water consumption and costs of treatment detergents and chemicals as part of their proposal. All of these steps will save water. Some will save energy, too.
Do you rinse products?	Y N	Consider the following water-conservation measures: Counter-current rinsing, or counter-current rinsing with a preliminary static tank ("still rinse" or "dead rinse"). Using measured amounts of water rather than continuous streams. Using timers and conductivity controllers to control make-up water in rinses. Batch processing. Using spray rinsers, particularly for parts with small holes and cup shapes. Recycling clean rinse water for washing. Using treated waste water from other processes.

Simple Water Assessment

Notes:

Other Worksheet

Question	Answer	Opportunity
Has it been more than 1 year since you checked your facility for water leaks?	Y N	At a time when the facility is shut down and no water is in use, track the water meter for several hours to determine if there may be leaks.
Is water pressure higher than 60 psi (pounds per square inch)?	Y N	Install pressure reducing valves to reduce pressures to 60 psi, unless using specialized equipment that requires higher pressures.
Can you identify one or more pieces of equipment which are your most significant users of water?	Y N	<p>In addition to asking yourself questions in the previous pages, also consider:</p> <p>Measure actual water flow to equipment and compare it against specifications. Install flow reduction or flow control compensating devices.</p> <p>Install a timer, switch, or solenoidal valve so that water only flows to the equipment when the equipment is operating.</p>

Simple Materials Assessment

Notes:

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Helps identify possible waste reduction opportunities that could save money.

What this tool does not do:

- Identify possible waste reduction measures.
- Identify how much waste your facility produces, where waste is produced, or where the greatest potential for waste reduction exists.
- Identify cost impacts of specific waste reduction measures.
- Tell you which measures are appropriate for your site.

How to use this tool:

- Ask yourself the questions in the assessment. Circle “Y” for yes or “N” for no as appropriate for each question.
- For every question you answered “yes,” there may be an opportunity to reduce waste. See the accompanying “Opportunity” note for that question.
- All of the questions that you answer “yes” to can serve as a short list of potential opportunities. In the “notes” margin, write the next step (do it now, do it later, research it, call in the experts).
- For measures that don’t require additional study, go directly to implementation.
- For measures that do require additional study, determine what information you need to make a decision and where you will obtain that information. You may want to involve your suppliers, garbage, and recycling companies, and/or your community’s Resource Efficiency Coordinator.
- Use the “Notes” column to keep track of any ideas or write down next steps.
- Don’t conclude your materials assessment with this tool. As noted above, go on to the Purchasing/Inputs Assessment, Discards Assessment, and Customer Impact Assessment.

Additional information can be found in the following tools:

- Whole Facility Assessment Overview.
- Asking Dumb Questions.
- Purchasing/Inputs Assessment.
- Discards Assessment.
- Customer Impact Assessment.
- Process Mapping.
- Planning and Getting It Done.
- Financing and Funding.
- Resource Accounting.

Simple Materials Assessment

Notes:

Office Areas Worksheet

Question	Answer	Opportunity
When you write a document using a computer, do you print out several drafts to edit before producing the final copy?	Y N	You can reduce the amount of paper you use by proofing documents on the computer screen before printing, and storing final documents on disk rather than making hard copies.
Do many people in your company use computers?	Y N	Consider developing a computer "conservation tips" card to help people use their computers effectively.
Does your computer printer discharge an extra sheet of paper before each print job?	Y N	Check the printer manual to determine how to eliminate the extra sheet of paper. If your manual does not address the issue, call the manufacturer.
Are the documents produced by your computer printer single-sided?	Y N	Many printers now have double-sided printing capabilities. Set double-sided printing as default. Next time you buy a new printer, look for this feature. If your printer does not double-side documents, you may be able to do it manually.
Do you purchase new printer toner cartridges?	Y N	Recharge old cartridges instead of buying new ones. There are many qualified companies that will take back used cartridges and sell recharged cartridges at a lower cost than new cartridges. Be sure to ask companies that sell recharged cartridges for references so you can check the quality of their service.
Are most of your photocopies single-sided?	Y N	Many copy machines have a built-in duplex mechanism that makes copying on both sides easy. If your copier doesn't have this feature, you can still do it manually. The reduction in the amount of paper you purchase may well be worth the extra time it may take. You'll also save filing space.
Do you usually use new paper for drafts and non-essential documents?	Y N	The clean side of discarded sheets of paper can be used for draft documents (you might want to mark a slash or X on the printed side to avoid confusion). Fill the second tray of your copier with used paper so it can be selected easily. Review "A Draft Printer System Can Save You Money" in the appendix.
Do you have a central copy center or send projects out to a print shop for copies?	Y N	Require your central copy center to make all copies double-sided unless otherwise specified or request double-sided copying for all jobs sent to a print shop.
Do you use a facsimile (fax) machine?	Y N	Reduce or eliminate the cover page by designing it to be as small as possible and still leave room for a message, or purchase a stamp to use on the first page of the fax to convey transmittal information when a message is not necessary.

Office Areas Worksheet continued

Notes:

Question	Answer	Opportunity
Does your office need a central filing system to eliminate duplicate files?	Y N	Save paper and space in your office by using or creating a central filing system instead of maintaining duplicate personal files.
Do you send sales materials (brochures, etc.) to customers?	Y N	Cut your printing costs and help your customers reduce waste by keeping your mailing list current. Frequently check distribution lists for customers who have moved, changed address, or no longer need your information.
Do you receive newspapers or other publications?	Y N	Regularly review subscriptions and circulation lists and ensure that they are accurate and still appropriate. Also, ask your co-workers who subscribe to the same publication if they would be willing to reduce to one subscription and circulate the copy.
Do you have electronic mail?	Y N	Use the electronic mail system to send messages whenever possible instead of written memos.
Does your company use carbonless forms?	Y N	Evaluate whether forms can be condensed, consolidated, or reduced in size (e.g., triplicate to duplicate).
Does your business purchase new note pads and phone message pads?	Y N	Keep discarded sheets of paper that still have one clean side for note and phone message pads. Many print shops will cut the paper and glue one end together at a fraction of the cost of new note pads.
Do you purchase file folders?	Y N	File folders can be easily reused by turning them inside-out or by covering the tab with an adhesive label.
Are there letters, memos, and drafts of reports in your office's trash cans?	Y N	Set up or expand the paper recycling program at your business. Many types of paper are now accepted for recycling, such as envelopes, fax paper, and magazines. Check with your local recycling depot, recycling company, garbage hauler, or city/county recycling coordinator to find out what is accepted in your area. It is easy to set up a recycling program and the potential savings on disposal should make it well worth the effort.

Simple Materials Assessment

Notes:

Shipping and Receiving Worksheet

Question	Answer	Opportunity
When you unpack a shipment of office supplies do you often find boxes within boxes?	Y N	Let your supplier know that you don't want excess packaging. Remember, you pay for the packaging in the price of the product and in shipping charges.
Do you notice that more waste is generated on days when products or packages arrive?	Y N	Let your vendors know that you won't accept unnecessary packaging. Don't buy over-packaged products
Do you frequently mail materials or ship products?	Y N	Look at your packaging from a customer's perspective. Is it excessive? Can it be recycled easily? Help your customers reduce waste as well by delivering your own products or literature in the smallest amount of packaging necessary. Corrugated cardboard boxes can be reused many times, and so can most packaging materials, such as foam peanuts and bubble wrap. You can also help your customers reduce waste by choosing efficient, reusable, and/or recyclable packaging.
Do you receive many products from one manufacturer or vendor?	Y N	Ask your vendors to use returnable containers. If you ship products, switch to returnable containers. In the long run, returnable containers will save you money because you won't have to continue purchasing and disposing of single- or limited-use containers.
Have you ever ordered more of an item than you can use?	Y N	Donate surplus items to local charities or set up a give-and-take area in your business for employees to use. Surplus items and reusable waste can also be advertised through a commercial waste exchange.
Does your business ship or receive products on wooden pallets?	Y N	Recycle the wooden pallets that you cannot reuse or repair. Ask suppliers to take back pallets. Check with your local recycling depot or garbage hauler to find out about setting up a collection or drop-off program.

Kitchen/Cafeteria/Break Room Worksheet

Notes:

Question	Answer	Opportunity
Are there paper coffee cups and disposable dishes in the trash can in your break room?	Y N	Purchase a set of permanent dishes for your office or encourage people to bring in reusable coffee mugs. If you have a cafeteria that uses disposable dishes, consider switching to permanent dishes.
Do you have a soda pop machine in your break room or do people bring in cans from home or the local deli?	Y N	Set up a recycling program for aluminum cans. If you have a soda pop machine ask the vendor if they will take the cans back. You can also collect the cans yourself and start an office "kitty" with the deposit money.
Do many people bring in their own lunches?	Y N	Set up a recycling program in the break room or cafeteria for glass containers and tin cans. Check with your local recycling depot or garbage hauler to find out what other materials are accepted for recycling.
Do you have an onsite cafeteria or kitchen?	Y N	Consider the following waste reduction measures: Use bulk dispensers for condiments, rather than individual packages. Use bulk dispensers of drinks (milk, juices, beers) rather than individual cartons or cans. Use durable towels, tablecloths, napkins, dishes, flatware, cups, etc. Recycle or reuse cardboard boxes, glass, metal, and plastic containers. Donate leftover foods to charities. Compost vegetable food scraps.

Simple Materials Assessment

Notes:

Other Worksheet

Question	Answer	Opportunity
Do you have a comprehensive recycling program but still find a lot of material in the trash cans?	Y N	Avoid buying products that are not easily recyclable in your area. Make sure recycling is convenient by placing clearly labeled recycling containers in all work areas. Promote recycling to all employees. Make a poster or label that lists or even shows what can and can't be recycled.
Are the trash cans in the restroom full of paper towels?	Y N	Instead of paper, switch to cloth roll towels or air dryers in the restrooms, or switch to a dispenser that isn't so generous with paper towels. This will cut down on the amount you spend for janitorial supplies and reduce your disposal costs.
Is the area around your business landscaped?	Y N	Ask the company that does the landscaping to recycle the grass clippings and prunings. If you do not use a landscaper, buy a mulching mower and recycle grass clippings by leaving them on the lawn or start a compost pile and include prunings and leaves along with grass clippings.
Do you need new equipment?	Y N	Whenever possible repair rather than replace office equipment. If the equipment is beyond repair, consider purchasing remanufactured or used equipment. Donate used equipment to a school or charity.
Do you buy trash can liners?	Y N	Review whether all garbage cans, particularly in offices, need liners. If liners are used, they may not need to be replaced every time the garbage is emptied.

Purchasing/Inputs Assessment

Notes:

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Helps you brainstorm and identify possible material efficiency measures by looking at the items you most commonly purchase or receive from suppliers.

How to use this tool:

- In the first column, list the most significant purchases and other “inputs.” Inputs can be what you receive from your suppliers (including packaging) and unsolicited materials (like unwanted mail). Choose the items that either represent the largest amounts of material you receive, or cost you the most. This could be either because they are expensive to purchase, or because they are expensive or time-consuming to manage.
- The second and third columns are optional. If you want, estimate how much it costs you to buy, store, ship, and recycle or dispose of the material, and then estimate how much you would save if you could reduce the use of that material by 20 percent. Generally speaking, the amount of time you put into the next step should reflect what your potential savings might be if you could use the material more efficiently: the higher the savings, the more time you should be willing to spend trying to figure out alternatives.
- Next, fill in the entire matrix consisting of the last four columns. Ask yourself each of the four questions for each major input you want to assess. At first, this may seem difficult. To get your creative juices flowing, apply the following rule: “You must fill in every space in the matrix, and ‘we can’t’ is not an acceptable answer — you must write down something.”
- If you’re still stuck, check out the Asking Dumb Questions tool. This may give you a different way of looking at the problem. Or bring in your community’s Resource Efficiency Coordinator or an outsider who might see things differently for a facilitated brainstorming session.
- Remember, if you don’t get creative, you may not find that brilliant solution that can save resources and cut your costs.
- When brainstorming, write down all of the ideas, no matter how stupid they may sound at first. You can assess the options later; for now, you need to be creative. It is fine if 95 percent of the suggestions don’t work. You can’t get to the five percent that do unless you brainstorm all of the other ones as well.
- Once you’ve finished brainstorming, begin assessing the ideas that you’ve compiled.
- You might want to try the Discards Assessment and the Customer Impact Assessment as well.

Purchasing/Inputs Assessment

Notes:

Related information can be found in these other tools:

- Asking Dumb Questions.
- Discards Assessment.
- Customer Impact Assessment.
- Process Mapping.
- Materials Appendix.

