

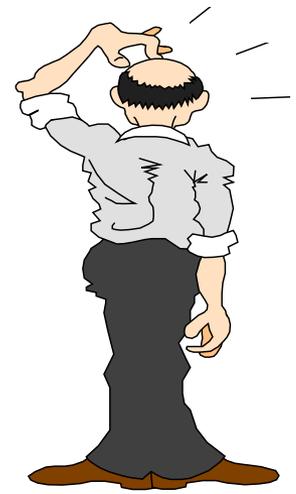
Introduction

**Employee
P2 Awareness
Training***

***Note: These Slides are in black and white as to allow individual facility artistry**

**The best way to reduce
pollution is to prevent it in
the first place.**

Why We Are Here?



- To make employees aware of the value of Pollution Prevention (P2) in order to involve employees in P2 planning and implementation to the maximum extent feasible
- (Employees include all management, maintenance, engineering, quality control, warehousing, accounting, and operations staff and may include others.)
- To provide employees information about P2 so they can go forth and look for P2 opportunities in their work areas individually and as P2 team members
- To learn how to provide P2 ideas to management
- To understand that management supports and encourages employee P2 ideas and that management wants employees to help improve the workplace and the environment and the help implement the facility's P2 plan.

Expectations

This training on pollution prevention will enable employees to:

- Define the concept of pollution prevention
- Recognize the environmental management hierarchy and priority
- Understand Source Reduction
- Show understanding of pollution prevention concepts and methods
- Describe the pollution prevention benefits
- Understand where P2 opportunities may be found and some of the online for pollution prevention resources
- Understand facility management's pollution prevention policy & management's unwavering support to urge P2 ideas from employees
- Recognize employees' pollution prevention responsibilities
- Understand management's desire that employees participate in pollution prevention idea generation and implementation support
- Acknowledge the employees pollution prevention effort recognition program
- Understand that pollution prevention ideas may be found in many areas including in revising/improving Operating Practices/Procedures, Inventory Control, Spill and Leak Prevention, Process Modifications to save energy & waste, Cleaning and Degreasing methods, equipment and products, Surface Preparation and Finishing equipment, methods and products, Product Modifications to minimize or eliminate waste and conserve materials, Energy Efficiency (electricity, natural gas), and Lighting.
- Recognize and Understand the company's current pollution prevention efforts and initiatives
- Be aware of the company's past pollution prevention successes
- Inform employees of specific environmental issues creating pollution at the workplace.

Part 1

Pollution Prevention: A Sensible Approach for Business

Fact: We Live in a Chemical
Environment.

We inhale, ingest or absorb
many of these chemicals.

We create lots of Waste!

What is Pollution?

- **Pollution** is waste. A waste of material which you or your company paid for.
- Basically, pollution is when we have stuff where we don't want it or we don't use it efficiently.
- Some types of pollution in our environment are:
 - Air Pollution
 - Water Pollution
 - Land Pollution
 - Noise Pollution
 - Light Pollution
 - Radioactive Pollution

Why Pollution?

We have pollution because:

- We fail to choose alternatives.
- We have not researched for alternatives, or communicated about potential alternatives with others.
- Alternatives are not yet technically feasible.
- We are not willing to spend the money on the alternative.

Pollution – Where?

Pollution may arise from many, many sources:

- Electricity generation
- Constructing Buildings and Roads
- Packaging on Products
- Animal Feed Lots
- Manufacturing Processes
- Evaporating Chemicals
- Spilling, Pouring or Leaking Chemicals
- Untreated waste
- Paint Spraying and Paint Solvents
- Cleaning products evaporating, spilling, or being inhaled.
- Automobile exhaust
- Garbage

Pollution Examples

United States is #1 with 20 tons of Carbon Dioxide produced per capita from energy use.

- Arizona is #24

United States is #1 with 760 kg per person per year of municipal waste generation.

United States is #4 with 460 kg per person per year of waste generation.

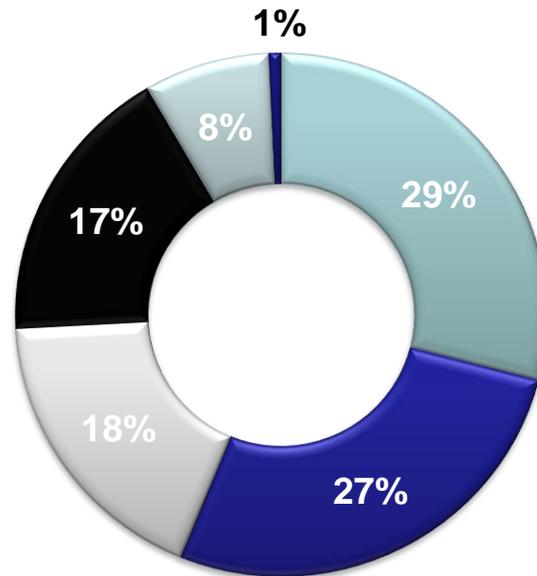
United States is #1 with 18,690,000 bbl/day oil use.

Ref: <http://www.nationmaster.com/cat/env-environment>

Greenhouse Gasses

U.S Greenhouse Gas Emissions by Economic Sector with Electricity-Related Emissions Distributed (2009, CO₂ Eq.)