Purchasing/Inputs Assessment Worksheet

Notes:

Materials	Financial Motivation		Material Questions				
	How much do we spend on buying, storing, shipping, & recycling/dispersing of this material (estimated)?	How much could we save if we reduced the use of this material by 20 percent?	How could we stop using this material altogether?	How could we reduce our use of this material?	Does this material currently contain recycled content? If not, can it?	Is this material easily recyclable at our facility and by our customers? If not, how can we change it?	
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Notes:

Discards Assessment

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Helps you brainstorm and identify possible material efficiency measures by looking at the items you most commonly discard.

How to use this tool:

- With this tool in hand, walk through your company and look into the garbage and recycling containers — both inside and out. In the first column, list the most commonly found items.
- The second and third columns are optional. If you want, estimate how much it costs you to buy, store, ship, and recycle or dispose of the material, and then estimate how much you would save if you could reduce the use of that material by 20 percent. Generally speaking, the amount of time you put into the next step should reflect what your potential savings might be if you could use the material more efficiently: the higher the savings, the more time you should be willing to spend trying to figure out alternatives.
- Next, fill in the entire matrix consisting of the last four columns. Ask yourself each of the four questions for each major material you want to assess. At first, this may seem difficult. To get your creative juices flowing, apply the following rule: “You must fill in every space in the matrix, and ‘we can’t’ is not an acceptable answer — you must write down something.”
- If you’re still stuck, check out the Asking Dumb Questions tool. This may give you a different way of looking at the problem. Or bring in your community’s Resource Efficiency Coordinator or an outsider who might see things differently for a facilitated brainstorming session.
- Remember, if you don’t get creative, you may not find that brilliant solution that can save resources and cut your costs. When brainstorming, write down all of the ideas, no matter how stupid they may sound at first. You can assess the options later; for now, you need to be creative. It’s okay if 95 percent of the suggestions don’t work. You can’t get to the five percent that do unless you brainstorm all of the other ones as well. Once you’ve finished brainstorming, you can begin assessing the ideas.
- You might want to try the Purchasing/Inputs Assessment and the Customer Impact Assessment as well.

Related information can be found in these other tools:

- Asking Dumb Questions.
- Purchasing/Inputs Assessment.
- Customer Impact Assessment.
- Process Mapping.
- Materials Appendix.

Discards Assessment Worksheet

Notes:

Materials	Financial Motivation		Material Questions				
	How much do we spend on buying, storing, shipping, & recycling/dispersing of this material (estimated)?	How much could we save if we reduced the use of this material by 20 percent?	How could we stop using this material altogether?	How could we reduce our use of this material?	How could we or someone else reuse this material?	If the material was in the garbage, how could we recycle it?	
List major types of materials found in the garbage and recycling containers.							
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Notes:

Customer Impact Assessment

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Helps you brainstorm and identify possible material efficiency measures by looking at the “transferred inefficiencies” that you pass on to your customers.

How to use this tool:

- Take an objective look at what your customers receive from you. Write each item down in the first column of the worksheet. This may include the product (hamburger, widget, tax bill, or whatever), packaging (paper bag, boxes and bubble wrap, envelope), “extras” (packages of ketchup, marketing literature, return envelope), and any other material.
- The second and third columns are optional. If you want, estimate how much it costs you to buy, store, ship, and recycle or dispose of the material, and then estimate how much you would save if you could reduce the use of that material by 20 percent. Generally speaking, the amount of time you put into the next step should reflect what your potential savings might be if you could use the material more efficiently: the higher the savings, the more time you should be willing to spend trying to figure out alternatives.
- Next, fill in the entire matrix consisting of the last four columns. Ask yourself each of the four questions for each major material you want to assess. At first, this may seem difficult. To get your creative juices flowing, apply the following rule: “You must fill in every space in the matrix, and ‘we can’t’ is not an acceptable answer — you must write down something.”
- If you’re still stuck, check out the Asking Dumb Questions tool. This may give you a different way of looking at the problem. Or bring in your community’s Resource Efficiency Coordinator or an outsider (maybe even a customer) who might see things differently for a facilitated brainstorming session.
- Remember, if you don’t get creative, you may not find that brilliant solution that can save resources and cut your costs. When brainstorming, write down all of the ideas, no matter how stupid they may sound at first. You can assess the options later; for now, you need to be creative. It’s okay if 95 percent of the suggestions don’t work. You can’t get to the five percent that do unless you brainstorm all of the other ones as well. Once you’ve finished brainstorming, begin assessing the ideas.
- You might want to try the Purchasing/Inputs Assessment and the Discards Assessment as well. If you want to conduct an even more thorough and sophisticated assessment, refer to the “Institute of Packaging Professionals Packaging Reduction, Reuse, Recycling & Disposal Guidelines” in the Materials Appendix (your community’s Resource Efficiency Coordinator should have a copy).

Related information can be found in these other tools:

- Asking Dumb Questions.
- Purchasing/Inputs Assessment.
- Discards Assessment.
- Process Mapping.
- Materials Appendix.

Notes:

Customer Impact Assessment

Notes:

Customer Impact Assessment Worksheet

Materials	Financial Motivation		Material Questions			
	How much do we spend on buying, storing, shipping, & recycling/disposing of this material (estimated)?	How much could we save if we reduced the use of this material by 20 percent?	How could we stop using this material altogether?	How could we reduce our use of this material?	Does this material currently contain recycled content? If not, can it?	Is this material easily recyclable or reusable by our customers? If not, how can we change it?
List the items received by our customers, including packaging.						
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Asking Dumb Questions

Notes:

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Discusses the value of asking “dumb questions” and presents some sample questions.

How to use this tool:

- This tool is not meant to be used by itself. Rather, it should be used in support of any of the other assessment tools, listed below. Read the tool, and then apply what you’ve learned as you look for creative opportunities for efficiency in your operation.
- Don’t be afraid to ask “dumb” questions. The first 19 questions might not lead anywhere, but the 20th might reveal a whole new way of looking at your operation that could save money and resources. If you want, invite in an outsider, someone who isn’t familiar with your operation. The fresh perspective can be very helpful, and a person who doesn’t work with the operation is safe to ask all the dumb questions they want.

This tool is meant to be applied to any of the following participant tools:

- Simple Energy Assessment.
- Simple Water Assessment.
- Simple Materials Assessment.
- Purchasing/Inputs Assessment.
- Discards Assessment.
- Customer Impact Assessment.
- Process Mapping.

Asking Dumb Questions

Notes:

What's a dumb question?

The dumb question is the one that isn't asked. You know those questions that five-year-olds ask, such as "Why is the moon yellow?", "Where does the snow go?", "Why do you do that?" They drive us crazy because we really have to think about the answer and the truth is we may not know.

A real-life example of a dumb question is related in Charles Thompson's book, "What a Great Idea!" Thomas MacAvoy, former president of Corning Glass Works, asked the head of research, "Glass breaks, why don't you do something about that?" This dumb question resulted in Corning Ware, a virtually unbreakable glass.

Another dumb question could have been "Why does glass break?". This could have resulted in a list of reasons why glass breaks, and a look at the reasons could lead to a second question: "What can we do to reduce this cause of the breakage of glass?"

Some Really Smart Dumb Questions. "Why" may be the best dumb question. But you need to ask it five times. When the answer becomes "just because" it's a good place to stop and brainstorm how to change it.

- Why do we do this?
- Why have we always done it this way?
- Do we need to do this?
- Does anyone really look at this form?
- Why do I need a hard copy?
- If I couldn't change it before (because of cost or time) should I research it again?
- What waste will our customer have to deal with?

Process Mapping

Notes:

Whole Facility and Products or Services

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Provides a big picture view of the resources used, passed on or wasted when you make your product or deliver your service.
- Helps you map the processes your products or services go through from material acquisition through production, transfer to customer, and final disposal.
- Helps identify how much waste your facility is producing, and where the greatest potential lies for resource efficiencies.
- May be used to identify cost and labor impacts.

How to use this tool

- Read through the tool and decide if you would like to do the exercise by yourself or use a team approach.
- Walk through your facility and note all of the activities, materials and waste.
- Use the material, energy and water assessments to gather in-depth information.
- Review the other tools listed below to determine which would be helpful in this process.
- Redo the exercise every one or two years and educate employee to always look for more efficient ways to make your product or deliver your service.

Additional information can be found in the following tools:

- Asking Dumb Questions.
- Whole Facility Approach.
- Involving Employees.
- Simple Material Assessment.
- Simple Energy Assessment.
- Simple Water Assessment.
- Resource Accounting.

Notes:

Whole Facility and Process Mapping

You have probably drawn a map for someone to get to your home or office. A map will direct someone to where they need to go and to the best route to take. Process mapping is just that, but you are mapping what you do (make a product or deliver as service) and the materials and resources you use to make it. Starting with the big picture or the whole facility map is like giving someone a state map. For example, a widget maker may do the following things; receive widget material, use energy to cut widget, dispose of widget waste, package and ship, send out brochures and bill customers. A whole facility map may show a widget maker that the company is ordering a lot of widget material that is being discarded, but it does not necessarily pinpoint the wasteful part of the process.

Just as some people will want a street map instead of a state map, you may want to look more closely at the processes you use. For example, a step-by-step map of making a widget may show that the waste materials could be reused in the process or that steps could be eliminated.

The Whole Facility View

Figure 1

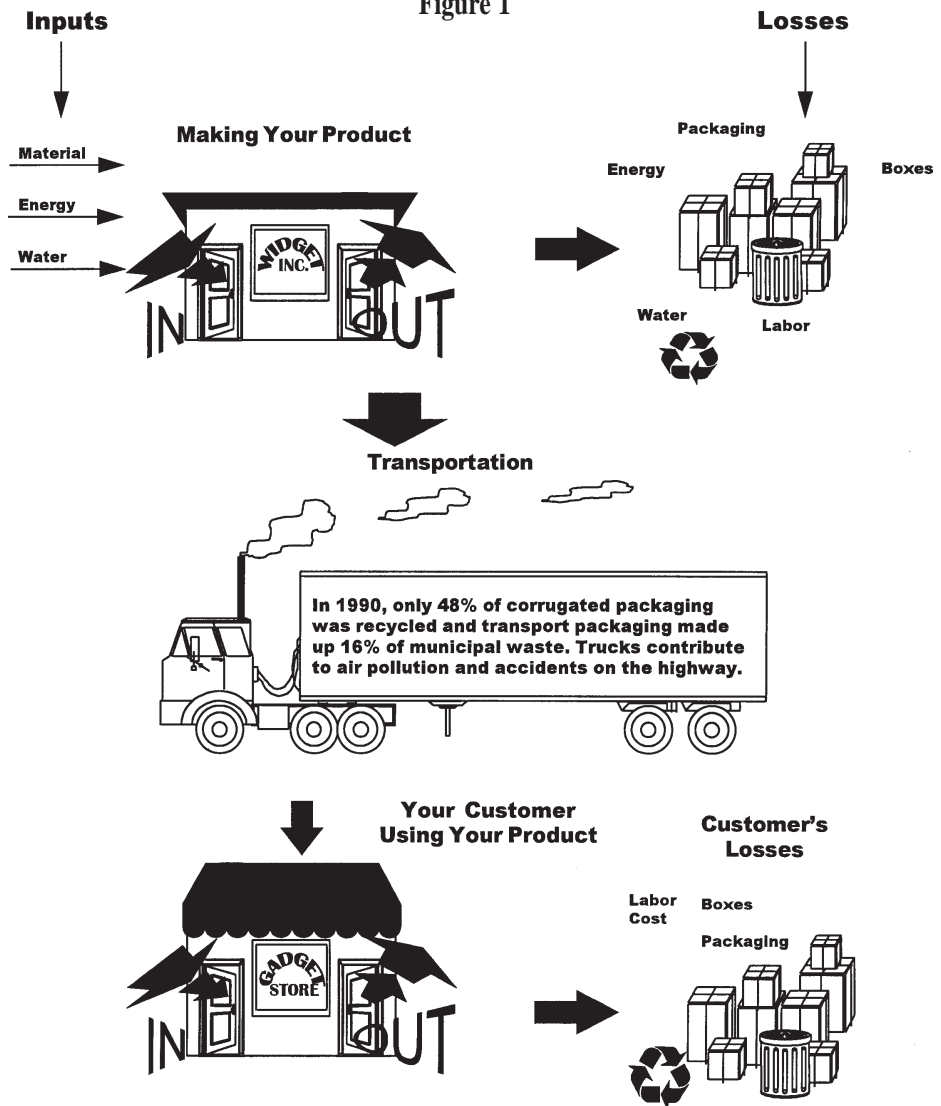
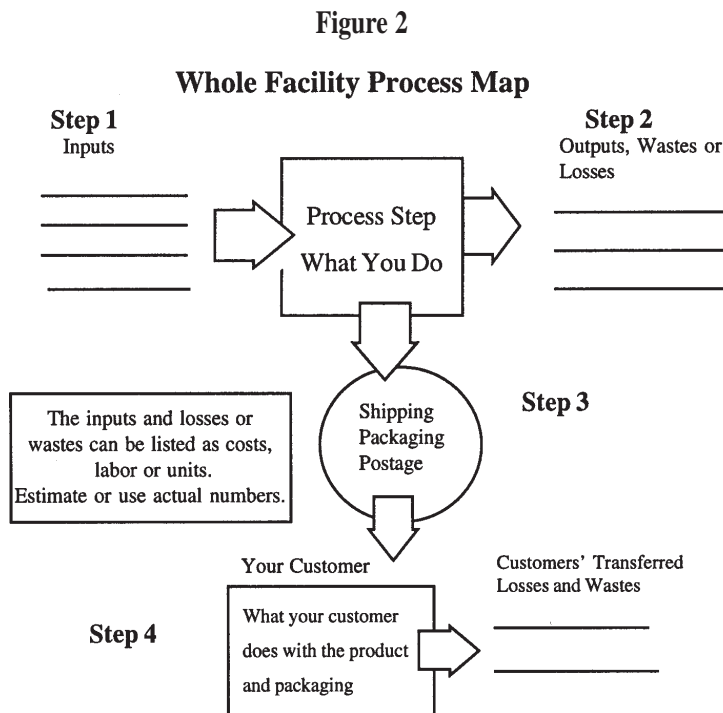


Figure 1 is a “big picture” view of your whole facility. Materials, energy, and water come in to your operation, you make your product or service and it gets shipped, mailed or delivered. Notice on the right side are the wastes or losses you might incur, but not all the losses are seen here. Some of your losses may be passed on to your customers. For example, if you are over-packaging your products, you may be passing on items that your customers don’t want or need — and that is a loss. Even if your customers are paying for the shipment, and disposing of the wastes, you are losing an opportunity to be more efficient and competitive.