- Industry
- Commercial
- Agriculture
- Transportation
- Residential
- U.S. Territories

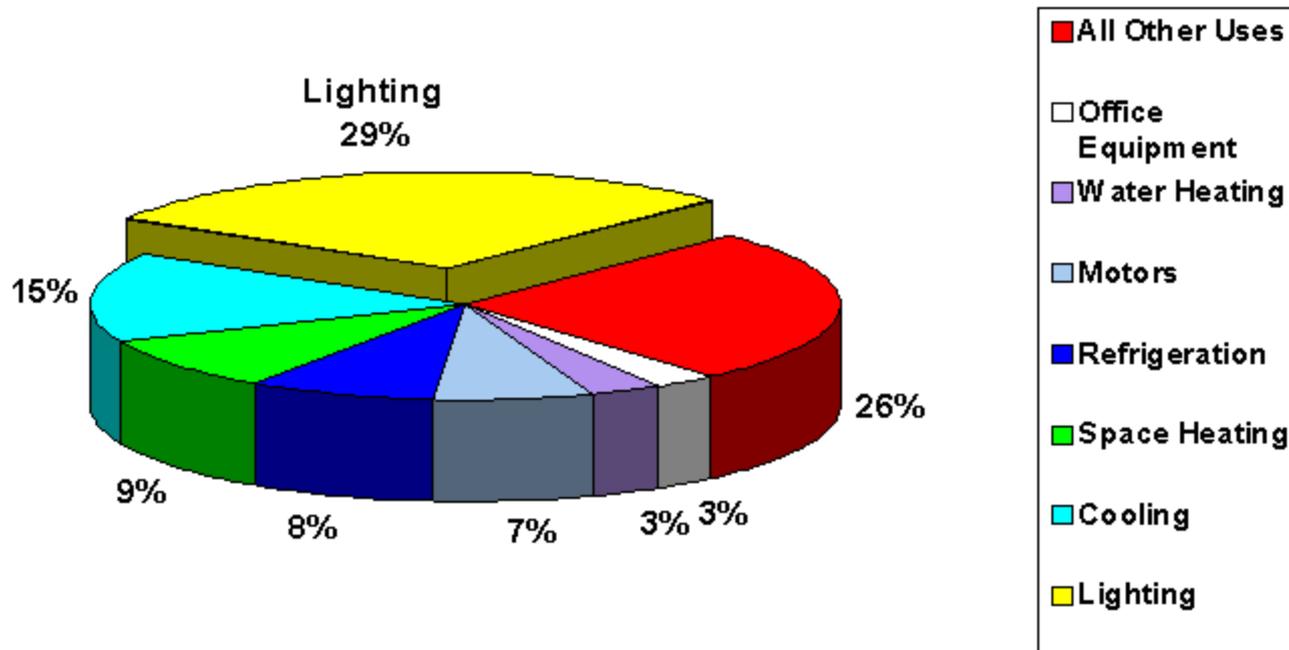


¹ Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2008

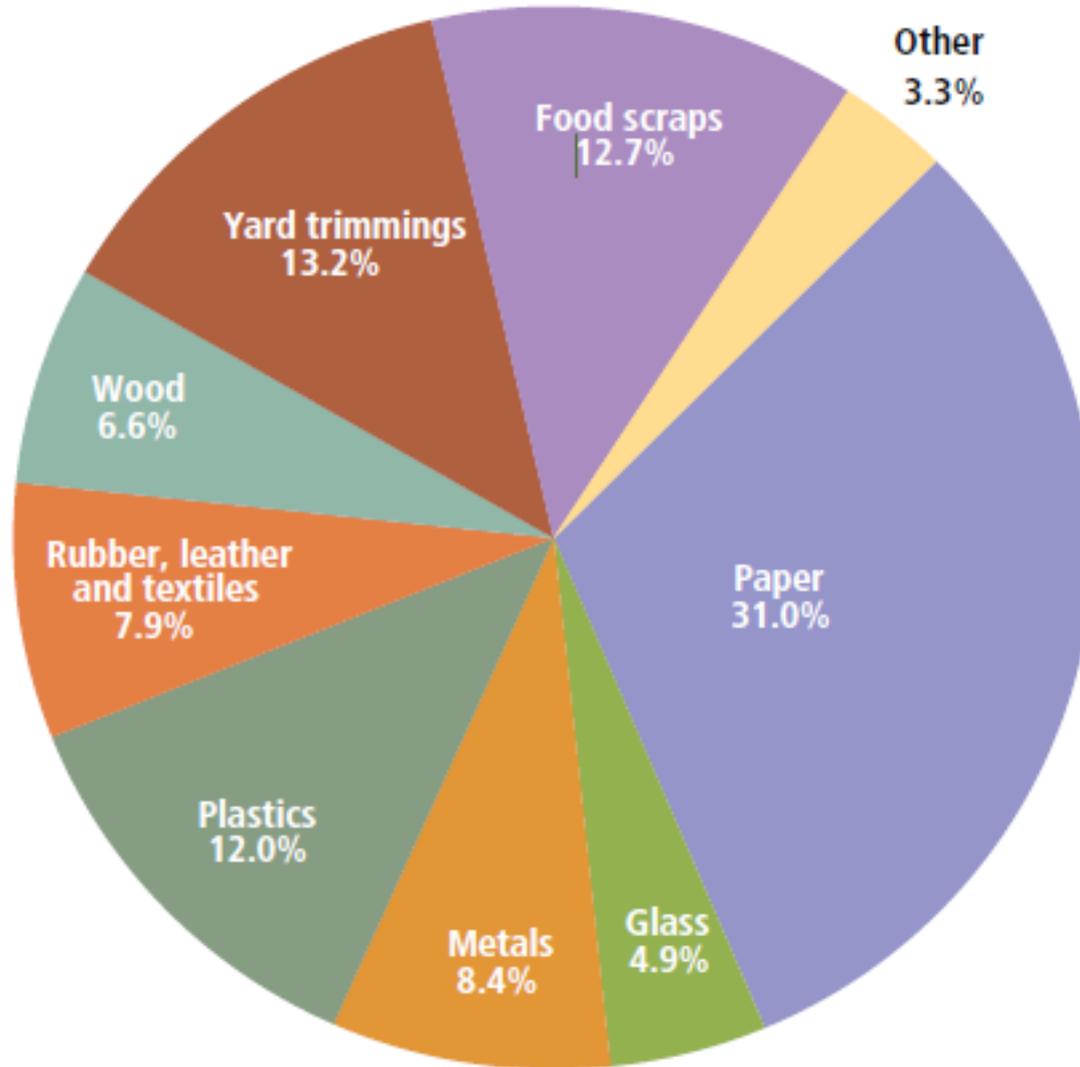
Pollution Examples

Energy Usage