Notes:



The diagram above (Figure 2) shows a simple way to begin to get the layout of inputs and outputs, or losses.

- Step 1). Begin by asking the question “What do we do?” Add that list to the first box. The box represents your facility or the process step. Materials come into the box (facility) and are then put through various processes to make your product or deliver your service. On the left side of the box list the inputs or what comes into your facility (raw materials, paper, packaging, power and water) and is used in a process step. You can use actual gross or unit costs, or number of items used or make estimates.
- Step 2). On the right side of the box list your outputs or losses which might include materials, wastes, scrap, by-products, and water or energy inefficiency. Even the materials you recycle could be considered a loss if you did not use the material to its fullest. For example, if an office audit shows a lot of single-sided paper in the recycling bins, you may be missing a golden opportunity to increase double-sided printing. A hospital’s losses could be discovered in patient gowns, hospital patient kits or forms.

Process Mapping

Notes:

Some outputs or losses (like materials or supplies) you can “see” while other losses, such as water and energy, are not as obvious. Your utility provider or an energy, water, or materials expert may be able to help track any inefficiencies. Or use the self assessment tools for energy, water and materials to determine if this is an area you need to check further.

- Step 3). The circle in Figure 2 represents your product or service as it leaves your operation. For example, if you are mailing a letter when a postcard would do, sending three units when two would do, or over-packaging, you and your customers have unnecessary losses. Over-packaging is a large source of waste and transporting it increases the number of trucks on the road as well as air pollution.
- Step 4). The final rectangle in Figure 2 represents your customer. You may want to map out what you think they do with your products to get an idea of their losses.

This simple Process Map may make some things jump out at you. You can look at the input side of the map and see what resources you use, or the output side and find the sources of waste.

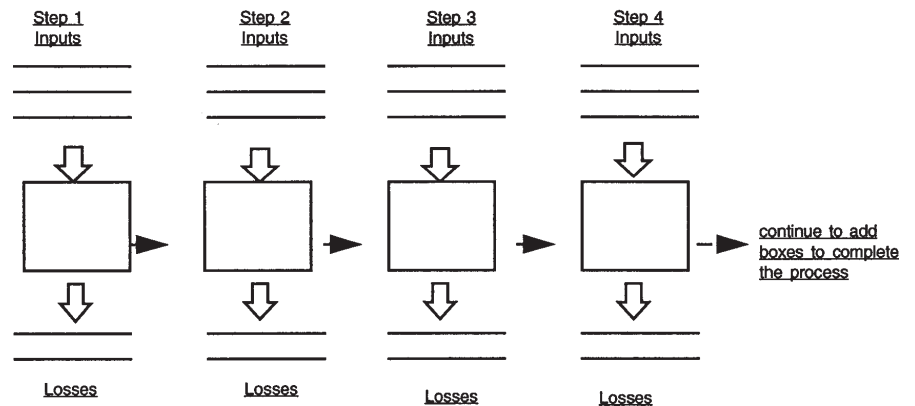
This gives you a snapshot of your whole facility. However, you may want a closer look at one activity, product or material to gauge its impact.

Drawing the Process Map

To do this you need to take a closer look at one or more individual processes. You’ll take a magnifying glass to your whole facility map and look in greater detail at one or more processes. Like drawing a map for a friend this is where you begin to draw a street map and identify road signs, mileage, and other directional details. The following activity needs to include anyone who is involved in the process. Each person understands a part of the process.

Process Mapping

Figure 3



- Step 1). Once you have identified the service, product or activity you want to track, begin by drawing a single square. This square represents the first step in the process. The first step in a surgery may be checking the patient into the hospital. The inputs into this process may be several different forms (medical information, insurance, etc.), a patient identification wristband, and a patient admitting kit consisting of a cup, toothbrush, toothpaste, and a package of tissues, all packed in a wash basin and wrapped in plastic. The outputs (wastes or losses) from this process may be the unused part of the forms, or it might be the packaging from the admitting kit. Similarly, the patient may then move on to a third process (pre-operative monitoring) which would be diagrammed in yet another box. Each step or box may have new input and new output or losses.
- Step 2). Keep adding a square for each step that the service or product goes through. You will quickly realize that other people are involved including your suppliers, other departments or your customers. You may want to contact these parties to understand how they are affected or impacted by your processes. Remember the hospital patient kits? They often contain plastic bed pans, washing basins, pitcher and glass. Upon closer examination, nurses may tell you that many patients never use the bedpans or wash basins. This might present an opportunity to give the patients only the items they need, instead of packaging them all together.

Notes:

You can do the process map yourself with a pencil and piece of paper or you can ask an outsider to join you in the process. You can more objectively look at how and why you do things when you try to explain it to a person not directly involved. You can also use the team approach that is discussed in the Employee Involvement tool. The Asking Dumb Questions tool can also help you get started on your process map.

It is unlikely that your process steps will all be in a neat line like the one in this figure, it will more often look like the process maps in Figure 4 and Figure 5. Reducing waste generally means you will also eliminate some processes which will often save both materials and labor. Remember, the process should include consideration of the manner in which your product or service is delivered to your customer. Some thought needs to be given to the outputs or inefficiencies for them.

Example A: Rogue Wave Software (simplified)

This is a simple example of how a process map can illustrate opportunities for reduction of waste involved in the shipping of disks and manuals to buyers of computer software. For a full description of the efficiencies involved, review the case study of Rogue Wave Software in the “Case Studies” section of this tool kit.

Notes:

Rogue Wave Software

Figure 4

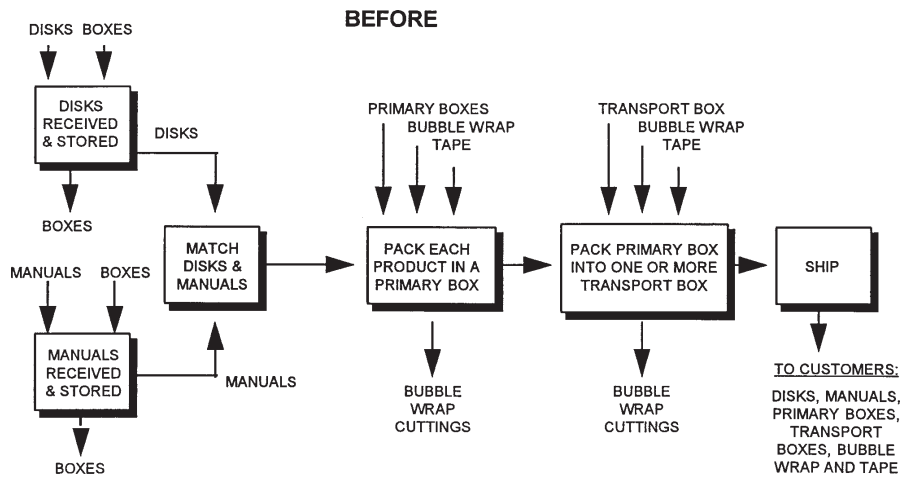
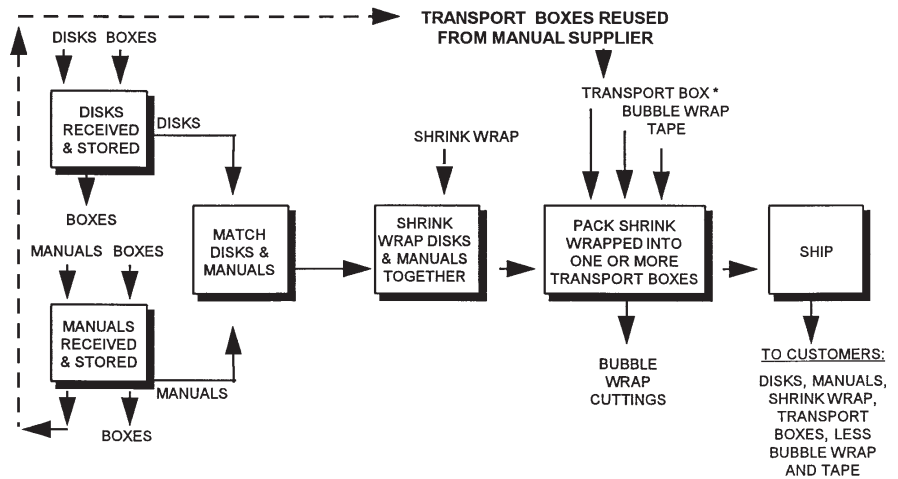


Figure 5

AFTER



* SOME TRANSPORT BOXES ARE NEW, OTHERS ARE REUSED FROM MANUAL SUPPLIES.

Figure 4 illustrates a simplified version of how this Corvallis company would ship its software products to a customer:

- Disks would arrive at the shipping area in boxes; the disks would be stored and the boxes eventually recycled.
- Manuals would arrive at the shipping area in boxes; the manuals would be stored and boxes eventually recycled.
- When an order needed to be filled, the appropriate disks and manuals would be matched to each other.
- Each product (a set of disks and manuals) would then be packed in a “primary” box, which was stuffed with bubble wrap and sealed with tape.

For the majority of customers who ordered more than one product at a time, all of the primary boxes would be then packed into a larger, “transport” box, which was also stuffed with bubble wrap and sealed with tape.

Wastes at Rogue Wave Software included boxes from its disk and manual suppliers, and cuttings of bubble wrap. Rogue Wave’s customers received a box and a piece of bubble wrap for each product they ordered, plus at least one additional box.

Two changes to the packaging system are portrayed in Figure 5. First, boxes that manuals were received in were reused to ship some products to customers. Second, a shrink wrap machine was purchased to replace the use of the primary boxes and accompanying bubble wrap. The impact of this shrink wrap machine for Rogue Wave’s customers is a significant reduction of outputs or losses (cardboard boxes and bubble wrap).