Nonresidential Buildings

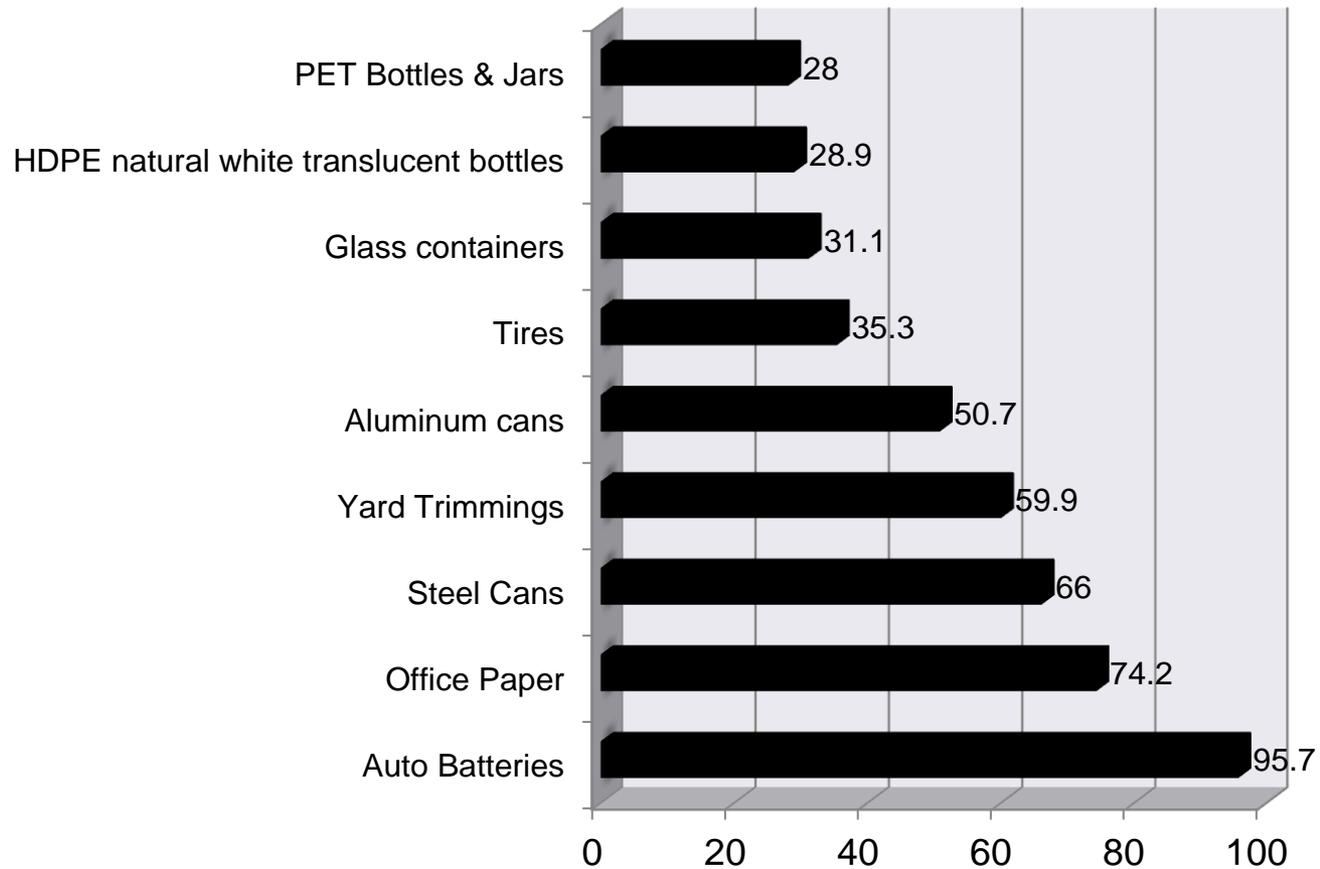


Total Municipal Solid Waste Generation (by material), 2008 250 Million Tons (before recycling)



Waste Diversion

Percentage of Materials Recycled¹



¹ US Environmental Protection Agency "Municipal Solid Waste."

So...Being Efficient by Minimizing
Pollution In Our Environment Can
Be Good.

Do you want to help?

GET INVOLVED!

Involvement - How? Prevention!

“An ounce of prevention is worth a pound of cure.” Benjamin Franklin’s maxim is as true for the health of a business as it is for the health of an individual.

Nobody disagrees with that. But how, exactly, do we go about doing it without hindering our jobs and our enjoyment of living?

The Philosophy of Prevention

Maybe it's not as hard as it looks...Because we have the “Philosophy of Prevention”

- “Prevention” isn't a curriculum and doesn't necessarily imply a particular set of rules.
- P2 is a way of thinking. It's an interdisciplinary multi-media thinking process aimed at empowering employees in engineering, quality control, operations, maintenance, management, accounting, warehousing, transportation, etc. with the information, skills, and resources each needs to help build a wonderful world.
- Prevention provides people with tools (information, skills training, or linkage with resources) that enable them to reduce chemical-related risks in their lives.

How Do We Do It?

We do it carefully, thoughtfully and by working together.

Pollution prevention succeeds when employees take an active role and participate in pollution prevention.

So lets talk P2!

AZ State Prevention Policy?

We started years ago with these simple enough goals.

State of Arizona Pollution Prevention Policy¹

"In the interest of protecting the public health and safety and the environment, the legislature declares that it is the policy of this state to:

- 1. Encourage pollution prevention whenever technically and economically practicable, without shifting risks from one part of a process, environmental medium or product to another.*
- 2. Reduce the amount of hazardous substances used and reduce the amount of hazardous waste generated in this state."*

¹ 1990 House Bill 2121 by the Arizona legislature



Summary of Pollution Prevention (P2)

What? In its simplest form P2 is the philosophy:

- Make products using less water, electricity and materials
- Don't make waste
- Reduce the amount of waste you make
- Use less toxic chemicals
- Use smaller amounts of toxic or hazardous chemicals

How?

- Re-use materials
- Optimize the use of chemicals we must use (be very efficient)
- Use the least toxic or non-toxic chemical that works
- Selecting resources and technologies to reduce the impact on people and the environment.
- Be on the lookout for new resources and new technologies
- Use best management practices
- P2 in simple process improvements to large investments in new technology and product redesign

You have a role to get involved here!

P2 Expected Results

- Efficient Use of Materials
- Reduction of Environmental Burden
- Reduction of Facility Costs
- A Healthier and Safer Work Place

P2 Example...Climate Change is an Energy Problem

Almost 90% of the world's energy is supplied through the combustion of fossil fuels, and every time we burn these fuels to make energy we release carbon dioxide into the atmosphere; carbon dioxide, in turn, is the principal component of the "greenhouse gases" (GHGs) that scientists believe are responsible for warming the planet.

Energy used in transportation, manufacturing, lighting, building heating/cooling, pumping water, etc. influences atmospheric chemistry. Atmospheric chemistry change is directly related to Climate Change.

And... Energy Efficiency is P2

Energy use and pollution prevention are related.

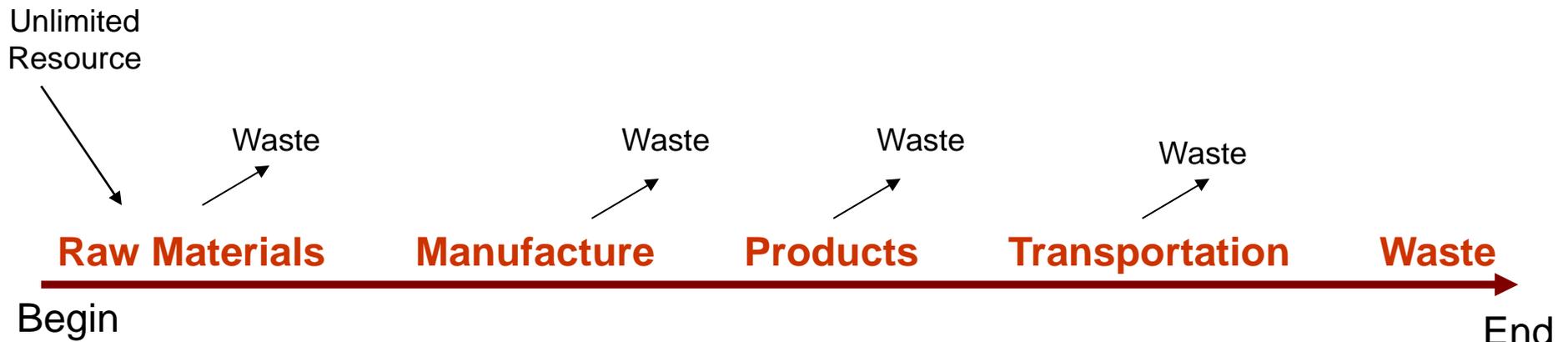
Homeowners and Businesses that become more energy-efficient are also preventing pollution.