Notes:

Process Mapping

Notes:

Example B: Stahlbush Island Farms (simplified)

Figure 6

BEFORE

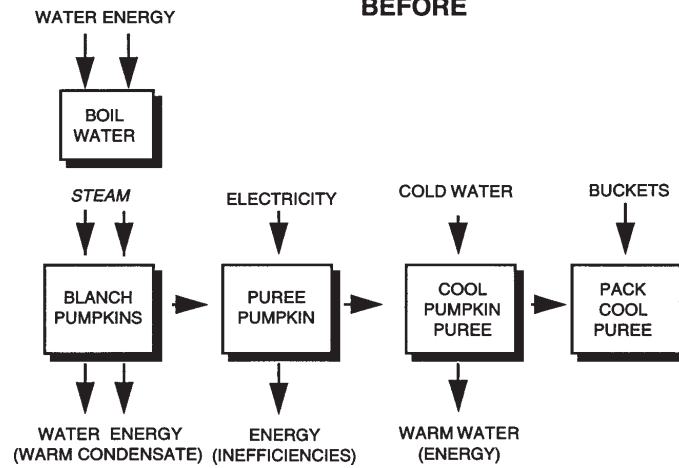
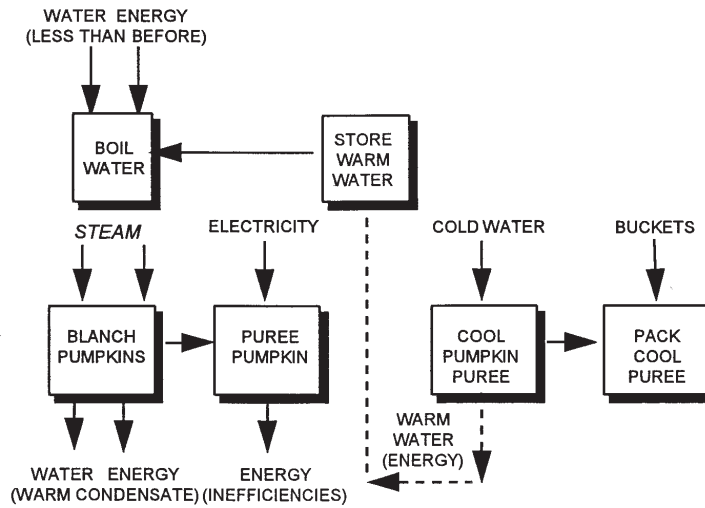


Figure 7

AFTER



Figures 6 and 7 show a simplified process map of the manufacture of pumpkin puree at Stahlbush Island Farms in Corvallis, Oregon. For a full description of the efficiencies involved, review it in the “Case Studies” section of this tool kit.

In this process, pumpkins are blanched with steam, pureed, cooled using a heat exchanger (cold water is run through a series of tubes that are in contact with the hot pumpkin puree; the cold water carries heat away from the pumpkin puree, thus heating the water and cooling the puree; the water never comes into direct contact with the puree), and finally packed into buckets.

The efficiency here is that the waste (warm water) from the process of cooling the pumpkin puree supplements the inputs (water and energy) for the boiling of water. Due to the supplemented input, less water is needed, and less energy is needed to boil the water, since it has already been pre-warmed.

Process Mapping, A Daily Business

Other tools that help to complete this effort and integrate it into the way you do business are the Resource Accounting tool and the self-assessment tools for energy, water, and materials. Once you have completed your first process map and implemented changes to improve the efficiencies, the mapping practice can be used for other processes. As people use the system they begin to think more closely about what they are doing and begin to ask process questions as they conduct their daily business.

Notes:

Notes:

Planning and Getting It Done

To be used by:

- Resource Efficiency Coordinator.
- Participants.

What this tool does:

- Helps you write a resource efficiency plan for your business or facility.

What this tool does not do:

- Determine the elements of your resource efficiency plan.

How to use this tool:

- Read the description of a resource efficiency plan on the following page.
- Review the sample plan.
- Write a resource efficiency plan tailored to your business using the worksheet as a sample template.

Related information can be found in these other participant tools:

- Securing Management Support.
- Involving Employees.
- Financing and Funding.
- Resource Accounting and Measurement.

Sources: “Minnesota Waste Wise Guidebook,” Minnesota Chamber of Commerce in partnership with the Minnesota Office of Environmental Assistance, and the Metropolitan Council; “Small Business Reduce, Reuse, and Recycling Arizona Guide,” Small Business Reduce, Reuse, & Recycle Project, Phoenix, Arizona; “Working Your Way to a Green Office,” Canada’s Green Plan; and “Businesses Guide for Reducing Solid Waste,” United States Environmental Protection Agency.

Developing Your Resource Efficiency Plan

A resource efficiency plan defines a strategy for incorporating material, energy, and water conservation into the management and operation of your business.

The purpose of the plan is to establish your company's goals in terms of resource efficiency and define a series of actions to attain those goals.

The time to write your resource efficiency plan is after you have obtained management support, formed a resource efficiency team or appointed a program coordinator, and conducted an energy, water, and materials/purchasing/waste assessment. You could write the plan after you've evaluated all of your options and decided what you will change, or the plan could be written earlier in the process and include evaluation and decision steps. The plan could be written by the resource efficiency team and/or company management.

What to Include

The elements of your plan could include:

- The corporate policy or mission statement adopted by your company which states the commitment of senior management and staff (see the Securing Management Support tool).
- Quantifiable goals that state how much material, energy and water will be saved and how much waste will be reduced. Include deadlines for when goals should be achieved.
- The criteria used to evaluate and select resource efficiency measures identified by the material, energy, and water assessments based on operational and economic feasibility.
- The resource efficiency measures selected and prioritized for implementation.

The measures could be prioritized as follows:

- 1).Operational measures that are known to be cost-effective and feasible and can be implemented immediately.
- 2).Capital measures that are known to be cost-effective and feasible and can be implemented immediately.
- 3).Capital measures that are known to be cost-effective and feasible and can be implemented as soon as capital improvement funds are budgeted or available.
- 4).Measures which need additional evaluation to determine if they are cost-effective and/or feasible.
- 5).Other measures.

Alternately, you could prioritize measures based on “easy,” “less easy,” and “difficult,” or “immediate,” “next six months,” and “needs more study.”

Notes:

Planning and Getting It Done

Notes:

- An outline of the specific tasks to implement each resource efficiency measure, including the management and employees responsible for implementation and the timeline for completion.
- The identification of funding sources for specific measures that will require capital expenditures.
- A provision for evaluation and revision. The resource efficiency plan should state criteria for making revisions and provide a schedule for when the effectiveness of measures should be reviewed.

Worksheet and Sample Plan

The following page contains a blank worksheet that you can use to develop a simple resource efficiency plan. The next page contains a sample plan using the worksheet.

Sample Worksheet for Developing a Simple Resource Efficiency Plan

Notes:

I. Goals			
II. Tasks, Timeline, and Responsibilities			
Specific Steps	Responsibilities	Timeline	Other/Notes
Efficiency Measure:			
III. Evaluation			

Notes:

**Sample Resource Efficiency Plan for
Fictional Software Company April 5, 1996**

I. Goals			
By 1997, reduce our annual use of electricity by 20 percent, from a base year of 1995.			
By 1998, reduce our use of energy (electricity and natural gas) by 20 percent, from a base year of 1995.			
Use 25 percent less photocopy paper per employee in 1997 than in 1995.			
Implement other efficiencies in the use of materials and water.			
II. Tasks, Timeline, and Responsibilities			
Specific Steps	Responsibilities	Timeline	Other/Notes
Immediate Changes			
Efficiency Measure 1: Faucet Aerators			
Purchase faucet aerators for all 8 bathroom sinks	Bob	by May 1, 1996	Estimated cost of \$80
Install aerators	Bob	by May 8, 1996	
Efficiency Measure 2: Double-Sided Copying			
Develop and place poster above copiers	Susan, Mark	by May 1, 1996	May need \$10 to \$30 for color printing and laminating
Get on agenda for quarterly staff meeting	Mark to coordinate with Jane	ASAP	
Short presentation at quarterly staff meeting	Susan, Mark, Bob	Next meeting is scheduled for June 15	Opportunity to brief all employees on this and other resource efficiency efforts.

Notes:

II. Tasks, Timeline, and Responsibilities			
Specific Steps	Responsibilities	Timeline	Other/Notes
Next Eight Months			
Efficiency Measure 3: Lighting Retrofit			
Invite bids from _____ and _____.	Bob	June 3	Bob to provide electricians with a copy of Oregon Power's efficiency audit; estimated cost \$3,000.
Select contractor, confirm exact scope of retrofit.	Bob	June 24	Still need to determine if reflector lenses will be included in the retrofit.
Submit Business Energy Tax Credit to ODOE; submit refund application to Oregon Power (utility).	Bob, with help from Lydia	July 8	BETC has filing fee.
Obtain ODOE and Oregon Power approval of retrofit.	Bob, ODOE, Oregon Power	by August 12 (hopefully)	Approvals needed before retrofit can actually begin.
Conduct lighting retrofit.	Bob, contractor	Note: to obtain refund from Oregon Power, retrofit needs to be completed and inspected by November 29.	
Submit receipts etc. to ODOE and Oregon Power.	Bob, with help from Lydia.	by December 20	

Planning and Getting It Done

Notes:

II. Tasks, Timeline, and Responsibilities			
Specific Steps	Responsibilities	Timeline	Other/Notes
Efficiency Measure 4: Update catalog mailing lists			
Create master database to allow merging of existing mailing lists	Susan	by July 8	
Target specific "old" mailing lists for cleaning	Susan	by July 8	
Hire temporary employee; begin contacting names on list and updating or purging outdated names	Susan, with help from Lydia	August 1	Assume temporary employee works half time for all of August and September (need about \$2,000).
Complete update	Temporary employee; managed by Susan	Target date: October 1, 1996	
Estimate annual savings (printing, postage)	Susan	A few weeks after update is complete	
Needs More Research			
Efficiency Measure 5: Seven-day, 24-hour programmable thermostat			
Research options; costs; availability of tax credits, refunds, etc.	Bob	by July 22	
Make decision, plan next steps	Bob, Susan, Mark	by July 29	

Notes:

II. Tasks, Timeline, and Responsibilities			
Specific Steps	Responsibilities	Timeline	Other/Notes
Efficiency Measure 6: Make program manuals less wasteful			
Meet with manual writing team to discuss how to make manuals less wasteful	Susan to contact Joan to get on agenda	ASAP	Issues include making manuals smaller (fitting more on the page); making manuals easier to recycle; using recycled paper; distributing manuals on CD-ROM.
Next steps unknown	?	?	
III. Evaluation			
Fictional Software Company's "Green Team" will meet at the end of 1996 to evaluate the successes, costs, and impacts of all of the measures listed above, and to update this plan for 1997.			

Notes:

Funding and Financing

To be used by:

- Participants.
- Resource Efficiency Coordinator.

What this tool does:

- Describes rebates, tax credits, and other sources of financing for resource efficiency investments.
- Describes some strategies to obtain approval for up-front investment in resource efficiency measures.

How to use this tool:

- Read the “Rebates/Tax Credits” section to see how you might reduce the cost of your investment by utility rebates or Oregon income tax credits.
- If you have to obtain authorization for a capital improvement or other investment in resource efficiency, read the “Strategies to Obtain Investment Approval” section.
- If you need outside financing because of cash flow or other reasons, review the options in the “Other Sources of Funding” section.
- If you have difficulty understanding the terms in this tool, read the “Accounting Terms and Concepts” tool.
- If you still have questions, ask your community’s Resource Efficiency Coordinator, utility, or relevant state agency for help.

Related information can be found in the following tool:

- Accounting Terms and Concepts.

Sources: Oregon Administrative Rules; “Community Energy Workbook,” Rocky Mountain Institute.

Note: All rebate, tax credit, and financing options described in this tool are described for informational purposes only. DEQ does not guarantee the accuracy of these descriptions, and warns that conditions, including availability of funding, participant requirements, and terms of financing, may change. Participants are strongly encouraged to use this tool only as a starting point to identify possible options. Details of tax credits, rebates, and financing should be obtained from the offering organization or financial institution.

Rebates and Tax Credits

Utility rebate programs and Oregon Business Energy Tax Credits can help reduce net costs, thus shortening paybacks and increasing the return on investment (ROI).

Utility Rebate Programs

Some utilities, particularly electrical utilities, may offer rebates to businesses that implement efficiency measures. The rebate is often in the form of a check issued shortly after the retrofit has been installed and inspected. Check with your local utility for more information. Your utility may also offer low interest loans, equipment leasing, and product giveaways. Also, note that utility rebate programs typically change from year to year. A utility's rebate offer one year may only hold for that year, requiring that the retrofit be completed and inspected by a specified time.

Business Energy Tax Credits (BETC)

The Oregon Department of Energy (ODOE) administers a credit of 35 percent of the eligible costs of approved energy conservation measures (including retrofits), taken as a credit against Oregon business income taxes over a period of five years (10 percent in years one and two, five percent in years three, four, and five; the net present value of the credit in year one is typically more like 28 percent to 30 percent). Note that only certain types of projects are eligible, and an application (with a non-refundable filing fee) must be approved by ODOE prior to beginning the retrofit.

Funding for BETC is set by the Oregon legislature and is subject to change. Also, some funds are reserved for special types of projects ("targeted" and "preferred" projects), including research/development/demonstration projects and projects costing \$100,000 or less. Applications typically exceed eligible funding for non-reserved projects, and credits are issued on a first-come first-served basis, so unless the project meets the criteria of a "targeted" or "preferred" project, it's a good idea to submit applications as close to the beginning of the calendar year as possible. Funds set aside for special types of projects are typically freed up in mid-November if they haven't been fully utilized. For more information, including applications and instructions, call ODOE at 800 221-8035, and/or review the brochure "Business Energy Tax Credits."

Other Tax Credit Programs

- **Pollution Control Facility Tax Credit.** A recycling facility is one type of pollution control facility which may qualify for this tax credit. The credit under this program is up to 50 percent of the certified value of qualified facilities. In most cases the credit is taken over a 10-year period at five percent per year. Credit not used in any tax year may be carried forward for up to five years. Applicant may submit an optional application for preliminary certification.