The less energy wasted at home or at the plant site, the less electricity has to be produced in power plants that emit pollutants. Therefore we should look for energy reduction opportunities as P2 opportunities

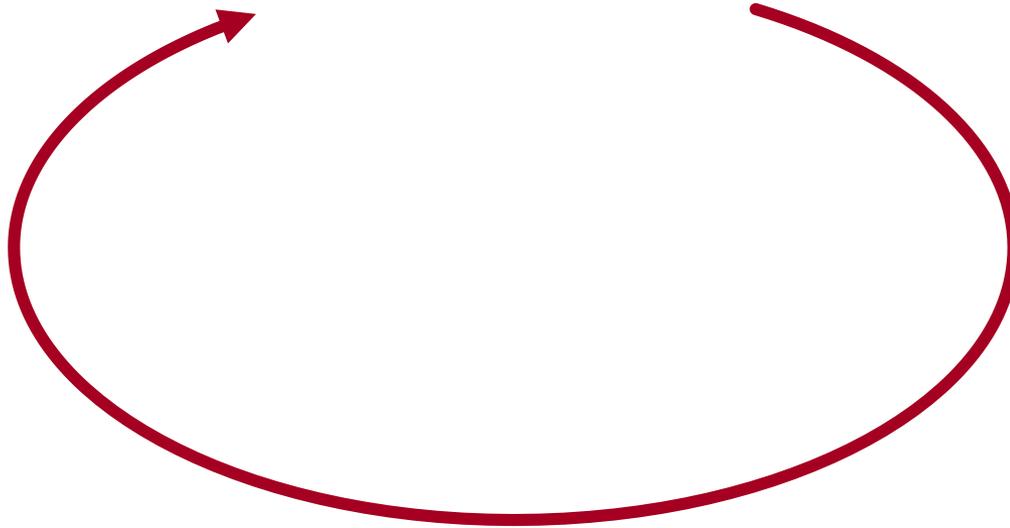
Example: Coors brewing switched to UV-cured coatings for their cans. This eliminated use of VOC-emitting solvents and drastically reduced generation of hazardous waste. But, the change also had a profound impact on energy use, since Coors no longer needed large ovens to cure their cans. <http://www.pprc.org/pubs/factsheets/e2p2.pdf>



Our Linear Past - P2 Not Implemented

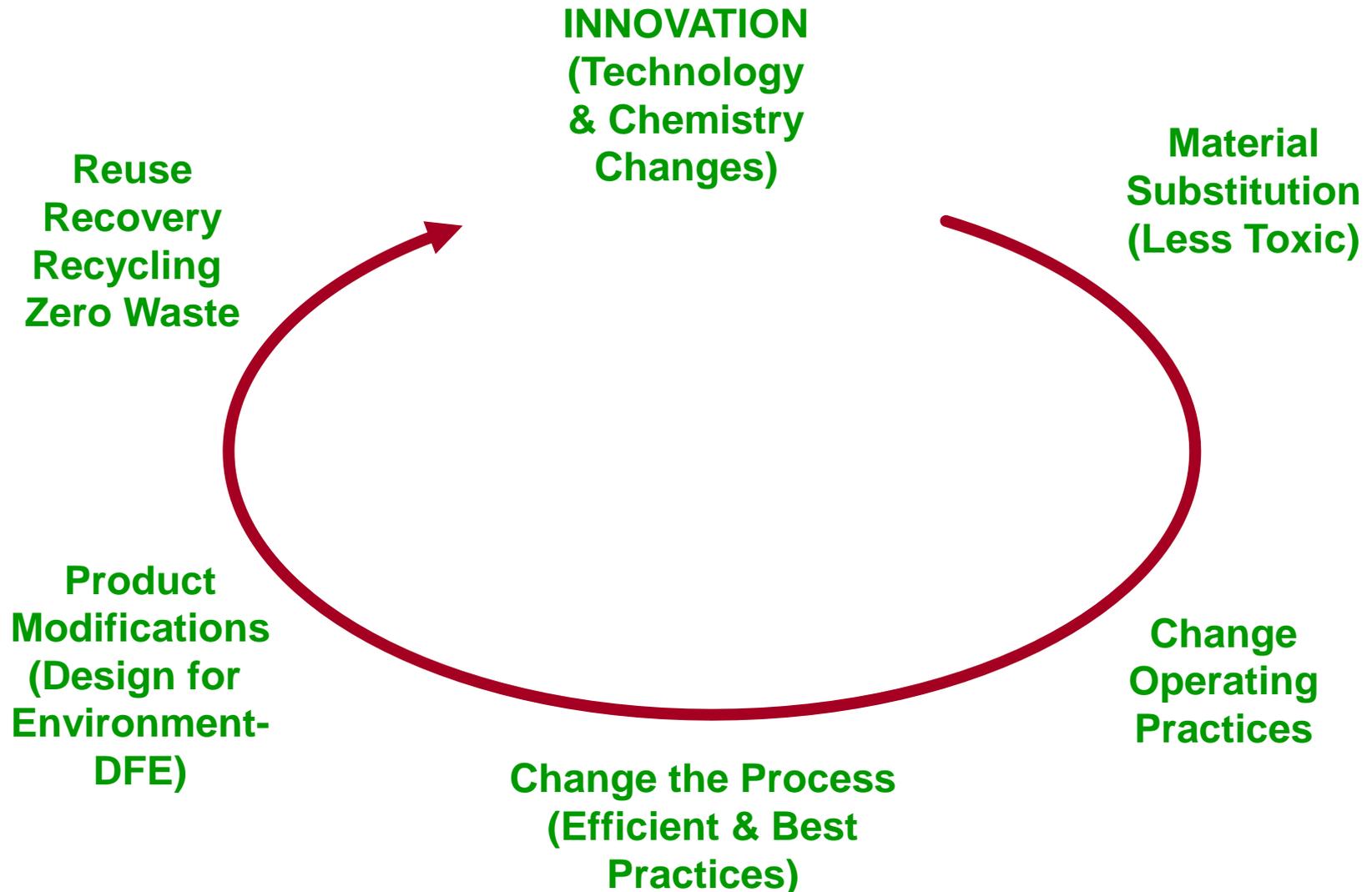


Wouldn't it make more sense to bend this line so it connects back at the beginning?



That is the way of nature where everything that is made is used over and over.

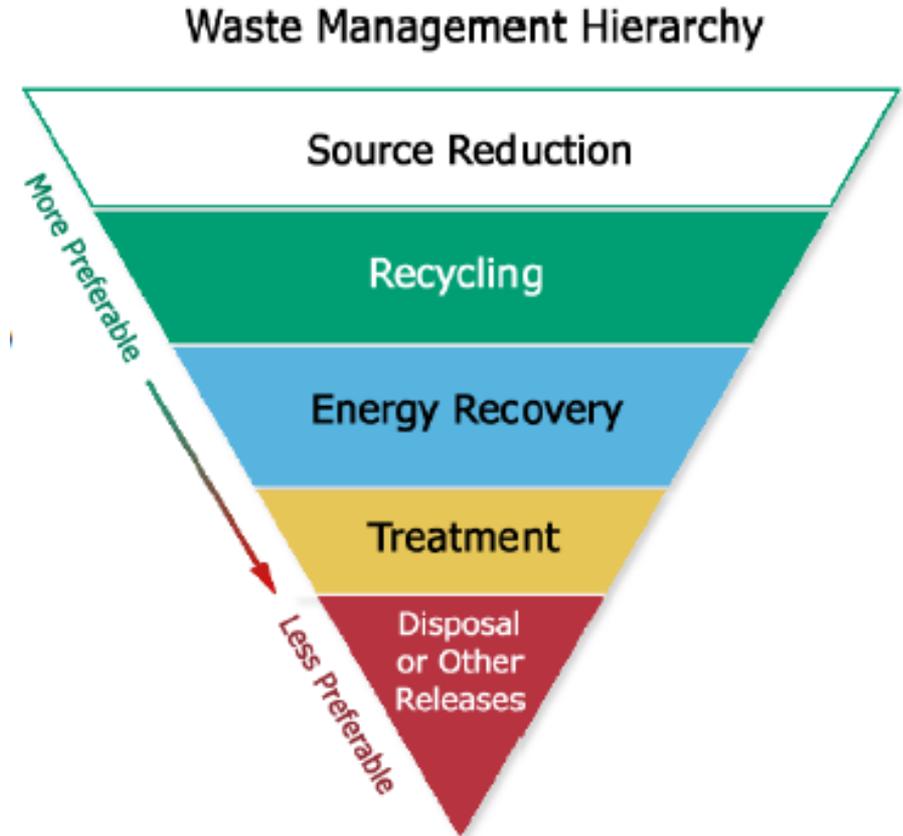
The End Game: Using P2 Helps Bend the Line Around to Complete the Loop



1st Priority: P2

P2 includes any activity that:

- Avoids, Eliminates, or Reduces the generation of hazardous waste;
- Avoids, Eliminates, or Reduces the use of toxic substances, or the release of a pollutant or contaminant at the source
- Includes in Arizona reuse, recycling, reclamation, conservation, substitution, toxicity reduction



Pollution Prevention Analysis Areas



Product Modifications



Process Modifications



Operating Practices



Technology Changes



Input Material Changes



Energy / Water Efficiency

Pollution Prevention Areas and Related Sample P2 Techniques

Product Modifications

- >Design for Less Environmental Impact
- >Increase Product Life
- >Change Packaging

Process Modifications

- >Input Material Changes
- >Technology Changes
- >Improved Operating Practices

Input Material Changes

- >Raw Material Modifications
- >Material Purification
- >Substitute less toxic materials

Energy / Water Efficiency

- .Reduce inefficient energy use
- Reduce inefficient waster use

Technology Changes

- >Layout changes
- >Increased automation
- >Improved operating practices
- >Improved equipment
- >New technology

Operating Practices

- >Spill and Leak Prevention
- >Inventory Control
- >Material control improvements
- >Surface Preparation /Cleaning Management practices
- >Production scheduling
- >Maintenance
- >Training
- >Good Operating Practices

Applying Pollution Prevention

Lets look in more detail within these broad P2 techniques. We can break them down into even more sub-techniques. Then we can look for more precise P2 opportunities while getting closer to developing an actual reduction goal.