Notes:

Funding and Financing

Notes:

- Reclaimed Plastic Tax Credit. This program provides a tax credit of up to 50 percent of the investment cost in qualified equipment which is used to either 1) collect, transport or process recyclable plastic or 2) manufacture a product from reclaimed plastic. The credit is taken over a five-year period at a rate of 10 percent per year.

For more information, call Oregon Department of Environmental Quality, (503) 229-5253.

Strategies to Obtain Investment Approval

Not all resource efficiency measures have up-front costs — or any costs at all. But for those that do, and particularly for those that require significant investments, you may need to be proactive in getting management approval to invest the capital today that will yield savings in the future.

A few suggestions:

- Link low-cost efficiency measures to higher-cost measures. For example, your company may limit investments to those with paybacks of less than three years. But you may have a lighting retrofit consisting of two parts, with paybacks of 1.0 and 6.0 years, respectively. By packaging them as one project, you may be able to reduce the entire payback to less than three years.
- Use the savings from other efficiency measures to “pay” for measures that are less cost-effective (or not cost-effective at all). For example, if your company cuts its garbage bill by \$500 a year due to recycling, suggest using these savings to pay for a \$700 upgrade to a copy machine that automatically copies on both sides of the page. Even without the paper savings, the “system” would pay for itself in less than two years.
- Use other savings to “pay” for measures that are less cost-effective. For example, many businesses find that their garbage containers are oversized, and they are paying their garbage hauler to “haul air”. Reducing the dumpster size doesn’t save resources, but it does save money. Similarly, shifting infrequently performed tasks to times when electrical demand is lower will reduce your demand charges, even if it doesn’t use any less energy. Use these savings to pay for real resource efficiencies.
- Sell the qualitative benefits. Not all of the benefits of resource efficiency can be easily expressed in an equation. For example, switching from T-12 fluorescent lamps and magnetic ballasts to T-8 lamps and electronic ballasts reduces flicker. Fixing that unbalanced HVAC system can improve employee comfort. Both can lead to increases in worker productivity. And since labor is typically a much more expensive cost than utilities, a small increase in efficiency can yield large savings, even if they aren’t easily quantified. There are also environmental, social, marketing, and employee morale benefits to “doing what’s right”.
- If you know that resource costs are expected to increase in the near future, recalculate the net present value of the project’s benefits.
- If you rent or lease your building but pay the utility bills, work with the building owner to audit the energy and water use. The building owner can pass the costs of improvements on through higher rents, as the current and future building occupants will benefit from lower utility bills.

Other Sources of Financing

If your organization wants to invest in a resource efficiency measure but can't afford it for reasons of cash flow, there are several other resources that might be able to help.

Small Scale Energy Loan Program. The Oregon Department of Energy administers the Small Scale Energy Loan Program (SELP), which provides low-interest, long-term loans for conservation and renewable resource projects. SELP loans can cover eligible equipment costs, construction, certain design and consultant fees, some reserves, construction interest, and most loan closing costs. The loan amount is based on the project cost, security offered, and other financial information. For more information, call SELP at (800) 221-8035, or read the brochures/fliers "Small Scale Energy Loan Program" and "Energy Savings for Cities."

Banks, Investors, and Venture Capitalists. You can also apply for a loan from your local bank, investor or venture capitalist. Be prepared to demonstrate solid proof that your project is a good investment (that the project will pay for itself, and that your company is expected to stay in business over the life of the loan). Plan on paying a premium for handling/processing the loan and the investors' risk.

Equipment Leasing. Instead of borrowing to buy equipment, you may be able to lease the equipment. In order to be cost-effective, the resulting savings should exceed the lease payments. There may also be an option of leasing to buy.

Energy Service Companies. Energy Service Companies (ESCOs) are private companies that will perform energy audits, select and install energy efficiency measures, and monitor the results. ESCOs may pay the up-front installation costs, and bill the customer for monthly payments. The payments are often guaranteed to be less than the energy savings.

Small Business Administration Energy Loan Guarantees. The U.S. Small Business Administration (SBA) is authorized to offer loans to assist small businesses with energy conservation measures under Section 7 (a) (12) of the Small Business Act. However, effective October 1995, appropriations for direct loans have been discontinued. The SBA may be able to guarantee your loan if a bank initially rejects your loan application. Call the Oregon office of the SBA at (503) 326-2682.

Property Owner. If you rent or lease your property, check with your property owner. They may be willing to pay for certain fixed, capital improvements if the costs can be passed on to you and future tenants through higher rents.

Other Financing Sources. The U.S. EPA's Energy Star Program has a database of financing resources for building efficiency measures, including third-party financing sources. Call the Energy Star hotline at (202) 775-6650.

Notes:

Notes:

Accounting Terms and Concepts

To be used by:

- Participants.
- Resource Efficiency Coordinator.

What this tool does:

- Reviews three accounting terms and concepts that may be useful in understanding, explaining, or justifying a proposed resource efficiency measure:
 - Simple payback,
 - Return on investment (ROI), and
 - Net present value.

How to use this tool:

- Read the description of the accounting term for which you are seeking clarification.

Related information can be found in the following tool:

- Funding and Financing.

Simple Payback

Simple payback is a calculation of how quickly an investment will pay itself off. The smaller the simple payback, the faster it pays for itself — and then starts generating pure savings. For example, consider the hypothetical lighting retrofit below:

Retrofit Cost	
Labor	\$5,000
Materials	\$3,000
Permit	<u>\$100</u>
Subtotal (Gross Cost)	\$8,100
Rebate from Utility	\$1,200
Business Energy Tax Credit	\$2,415
Net Cost (Gross Cost minus Rebate, minus Tax Credit)	\$4,485
Annual Savings (reduced electrical bills)	\$1,495
Simple Payback (Net Cost divided by Annual Savings)	3.0 years

Notes:

Simple payback is calculated by dividing the net cost of a project by the projected annual savings. In this example, the business can expect a net cost (investment) of \$4,485. If the retrofit reduces its electricity bills by \$1,495 per year, then the retrofit will pay for itself in exactly 3.0 years. Every year after that, the business will save \$1,495. From an accounting perspective, this dividend (once the investment has been paid off) is pure profit — it's as if someone wrote the business a check for \$1,495 a year.

If you want to account for future rate increases, the payback isn't "simple" anymore. Review the Net Present Value section, below.

Simple Return on Investment (ROI)

The return on investment equals savings divided by investment, and then multiplied by 100 and expressed as a percentage. For example, an investment that costs \$100 but saves a business \$200 has a ROI of 200 percent (\$200 divided by \$100 and multiplied by 100).

If the ROI is larger than 100 percent, the investment is paying out more than you put in. If the ROI is smaller than 100 percent, the investment isn't paying for itself. For a resource efficiency investment to pay for itself, you want a ROI higher than 100 percent.

Clearly, whether or not the ROI is higher than 100 percent depends on the length of the investment horizon. Thus, there are two approaches to calculate the return on investment: annually, or over a longer time frame.

Notes:

Consider two types of investments in resource efficiency:

- Ongoing investment: Monthly inspections of a large cooling tower cost \$100 each, but save \$200 per month in reduced electricity and water costs. Over one year, the “investment” costs \$1,200. Investing in monthly inspections saves \$2,400. So the ROI is 200 percent. Because this is an ongoing investment, the ROI doesn’t change over time. Over five years, the investment would cost \$6,000 and save \$12,000, which is still a ROI of 200 percent.
- One-time investment: A \$4,485 investment in a lighting retrofit will reduce electricity bills by \$1,495/year. In the first year, the ROI is only 33 percent. If, on the other hand, that \$4,485 had been invested in a checking account earning 5 percent interest, the business would have \$4,709 after one year, a 105 percent ROI.

But over three years, the one-time cost of the investment is still \$4,485, but the savings have grown to \$4,485, resulting in a ROI of 100 percent. Over five years, the savings have grown to \$7,475, with an ROI of 166 percent. In contrast, that checking account earning 5 percent interest would only be worth \$5,724 after five years (a 128 percent ROI, due to compounding interest). This illustrates that for one-time investments, ROIs increase over time.

Net Present Value

The “simple payback” and “simple ROI” described above are “simple” in part because they ignore the fact that the value of money changes over time. How would a school calculate the ROI for an irrigation retrofit if it knew that water costs were going to increase 5 percent per year? What if the school had to take out a loan to pay for the retrofit? The concept of “net present value” lets the school compare apples and apples: the value now of future water savings, and the value now of repayment of the loan.

In general, the present value (PV) of X dollars one year from now at an interest rate of i per year is:

$$PV = X/(1+i)$$

Thus, if an investment will return \$110 in one year (X), and the interest rate is 10 percent (i), the present value (PV) of the investment is \$100 ($PV = \$110/(1+.1)$). Put differently, \$110 earned one year from now has the same value as \$100 today.

The present value of X dollars after t years at i percent interest is:

$$PV = X/(1+i)^t$$

Pretend that the irrigation retrofit has an up-front cost of \$3,500 in 1996. If water rates stayed constant, it would save \$1,000 per year. Thus, the retrofit has a simple payback of 3.5 years (\$3,500 divided by \$1,000).

Now pretend that water rates are scheduled to increase at 5 percent per year.

Notes:

<u>Year</u>	<u>Savings, Without Rate Increase</u>	<u>Savings, With Rate Increase</u>
1996	\$1,000	\$1,000
1997	\$1,000	\$1,050
1998	\$1,000	\$1,102
1999	\$1,000	<u>\$1,158</u>
Four-year savings		\$4,310

But is it correct for the school to say “we’ll save \$4,310 over four years?” Yes and no. Yes, because as the table above shows, the school will see its bills reduced by \$4,310 over the four year period. But no, because of net present value. \$4,310 earned over a four year period isn’t the same as having \$4,310 right now. The school may save \$1,158 in 1999. But \$1,158 won’t buy as many books in 1999 as it would in 1996, because inflation impacts other prices as well.

So what’s the net present value of the water savings? To calculate it, let’s assume that the school sees an average inflation of three percent per year, averaged over all expenses (salaries, books, water, etc.).

<u>Year</u>	<u>Savings, With Rate Increase</u>	<u>Net Present Value of Savings</u>
1996	\$1,000	\$1,000
1997	\$1,050	\$1,019
1998	\$1,102	\$1,039
1999	<u>\$1,158</u>	<u>\$1,060</u>
Four-year savings	\$4,310	\$4,118

Accounting Terms and Concepts

Notes:

Because water rates are expected to increase at a faster rate than other expenses for the school, the irrigation retrofit is expected to save \$4,118 a year, in current dollars (its net present value).

But what if the school district didn't have the cash on hand to afford the \$3,500 retrofit, and had to take out a loan? And what if the loan payments, stretched over four years, came to \$4,200 (\$1,100 in years one and two, and \$1,000 in years three and four)? Would the retrofit then cost more than the savings?

Again, finding the correct answer requires comparing the net present value of the loan repayments against the net present value of the water savings. We know from above that the net present value of the water savings (over four years) is \$4,118. The following table shows the actual loan repayments, the net present value of those repayments (again, assuming a three percent average rate of inflation), and the net present value of the savings.

<u>Year</u>	<u>Loan Repayments</u>	<u>Net Present Value</u>	
		<u>Loan Repayments</u>	<u>Savings</u>
1996	\$1,100	\$1,100	\$1,000
1997	\$1,100	\$1,068	\$1,019
1998	\$1,000	\$943	\$1,039
1999	<u>\$1,000</u>	<u>\$915</u>	<u>\$1,060</u>
Four-year payments/savings	\$4,200	\$4,026	\$4,118

The net present value of the \$4,200 loan is only \$4,026. This is less than the net present value of the savings, which are projected to be \$4,118. And of course, the water savings are expected to continue past 1999, whereas the loan should be entirely paid off in four years. In the example, it would be a wise financial choice to invest in the irrigation retrofit.

Resource Accounting Tool

Notes:

To be used by:

- Participating business, school, public agency.
- Resource Efficiency Coordinator.

What this tool does:

- Helps you set up a system for measuring the amount of material, energy, and water you use and the amount of resource savings achieved through implementation of efficiency measures.
- Helps you set up a system for measuring the cost savings associated with the resource efficiency measures implemented for material use, water consumption, and energy consumption.

What this tool does not do:

- Identify or help you measure all costs and/or savings associated with implementing resource efficiency measures, such as avoided disposal costs, or time and labor efficiencies.