Spill & Leak Prevention

- Improve storage or stacking procedures
- Improve procedures for loading, unloading, and transfer operations;
- Install overflow alarms or automatic shutoff valves;
- Install vapor recovery systems;
- Implement an inspection or monitoring program of potential spill or leak sources;

Material Control

- Reduce material loss through improved process operation, increased maintenance and employee training to identify sources of loss
- Handle and manage wastes to allow recycling or reuse

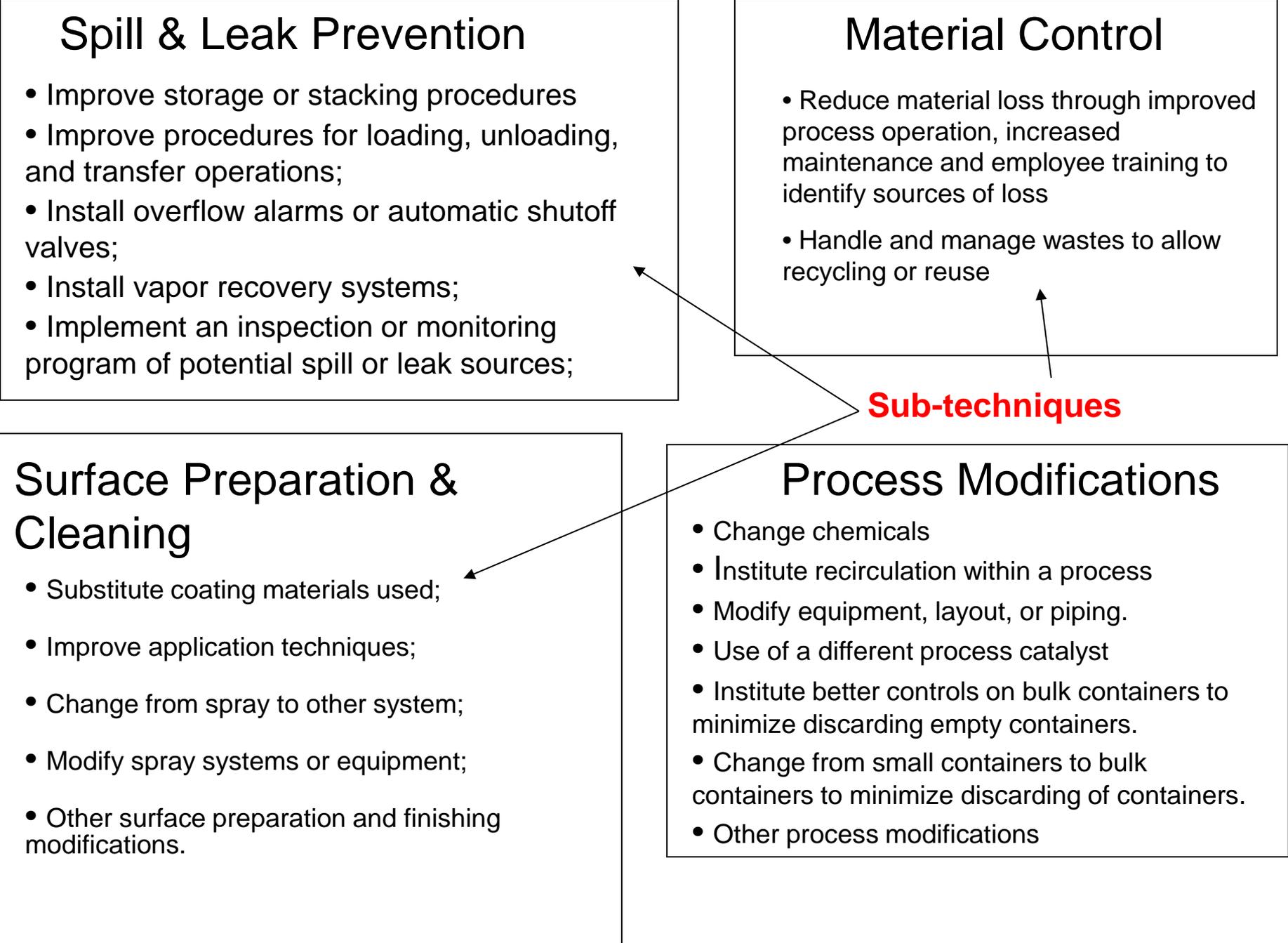
Surface Preparation & Cleaning

- Substitute coating materials used;
- Improve application techniques;
- Change from spray to other system;
- Modify spray systems or equipment;
- Other surface preparation and finishing modifications.

Process Modifications

- Change chemicals
- Institute recirculation within a process
- Modify equipment, layout, or piping.
- Use of a different process catalyst
- Institute better controls on bulk containers to minimize discarding empty containers.
- Change from small containers to bulk containers to minimize discarding of containers.
- Other process modifications

Sub-techniques



Cleaning & Degreasing

- Modify stripping/cleaning equipment
- Change to mechanical stripping/cleaning devices (from solvents to other materials)
- Change to aqueous cleaners (from solvents or other materials)
- Modify containment procedures for cleaning units
- Improve draining procedures
- Redesign part racks to reduce drag out
- Modify or installed rinse systems
- Improve rinse equipment design
- Improve rinse equipment operation
- Other cleaning and degreasing modifications
- Reformulation

Product Modifications

- Change product specifications
- Modify design or composition of product
- Modify packaging
- Other product modifications

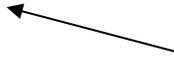
Raw Material Modification

- Increase purity of raw materials
- Substitute raw materials
- Other raw material modifications

Energy Efficiency

- Use more efficient motors, lighting, refrigeration
- Adjusting burners for optimal air/fuel ratio
- Improve thermodynamic efficiency of the process
- Insulate heating or cooling lines

Inventory Control



- Purchase only the quantity of material needed for the job or a set period of time
- Evaluate set expiration date on materials, especially for stable compounds, to determine if they could be extended.
- Search the inventory at other company sites for available stock before ordering additional material
- Purchase material in the proper quantity and the proper container size. If large quantities are needed, purchase in bulk. If the material has a short shelf-life or small quantities are needed, purchase in small containers
- If surplus inventories exist, use excess material before new material are ordered
- Contact supplier to determine if surplus materials can be returned. If not, identify other potential users or markets
- Evaluate whether alternative, non-hazardous substitutes prior to purchase and checked for acceptance at the facility.
- Institute procedures to ensure that materials do not stay in inventory beyond shelf life
- Test outdated material, continue to use it if still effective
- Eliminate shelf-life requirements for stable materials
- Institute better labeling procedures
- Institute a clearinghouse to exchange materials that would otherwise be discarded

Operating Practices: Maintenance Programs



Operational and Maintenance Procedures

- Reduce raw material and product loss due to leaks, spills, and off-specification products
- Develop employee training procedures on waste reduction
- Evaluate the need for operational steps and eliminate practices that are unnecessary
- Collect spilled or leaked material for re-use whenever possible
- Consolidate like chemicals and segregate wastes to reduce the number of different waste streams and increase recoverability

Preventative Maintenance

- Perform maintenance cost tracking
- Perform scheduled preventive maintenance and monitoring
- Monitor closely “Problem” equipment or processes that are known to generate hazardous waste (e.g., past spills).

Water Efficiency



- Reduce water losses
 - Repair leaks, eliminate water not being used
 - Use flow timer/switched to turn water off when not used
 - Conduct leak inspections and training
 - Use dry cleanup practices (a broom rather than hosing down)
- Reduce water use
 - Use minimum amounts for tasks
 - Recirculate water in a process
 - Optimize blowdown and bleed off in cooling towers and boilers
 - Use timers and pressure reducing valves
 - Eliminate once through equipment cooling
 - Extend life of aqueous baths with filtration, conductivity meters and proper maintenance
 - Use closed loop systems where possible
 - Use landscape appropriate to the locale (eliminate grass in desert settings)
- Reclaiming or Recycling water
 - Use water sequentially
 - Use treatment to only meet the water quality needed
 - Capture water for reuse

P2 Team

Another important aspect for successfully implementing P2 is for management to create a cross functional P2 team.

- A P2 team consists of a diverse team of knowledgeable personnel such as engineering, budget, maintenance, regulatory compliance, facility management, and waste management to develop P2 opportunities and a P2 plan.
- For a small facility, as few as 2 or 3 people may comprise this team.
- In some cases, it is helpful to include vendors, customers, or other stakeholders on the team, especially if their requirements would impose limitations on the alternatives considered.
- The team also must implement alternatives identified in a P2 action plan once it has been developed.



P2 Team

Once the team has been established, they will be a valuable resource within the company.

When plans are being made to expand the facility or to design or redesign products, the team can review the plans to determine whether chemical use and waste generation has been evaluated thoroughly.



P2 Team Tools

- **Methods**
 - P2 Plan
 - Environmental Management System (EMS)
 - Kaizen
 - Six Sigma
 - Can Ban
 - Lean Manufacturing
 - Baldrige Performance Excellence Program
 - Green Zia
- **Describing the Facility Processes for Discussion**
 - Process Mapping
- **Information and analysis**
 - Cause and Effect Diagrams
 - Environmental Cost Accounting
 - Bar charts
- **Opportunity Root Cause Analysis**
 - Cause and effect Diagram
 - Pareto (80/20 Rule)
 - 5 Whys

P2 and Sustainability

How does sustainability relate to P2?

- P2 is a cornerstone of the sustainability movement, which strives to ensure that our children and grandchildren inherit a world that is as good as today, or preferably better.
- The journey to a sustainable future will be fueled by pollution prevention (P2) through:
 - Maximization of resource efficiency
 - Implementation of existing and developing technical innovations
 - Minimization of toxics use
 - Application of solutions at the source of the problem
 - Education about individual contributions to global issues.

Sustainability Summary

Reducing the environmental burden requires an environmental strategy. And the environmental strategy must include pollution prevention goals.

Stage 1: Pollution Prevention

Stage 2: Product Stewardship (Product Design)

Stage 3: Clean Technology (Innovation)

P2 Awareness Summary

Simply stated:

- The best way to reduce pollution is to prevent it in the first place.
- Pollution prevention (P2), the reduction or elimination of waste at the source, is a natural underpinning for the green economy.
- Faced with the increasing costs and liabilities associated with current environmental control practices and energy costs, many companies are turning to P2 as a cleaner, safer and more cost-effective alternative.
- P2 has long provided successful, cost-effective solutions that respond to the challenges of protecting human health and the environment.

P2 Awareness Summary

P2 opportunities may be found in many places including:

- Improving Operating Practices/Procedures
- Inventory Control, Spill and Leak Prevention
- Process Modifications to save energy, water & waste
- Product Modifications to minimize or eliminate waste and conserve materials
- Energy Efficiency (electricity, natural gas)
- Lighting

Think Outside the Box!

Resources: Where to Learn Some More About P2 Opportunities

EPA Pollution Prevention Website <http://www.