How to use this tool:

- Using the material, energy, and water assessment tools, decide which efficiency measures you are going to implement.
- Read the “Overview” section of this tool. This will help you to decide, for each resource use that will be impacted, whether to take a simple or a more advanced approach to resource accounting.
- Use the instructions and worksheets in this tool to set up a tracking system for the amount and cost of the materials, water, and/or energy you use that will be impacted by the efficiency measure(s) you implement. Two worksheets are provided. They are shown in this section, but an 8.5” x 11” copy of each is available in the sleeve at the rear of the notebook. Both worksheets have their own sets of instructions and examples.
 - Worksheet A uses a simpler approach.
 - Worksheet B is slightly more complex, as it takes into account a “normalizing variable” (for example, normalizing the use of packaging as a function of product sales).
- Make blank copies of the original worksheets to use. You may wish to enlarge the worksheets for easier use. If so, copy at 129 percent onto 11” x 17” paper. Each resource impacted will require at least one worksheet. Thus, if you want to track paper, water, and fuel purchases, you’ll need three separate worksheets. In a few cases, a resource efficiency measure may impact more than one resource, thus requiring more than one worksheet. For example, a packaging retrofit which reduces both the use of boxes and loose-fill impacts two resources, so two worksheets may be required.

Resource Accounting Tool

Notes:

- If your resource accounting is complicated by such things as tiered rates (unit costs that change depending on how much of a resource you use), or if you want to use net present value (NPV) calculations, or if you want to normalize your resource use by more than one variable, or by variables which have a non-linear relation to the use of resources, read the “Complications” section at the end of this tool.
- Collect baseline and post-efficiency data. Baseline data refers to data from the base year - a period of time prior to implementing the efficiency measure. Post-efficiency data refers to data after the efficiency measure is implemented.
- Normalize the data (if using worksheet B). Total the resource use amounts and costs, and compare historic and current data to see how successful you are.
- Note any additional measures of success or impacts resulting from the efficiency measure. For example, using fewer resources may reduce your garbage bills, although purchasing impacts are generally more significant. Some resource efficiency measures may also improve time and labor efficiencies. Or a packaging redesign may earn you compliments from your customers. Even if you can't (or don't) quantify these, it is important to note them.
- Continue to monitor the amount of your resource use and costs in order to make future efficiency adjustments and reduce your costs.
- Use the participant promotion tool to promote your successes.
- Provide feedback to your employees so they know how successful their efforts have been. This will motivate them to do more, and make them proud to work here.

Resource Accounting Overview:

Resource accounting is a process for recording and tracking both the amount and costs of the various resources used by facilities. It indicates how efficiently resources are being used, thus reducing waste. Resource accounting allows the comparison of the current level of resource consumption to previous consumption. In some cases, such as energy and water consumption, it also allows comparison to an industry standard.

There are many reasons to account for the use of resources. These include:

- Identify where inefficiencies exist and where conservation efforts can be emphasized.
- Indicate when resource use strays from the average.
- Document and understand your accomplishments.
- Provide feedback to employees and management and generate pride and participation in the program.
- Identify areas for continued improvements.
- Stimulate friendly competition.

Sometimes, simply looking at and understanding how you are billed for resources can yield financial savings. You may find that you are paying for services that you aren't using. In rare cases, you may find that you have been overcharged for resources in the past.

This tool is organized around two worksheets. Both worksheets are accompanied by instructions and an annotated example.

- Worksheet A is the simplest approach to resource accounting. You can use this worksheet if you are tracking a resource where the amount of resource you use is not expected to be influenced by any “outside” factors (variables) you need to account for. For example, if an office installs energy-efficient lights, and doesn't change the hours of operations, then Worksheet A may be appropriate to use, as changes in electricity use may be largely due to the efficiency measure. However, if the hours the lights were left on did change significantly, then Worksheet B would be more appropriate.
- Worksheet B is a slightly more sophisticated approach to resource accounting. This worksheet allows for one normalizing variable, such as the hours your facility operates. Other examples include the quantity of packaging purchased changing as a function of sales, or the amount of water used changing as a function of visitor count. Worksheet B allows you to normalize for one “outside” variable so that you can better determine what the real resource and cost savings are, in contrast to changes due to non-efficiency related factors.

If your resource accounting is complicated by such things as tiered rates (unit costs that change depending on how much of a resource you use), or if you want to use net present value (NPV) calculations or normalize your resource use by more than one variable, or by variables which have a non-linear relation to the use of resources, read the “Complications” section at the end of this tool.

Notes:

Step 1: Deciding What To Measure

- Write down the resource that you will be tracking. Each resource to be tracked requires its own worksheet.
- Throughout this worksheet, avoid filling in the shaded areas.

The key to selecting the best method of measuring your resource efficiencies is to design a system that actually shows the results. Remember your two main goals are to:

- Reduce the use (consumption) of specific materials, water and/or energy.
- Reduce operating costs.

Look at the efficiency measure(s) you have selected to implement and which resources are impacted.

Materials: If your goal in selecting the measure(s) is to reduce the amount of materials used and/or wasted (such as paper, plastic resin, food, cleaning solution, etc., purchased), then you will want to measure:

- The amount of the material(s) purchased or the amount of material(s) throughput over an established timeline.
- The unit and total purchase cost over an established time period.

Energy: If your goal in implementing the measure(s) is to reduce energy consumption, then you will want to measure:

- Kilowatts (kW) and/or kilowatt-hours (kWh) of electricity, therms of gas, or gallons of oil used. Note that most electrical utilities charge larger customers (and sometimes smaller ones, too) for both peak kilowatts (demand) and kilowatt-hours (use/consumption), so in order to show energy savings you may need to track both, which may require the use of two separate worksheets.
- Cost per unit and total cost over an established time period.

Water: If your goal in selecting the measure(s) is to reduce water consumption then you will want to measure:

- Actual gallons (or “hundred cubic feet” [hcf]) of water used.
- Cost per unit and total cost over an established time period/dollars saved. Note that many water utilities charge separately for water use and wastewater discharge. However, water use is typically metered, while wastewater discharge is not. Different utilities have different methods for correlating the two: some assume that water in equals water out, while others accommodate summertime irrigation by estimating summertime waste water discharge based on non-summer water use.

Notes:

Notes:

Step 2: Define Monitoring Period

Write the base year and the post-efficiency year for which you will collect information and evaluate resource use, unit costs, and total costs. Your collection and analysis of data will begin at the start of the base year, and will end at the end of the post-efficiency year.

The “base year” refers to a period of time, and the “baseline” means the level of use and/or cost for that period of time. The base year is usually the 12-month period prior to implementing your resource efficiency measure. The post-efficiency year is usually the 12-month period following the implementation of the resource efficiency measure. These periods can be calendar years, business/fiscal years, or any other convenient period - even more or less than 12 months, if desired. The base year and post-efficiency year also do not need to be consecutive. For example, an efficiency measure implemented in mid-1996 could be accounted for with a base year of 1995 and a post-efficiency year of 1997.

Step 3: Define Sources of Data

List where you will obtain monthly (or other regular) data about the amount of resource used or purchased, its unit cost, and the total cost. Note that “unit cost” refers to the cost of one unit (for example, the cost of one box), while “total cost” refers to the total expenditures for all of a resource (for example, the amount of money spent purchasing all 5,000 boxes).

Most of the information you will need to set up your resource accounting baseline and tracking will come from utility bills and purchasing records or accounts payable.

- **Materials:** Look at your purchasing records for quantity, total cost, and unit cost of specific materials purchased during an established time period. If there are seasonal variations in your operations and/or use of certain materials you will need to define a base “year” and a post-efficiency “year” long enough and with the right start- and end-dates to account for such changes.
- **Energy:** The quantity of kWh, kW, therms, and/or gallons sold and the total and unit costs can be found on your utility bills. If you do not have back records for establishing the baseline, your utility provider can usually provide you with copies or a computer print-out for this purpose. Electricity and natural gas are metered, so kWh, kW, and therms sold equals kWh, kW, and therms used. Fuel oil is a little trickier, as it isn’t metered as it is used — only when it is sold.

Many buildings use more than one energy source: natural gas (for heating) and electricity (for everything else) is a common combination, for example. If you want to look at total energy consumption, you can convert everything to a common unit of measurement: typically a British Thermal Unit (BTU). A BTU is a very small amount of energy. To convert energy usage to BTU, refer to the following table.

Energy Unit Conversion Table

<u>Energy Resource</u>	<u>Unit</u>	<u>Conversion to BTUs</u>
Electricity (use)	kWh	3,413 BTU/kWh
Natural gas	therms	100,000 BTU/therm
Oil #1&2	gallons	138,690 BTU/gallon
Oil #4,5&6	gallons	149,690 BTU/gallon
Diesel	gallons	135,000 BTU/gallon
Gasoline	gallons	140,000 BTU/gallon

- Water: The water/sewer bills should contain the gallons of water used (or hundred cubic feet [hcf]; 1 hcf = 748 gallons), unit costs, and overall cost for the billing cycle. If you have both indoor domestic use of water, such as sinks, toilets, dishwashers, etc. and also outdoor irrigation uses, you may wish to get a breakdown of gallons used for different purposes depending on the efficiency measure(s) you are implementing. This will only be available if your facility has a separate irrigation meter. Multiple meters at one site are typically only found at larger facilities, such as municipal buildings, schools, and large businesses. Your local water utility should be able to help you with this.

Step 4: Collect Baseline Data

First, list up to twelve months for which you will evaluate baseline data. In the second column (B), list the quantities of resource used in each month. In the third column (C), list the unit cost that month. And in the fourth column (D), multiply the resource use (B) by the unit cost (C) to determine total cost for each month.

At the end of the base year, total the amount of resource used (B) and the total cost (D) for the year. Unit costs cannot be totaled.

Data does not necessarily have to be shown on a monthly basis. Quarterly or other record keeping can also be used.

It is important that the information is recorded in a manner that does not leave any gaps between the end and start dates that make up the billing and purchasing records.

- Materials: use dollars and quantity, weight or volume of material.
- Energy: use dollars and kWh, kW, therms, gallons, or conversion to BTUs.
- Water: use dollars and gallons (or hcf).

Notes:

Notes:

Step 5: Collect Post-Efficiency Data

This step is identical to Step 4, except that now data is collected for 12 months (or other time periods) following the implementation of the resource efficiency measure. First, list the twelve months for which you will evaluate post-efficiency data. In the second column (G), list the quantity of resource used in each month. In the third column (H), list the unit cost that month. And in the fourth column (I), multiply the resource use (G) by the unit cost (H) to determine total cost for each month.

At the end of the post-efficiency year, total the amount of resource used (G) and the total cost (I) for the year. Unit costs cannot be totaled.

Step 6: Compare Resource Use

For each of the twelve months, subtract the quantity of resources used in the post-efficiency year (column G) from the quantity of resources used in the corresponding month of the base year (column B). A positive number indicates that you reduced your use of the resource in that month. A negative number indicates that you increased your use of the resource in that month.

Sum up the “Resource Savings” over the twelve months and put it in the row labeled “TOTAL” at the bottom of Step 6 (column L). This is the annual reduction in use of the resource.

To check your math, this total should equal the total of column B minus the total of column G. If it doesn’t, re-check your calculations.

Step 7: Compare Costs

For each of the twelve months, first calculate how much you would have spent in the post-efficiency year if you would have used resources at the level you did before efficiency. This is done by multiplying the pre-efficiency (baseline) resource use (column B) by the post-efficiency unit price (column H). Enter the results for each month in column M, “New Cost Without Efficiency”. Total the monthly cost to obtain the total annual cost.

Finally, subtract the total cost in the post-efficiency year (column I) from how much you would have spent without efficiency (column M). Enter the results for each month in column N. A positive number indicates savings. A negative number indicates increased cost. Total the twelve months of column N to obtain the total annual savings.

Optional Shortcut: If resource use and total cost data are available on an annual basis, and if unit prices do not change over the course of a year, it is possible to skip filling in each individual month in Steps 4 through 7, and simply fill out the “total” row in each step. This will save considerable time; what is lost is the ability to evaluate any seasonal changes in data.

Example: Lighting Retrofit

This example shows the use of Worksheet A for a hypothetical lighting retrofit.

Notes:

**Worksheet A: Resource Accounting Without Variable
Example: Lighting Retrofit**

		Resource Use	Unit Price	Total Cost
Step 1 Decide what to measure		kWH		
Step 2 Define monitoring period		1995 <---Base year (pre-efficiency)		
		1997 <---Post-efficiency year		
Step 3 Define sources of data		utility bill	utility bill	utility bill
Step 4 Collect baseline (pre-efficiency) data		(B)	(C)	(D = B X C)
(1)	January	40,000	\$0.05	\$2,000
(2)	February	45,000	\$0.05	\$2,250
(3)	March	42,000	\$0.05	\$2,100
(4)	etc.			
(5)				
(6)				
(7)				
(8)				
(9)				
(10)				
(11)				
(12)				
TOTAL		127,000		\$6,350
Step 5 Collect post-efficiency data		(G)	(H)	(I = G X H)
(1)	January	37,000	\$0.055	\$2,035
(2)	February	40,000	\$0.055	\$2,200
(3)	March	38,000	\$0.055	\$2,090
(4)	etc.			
(5)				
(6)				
(7)				
(8)				
(9)				
(10)				
(11)				
(12)				
TOTAL		115,000		\$6,325
Step 6 Compare resource use		Resource Savings (L = B - G)	New Cost Without Efficiency (M = B X H)	Savings (N = M - I)
(B1 - G1)	3,000		\$2,200	\$165
(B2 - G2)	5,000		\$2,475	\$275
(B3 - G3)	4,000		\$2,310	\$220
etc.				
TOTAL	12,000	TOTAL	\$6,985	\$660

Notes:

Step 1: Deciding What To Measure

Because this is a lighting retrofit, resources saved will be consumption (measured in kWh), and possibly demand (measured in kW). In this example, Worksheet A is used to account for savings in energy consumption (kWh). Accounting of demand savings (kW) could be accomplished using a second worksheet.

Step 2: Define Monitoring Period

In this hypothetical example, the facility conducted a lighting retrofit in 1996. The base year was defined as the calendar year 1995, and the post-efficiency year was defined as the calendar year 1997.

Step 3: Define Sources of Data

Resource use, unit price, and total cost data are all obtained from the utility bill.

Step 4: Collect Baseline Data

In this example, only data for the first three months is shown. The amount of kWh used in January, February, and March of the base year (1995) is 40,000 kWh, 45,000 kWh, and 42,000 kWh, respectively. The unit price stayed constant at \$0.05 per kWh. The final column multiplies use by unit price to determine monthly cost. The final row adds the first three months for a quarterly total. In the first quarter of 1995, the facility used 127,000 kWh of electricity, at a cost of \$6,350.

Step 5: Collect Post-Efficiency Data

In this example, electricity use for the first three months of 1997 is 37,000 kWh, 40,000 kWh, and 38,000 kWh, for a total of 115,000 kWh. Note that the unit cost has increased from the base year to \$0.055 per kWh. The total cost for the first quarter of 1997 is \$6,325.

Step 6: Compare Resource Use

In January of 1995, 40,000 kWh were used (B1). In January of 1997, 37,000 kWh were used (G1). The resource savings are thus 3,000 kWh for the month of January. Because the number is positive, it indicates that the amount of resources used has decreased.

Monthly savings of 3,000 kWh, 5,000 kWh, and 4,000 kWh are summed together for a total of 12,000 kWh for the first quarter. This is the same as the total first quarter for 1995 (127,000 kWh) minus the total first quarter for 1996 (115,000), indicating that the math is correct.

Step 7: Compare Costs

In January of 1997, the unit cost of a kWh of electricity was \$0.055 (H1). This is multiplied by the resource use in January 1995 (40,000 kWh; B1) to show that if the facility had used resources in January 1997 at 1995 (base year) levels, but at current (1997) prices, it would have cost \$2,200 for the month.

This step is repeated for February and March, and the costs are totaled at \$6,985. This is how much the facility would have paid in the first quarter of 1997, had it used the same amount of electricity as in the first quarter of 1995.

In the final column (column N), each month's real total cost for the post-efficiency year (column I) is subtracted from the previous calculation (column M). For example, in January of 1997, the facility actually paid \$2,035 (I1). Without efficiency, it would have paid \$2,200 (M1). The savings is thus \$165 (N1). These monthly savings are summed together for a total savings of \$660. This is how much money the facility saved on electricity charges (excluding demand [kW] fees, as noted earlier).

This example illustrates the importance of tracking both resource use and unit prices. If the facility simply compared how much it spent (total costs) in the first quarters of 1997 (\$6,325; column I) and 1995 (\$6,350; column D), it would incorrectly conclude that efficiency had only saved it \$25. This is because price increases almost completely made up for savings due to efficiency. But in reality, without the efficiency measures, the facility would have seen its expenses increase by \$660.

Notes:

Worksheet B uses many of the same calculations as Worksheet A, but is made more accurate through the introduction of a “normalizing variable” to account for changes in resource use due to a non-efficiency related factor, such as increased sales, increased employment, or weather.

Step 1: Deciding What To Measure

Write down the resource that you will be tracking. Each resource to be tracked requires its own worksheet. See the description of this step for Worksheet A for a more detailed discussion on deciding what to measure. Throughout this worksheet, avoid filling in the shaded areas.

Also in Step 1, identify the single variable that you will use to account for non-efficiency related changes. Examples include:

- Heating degree days (the measure of heating requirements due to outside temperature) as the variable of natural gas or oil use. (See “Complications” at the end of this tool for more information on heating degree days.)
- Precipitation as the variable of water used for irrigation.
- Visitor counts as the variable of water used in a public facility (such as a conference center) where the majority of water is used in restrooms.
- Hours of operation as the variable of electricity use, if most electricity goes to lights and equipment which are only on when the building is occupied.
- Employees as the variable for the use of office supplies, such as paper.
- Sales volume as the variable for the use of packaging materials.

Choosing the best variable:

Sometimes, you’ll have more than one variable to choose from. In these cases, think about which variable is more closely correlated to the resource use in question.

For example, a medical supply company interested in measuring packaging reductions could use company employment, sales volumes (in number of shipments), or sales volumes (in dollars) as the variable. The question is: which of these variables is most closely related to the amount of packaging used?

- Company employment would be a good variable only if sales volumes grow at the same rate that employment grows. For example, if the facility is part of a national company, and is selected for the company’s new customer service center, employment would grow, but this increase in employment would have little correlation to the amount of packaging used in the local warehouse. Or what if the packaging change also led to labor efficiencies, thus reducing packaging waste and employment at the same time?
- Sales volume (in number of shipments) would be a good variable if the data is easily obtained. In this case, the variable could be the number of shipments, or the number of products shipped, since some shipments may contain more than one product.

Notes:

Resource Accounting Tool

Notes:

- Sales volume (in dollars of sales) may be a good variable, if prices and the company's product mix don't change significantly. Product prices are not related to the amount of packaging used — the price of a product could change due to competition but the amount of packaging isn't impacted. Similarly, if the company moves away from high-volume, low-cost items (gauze) with lots of packaging to low-volume, high-cost items (pharmaceuticals), the amount of packaging could decrease or stay the same while sales volumes (in dollars) increase. This is not a true efficiency: the hospitals are still buying gauze (and all of the associated packaging), just not from the supply company in question. Regardless of what variable you choose, bear in mind that this method is rarely 100 percent accurate. Real life and the factors that influence how resources are used, are typically much more complicated than this tool tries to account for. Results should always be evaluated with a dose of healthy skepticism.

Sometimes, there is no single "best" variable. In cases like these, a facility has three choices:

- Pick the single variable thought to be the best, and use this variable in Worksheet B.
- Pick two or more variables, and complete Worksheet B one time for each variable.
- Pick two or more variables, and attempt to normalize resource use for both variables simultaneously using linear regression, or some other method. See "Complications" at the end of this tool for more on this approach.

Step 2: Define Monitoring Period

Write the base year and the post-efficiency year for which you will collect and evaluate resource use, unit costs, total costs, and the chosen variable. Your collection and analysis of data will begin at the start of the base year, and will end at the end of the post-efficiency year.

The "base year" refers to a period of time, and the "baseline" means the level of use and/or cost for that period of time. The base year is usually the 12-month period prior to implementing your resource efficiency measure. The post-efficiency year is usually the 12-month period following the implementation of the resource efficiency measure. These periods can be calendar years, business/fiscal years, or any other convenient period — even more or less than 12 months, if desired.

Step 3: Define Sources of Data

List where you will obtain monthly (or other regular) data about the amount of resource used or purchased, its unit cost, the total cost, and the chosen variable. Note that "unit cost" refers to the cost of one unit (for example, the cost of one box), while "total cost" refers to the total expenditures for all of a resource (for example, the amount of money spent purchasing all 5,000 boxes). See the description of this step for Worksheet A for a more detailed discussion of data sources.

Step 4: Collect Baseline Data

First, list up to twelve months for which you will evaluate baseline data. In the second column (B), list the quantities of resource used in each month. In the third column (C), list the unit cost that month. In the fourth column (D), multiply the resource use (B) by the unit cost (C) to determine total cost for each month. And in the final column (E), enter the variable (hours of operation, heating degree days, sales, shipments, employment, etc.) for that month.

At the end of the base year, total the amount of resource used (B), the total cost (D), and the variable (E) for the year. You cannot total unit costs (C).

Data does not necessarily have to be shown on a monthly basis. Quarterly or other record keeping can also be used. It is important that the information is recorded in a manner that does not leave any gaps between the end and start dates that make up the billing and purchasing records.

Step 5: Normalize Baseline Data

This step is unique to Worksheet B. In column F, divide the amount of resource used (column B) by the variable (column E) for that month. This is a measure of how many resources are used per variable in each month. This calculation is referenced in subsequent steps.

The average (last row) is calculated by dividing the total amount of resource used in the year (from step 4, column B) by the total variable for the year (from step 4, column E). Do not attempt to calculate the average by taking a simple average (mean) of the monthly normalized baseline (from step 5), as these monthly averages have not been weighted.

Step 6: Collect Post-Efficiency Data

This step is identical to Step 4, except that now data is collected for 12 months (or other time periods) following the implementation of the resource efficiency measure. First, list the twelve months for which you will evaluate post-efficiency data. In the second column (G), list the quantities of resource used in each month. In the third column (H), list the unit cost that month. In the fourth column (I), multiply the resource use (G) by the unit cost (H) to determine total cost for each month. And in the final column (J), enter the variable (hours of operation, heating degree days, sales, shipments, employment, etc.) for that month.

At the end of the post-efficiency year, total the amount of resource used (G), the total cost (I), and the variable (J) for the year. You cannot total unit costs (H).

Notes:

Notes:

Step 7: Compare Resource Use

First, in column K, calculate how much of the resource you would have used in the post-efficiency year, if your per-variable use had not changed from the base year. This is done by multiplying data from column F by the corresponding month in column J, for each of the twelve months. Summing the results shows how much of the resource you would have used without efficiency, given new circumstances (employment, sales, temperature, etc.).

Second, in column L, calculate the actual savings by subtracting the quantity of resources actually used in the post-efficiency year (column G) from the quantity of resources that would have been used in that year without efficiency (column K). Summing the results shows the annual savings. A positive number indicates that you reduced your use of the resource. A negative number indicates that you increased your use of the resource.

As a check, the total of column L should equal the total of column K minus the total of column G. If it doesn't, check the calculations.

Step 8: Compare Costs

For each of the twelve months, first calculate how much you would have spent in the post-efficiency year if you would have used resources at the level you did before efficiency, but given more recent unit costs and normalizing variables. This is done by multiplying the pre-efficiency (baseline) resource use, normalized and adjusted for post-efficiency conditions (column K) by the post-efficiency unit price (column H). Enter the results for each month in column M, "New Cost Without Efficiency". Total the monthly cost to obtain the total annual cost.

Finally, subtract the total cost in the post-efficiency year (column I) from how much you would have spent without efficiency (column M). Enter the results for each month in column N. A positive number indicates savings. A negative number indicates increased cost. Total the twelve months of column N to obtain the total annual savings.

Optional Shortcut: If resource use, total cost, and variable data is available on an annual basis, and if unit prices do not change over the course of a year, it is possible to skip filling in each individual month in Steps 4 through 8, and simply fill out the "total" row in each step. The annual "average" from column F would be applied in the calculation in column K in lieu of monthly data. This will save considerable time; what is lost is the ability to evaluate any seasonal changes in data.

Example: Packaging Efficiency

Example: Packaging Redesign (variable: number of shipments)

Notes:

		Resource Use	Unit Price	Total Cost	Variable		
Step 1	Decide what to measure	number of small boxes			# of shipments		
Step 2	Define monitoring period	11/96 - 10/97	←-Base year (pre-efficiency)				
		11/97 - 10/98	←-Post-efficiency year				
Step 3	Define sources of data	invoices, calculations	invoices	calculation	shipping database	Normalized Baseline Resource Use	
Step 4	Collect baseline (pre-efficiency) data	(month)	(B)	(C)	(D = B X C)	(E)	Step 5
	(1)	November	300	\$0.50	\$150	100	Normalize (F = B/E)
	(2)	December	280	\$0.50	\$140	95	3.00
	(3)	January	290	\$0.50	\$145	105	2.95
	(4)	February	330	\$0.50	\$165	115	2.76
	(5)	March	420	\$0.48	\$202	135	2.87
	(6)	April	410	\$0.48	\$197	140	3.11
	(7)	May	450	\$0.48	\$216	150	2.93
	(8)	June	480	\$0.42	\$202	165	3.00
	(9)	July	440	\$0.42	\$185	160	2.91
	(10)	August	390	\$0.42	\$164	125	2.75
	(11)	September	370	\$0.42	\$155	120	3.12
	(12)	October	350	\$0.42	\$147	115	3.08
	TOTAL		4510		\$2,067	1525	3.04
							AVERAGE
							2.96

		(month)	(G)	(H)	(I = G X H)	(J)
Step 6	Collect post-efficiency data	(1)	November	300	\$0.35	\$105
		(2)	December	250	\$0.35	\$88
		(3)	January	320	\$0.35	\$112
		(4)	February	320	\$0.35	\$112
		(5)	March	350	\$0.35	\$123
		(6)	April	380	\$0.38	\$144
		(7)	May	370	\$0.38	\$141
		(8)	June	390	\$0.38	\$148
		(9)	July	400	\$0.38	\$152
		(10)	August	350	\$0.40	\$140
		(11)	September	325	\$0.40	\$130
		(12)	October	290	\$0.40	\$116
	TOTAL		4045		\$1,510	2290

		Resource Use		Financial Impact		
		Without New Efficiencies	Savings	New Cost Without Efficiency	Savings	
		(K = F X J)	(L = K - G)	(M = K X H)	(N = M - I)	
Step 7	Compare resource use	(1)	450	150	\$158	\$53
		(2)	354	104	\$124	\$36
		(3)	470	150	\$164	\$52
		(4)	517	197	\$181	\$69
		(5)	607	257	\$212	\$90
		(6)	644	264	\$245	\$100
		(7)	630	260	\$239	\$99
		(8)	698	308	\$265	\$117
		(9)	591	191	\$225	\$73
		(10)	686	336	\$275	\$135
		(11)	586	261	\$234	\$104
		(12)	548	258	\$219	\$103
	TOTAL	6780	2735	\$2,541	\$1,031	

In this example, Jones Medical Supply Company fills orders for doctors' offices by repacking medical supplies received from manufacturers. Shipments are sent in large boxes; a typical large box may contain several small boxes. In November of 1997, Jones Medical changed its packaging procedure to use fewer smaller boxes. This example shows the impact of this change on the purchase and use of smaller boxes.

Notes:

Step 1: Deciding What To Measure

Because this is a packaging change, resources saved will be smaller boxes (measured in number of boxes or pounds of packaging). The use of fewer smaller boxes, may also result in fewer larger (shipping) boxes and other packaging (loose fill “peanuts”, bubble wrap, etc.). In this example, Worksheet B is used to account for savings in smaller boxes. Accounting of larger (shipping) boxes or other packaging could be accomplished using a second worksheet and following the same accounting process.

The variable that will be used to normalize the number of boxes is the number of shipments.

Step 2: Define Monitoring Period

In this hypothetical example, the company changed packaging in November 1997. The base year was defined as the twelve months preceding the change (November 1996 to October 1997), and the post-efficiency year was defined as the following twelve months (November 1997 to October 1998).

Step 3: Define Sources of Data

In this example, the number of boxes purchased and the unit price of the boxes is determined by reviewing invoices from the box supplier. The total cost is a calculation (number of boxes multiplied by unit cost). The variable (number of shipments per month) comes from the company’s shipping database.

Step 4: Collect Baseline Data

In this example, data for all twelve months is shown. In November 1996, for example, the company used 300 small boxes that cost \$0.50 each, for a total cost of \$150. These 300 boxes were used to make 100 shipments.

Over the course of the entire base year, the company used 4,510 small boxes at a total cost of \$2,067. The unit cost varied throughout the year. A total of 1,525 shipments were sent.

Step 5: Normalize Baseline Data

In the first month (November), 300 small boxes were used to send 100 shipments. This results in a normalized baseline of 3.00 small boxes per shipment. Looking at annual totals, the company used 2.96 small boxes per shipment, on average.

Step 6: Collect Post-Efficiency Data

In this example, data for all twelve months is again shown. In December 1997, for example, the company used 250 small boxes that cost \$0.35 each, for a total cost of \$88. These 250 boxes were used to make 120 shipments.

Over the course of the entire base year, the company used 4,045 small boxes at a total cost of \$1,510. The unit cost varied throughout the year. A total of 2,290 shipments were sent. Thus, the company slightly reduced its use of small boxes (from 4,510 to 4,045) and reduced its total costs (from \$2,067 to \$1,510), despite increasing the number of shipments (from 1,525 to 2,290). The decreased use of small boxes it attributed solely to the efficiency measure. The decreased cost is a result of both using fewer boxes, and a (hypothetical) lower unit cost for boxes in the post-efficiency year.

Notes:

Step 7: Compare Resource Use

Column K shows that without the efficiency measure, Jones Medical would have used 450 small boxes in November 1997. This is because the company used to purchase 3.00 boxes per shipment (in November 1996, see F1), and made 150 shipments in November 1997 (see J1).

Column L shows that Jones Medical thus saved 150 small boxes in November 1997. This is the difference between what would have been used without efficiency (450 boxes; K1), and what was actually used (300 boxes; G1).

Similarly, for the entire year, Jones Medical saved 2,735 boxes (column L). Without resource efficiency, it would have used 6,780 (column K). The company actually used 4,045 (column G).

There is an alternative method of calculating the savings that yields slightly different results. This involves multiplying the post-efficiency normalizing variable (column J) against the *average monthly* normalized use (last row of column F), rather than the monthly normalized use. In this case, the average monthly normalized use was 2.96 boxes per shipment. Multiplying by 2,290 shipments (last row of column J) yields a total resource use without new efficiencies of 6,778 boxes - a difference from the previous calculation of two boxes. This difference would be more pronounced if the seasonal change in business differed between the two years.

Step 8: Compare Costs

Column M shows that in November 1997, Jones Medical would have spent \$158 on small boxes had it not made the change to efficiency. This is calculated by multiplying the number of boxes that would have been used without efficiency (450; K1) by the unit cost of boxes in November 1997 (\$0.35/box; H1). Note that had unit costs not gone down in 1997, the total cost of boxes would have been higher.

Column N shows that the efficiency change saved Jones Medical \$53 in box costs in November 1997. This is the difference between what would have been paid without efficiency (\$158; M1) and what was actually paid (\$105; I1).

Over the course of the post-efficiency year, Jones Medical enjoyed savings of \$1,031. Again, had the cost of boxes stayed constant or increased from the base year to the post-efficiency year, savings would have been even more significant.

Notes:

Complications

The preceding instructions, worksheets, and examples are for relatively straight-forward resource accounting applications. In cases where resource use is impacted by many variables, or the accuracy of data is questionable, the results of these resource accounting methods will be crude and should be viewed as estimates - not the Absolute Truth. This section briefly describes how the worksheets can be modified for more complicated situations, depending on your operation and your need and use for measuring resource use and costs.

- **Tiered Rates:** Some resources may be sold under tiered rates, where the unit cost is a function of how much of the resource is purchased. The most common example of tiered rates is electricity, where a business may pay one rate per kWh for the first 3,000 kWh per month, and then a slightly lower rate for additional energy. A less common, but still possible, example would be a company that gets a price break if it purchases more than a certain amount of materials.

Tiered rates can be accommodated by splitting each of the rows in Steps 4 through 8 in Worksheet B. For example, if the resource use is kWh, and the unit costs are different above and below 3,000 kWh, then for each month, the facility could record the first 3,000 kWh at the higher rate, and any additional kWh at the lower rate.

- **Non-Linear Variable:** Some normalizing variables clearly do not have a linear relationship with their associated resource use. An example of a fairly linear relationship is customer visits and use of take-out bags at a fast food restaurant. If the number of customers doubles, the number of take-out bags is expected to roughly double as well.

In contrast, an example of a non-linear relationship is outside temperature and fuel or electricity use for cooling or heating. Consider a facility with electric air conditioning. In this building, the air conditioner only comes on if the outside temperature rises above 70 degrees Fahrenheit. (In reality, large commercial buildings have tremendous “heat load” from computers, lighting, equipment, and people, so the air conditioner may be required at outside temperatures as low as 50 degrees Fahrenheit.) If the temperature is 80 degrees Fahrenheit for the entire month, 2,000 kWh are used for cooling. So does it require a doubling of temperature (to 160 degrees Fahrenheit) to double the use of electricity to 4,000 kWh? Obviously not!

Non-linear variables can be accounted for by changing the calculation in columns F and K from simple division and multiplication to a function that more accurately reflects the relationship between the normalizing variable and the resource use.

In the example of cooling and heating, energy analysts have developed the concepts of “heating degree days” and “cooling degree days.” A heating degree day is defined as the difference between 65 degrees Fahrenheit and the average of the high and low temperatures in a given day. The higher the number, the more energy is needed for heating. Rather than dividing fuel use by average

outside temperature, it is more accurate (although still not entirely so) to divide by heating degree days.

For example, if the high temperature on January 1 is 60 degrees and the low temperature is 30 degrees, then January 1 is a 20-degree-day day (65 minus the average of 60 and 30). If the high temperature on March 1 is 70 degrees and the low temperature 50 degrees, then March 1 is a 5-degree-day day (65 minus the average of 70 and 50). Heating degree days are roughly correlated to the amount of energy needed to heat a building. Thus, January 1 would require roughly four times as much energy for heating than March 1 (20-degree-day versus 5-degree-day).

The Oregon State University Climatology Center ([541] 737-5705) can provide the heating degree days, by day, month, or year, for 30 weather stations located across Oregon. For reference, the 30-year rolling average for Portland, last updated in 1990, is 4,520 heating-degree-days per year. This compares to approximately 500 for Miami and 8,000 for Minneapolis!

- **Multiple Variables:** As an example of a resource use that could be impacted by more than one variable, consider the use of water to irrigate a city park. The amount of water used will depend on temperature *and* rainfall. One approach would be to fill out Worksheet B twice - once with temperature as the variable, and once with rainfall as the variable, and pick the result that seems the most realistic. (Note, however, that the relationship of irrigation water to both temperature and rainfall is probably not linear, so the calculations in columns F and K would require some additional tinkering, as described above). A second approach would be to alter the calculations in columns F and K using a multi-variable equation that could be derived using linear regression. This tool will not explain how to conduct linear regression analysis. If you aren't familiar with this type of analysis, dust off that college statistics textbook, or get someone to help you.
- **Net Present Value:** Even if unit prices do not change from the base year to the post-efficiency year, the real value of money may change as a result of inflation. For more information on this concept, review the "Accounting Terms and Concepts" tool.

Notes:

Notes:

Participant Promotion

To be used by:

- Participants.

What this tool does:

- Provides guidelines for promoting one's own resource efficiency accomplishments to the general public, including customers.
- Provides suggestions for different promotional methods.

What this tool doesn't do:

- This tool is not intended for a community-wide program to promote the program or recognize participants. For ideas about promoting resource efficiency within an organization, go to the Involving Employees tool. For ideas about promoting the program, go to the Community Promotion tool in the community tools.

How to use this tool:

- Review the suggestions and tailor your own promotional activities as appropriate.

Related information can be found in these other tools:

- Involving Employees (Participant tools).
- Community promotion (Community tools).

Why Promote?

- Your customers (or taxpayers, as the case may be) may appreciate knowing that you are pitching in to help the environment and reducing or controlling costs, which translates into savings for them.
- Potential customers may choose to do business with you because of your commitment to the environment and community quality of life.
- Your peers may be able to learn from what you've done to implement similar resource efficiency measures themselves.
- Good publicity about a company can improve employee morale.

Ideas for Promotion

- If you use recycled paper or non-petroleum inks (soy inks) in your stationery, business cards, or forms, say so. Clear/white chasing arrows on a black circular background means "recycled materials".
- If your customers end up with packaging from your store/distribution system, label it (as appropriate) as redesigned to make less waste, reusable, recyclable, and/or containing recycled materials.
- If you mail customers return envelopes, use two-way envelopes, and label them as reusable to reduce waste.
- If your facility includes energy-efficient or water-saving features, or uses recycled content building materials, feature them with a small sign or plaque.
- Donate proceeds or savings from your resource efficiency efforts to your employees' favorite local charity.
- Print a short brochure, table tent, or other material that summarizes the accomplishments of your resource efficiency measures.
- If you're a retailer, highlight products you sell that have resource efficiency attributes. Use special labels, or feature them in advertising as a loss-leader or "resource-wise product of the month".
- If your accomplishments are exceptional by the standards of your community, issue a press release. A sample is attached in the Appendix.
- If you are planning an activity as part of your resource efficiency program that has visual interest, invite the media. A sample media alert is attached in the Appendix.

A Few Words of Warning

- Avoid inaccurate or potentially misleading statements, particularly surrounding products which your company manufactures or distributes.
- The Federal Trade Commission has issued guidelines on environmental product marketing claims. You may want to read these if you have questions.

Notes: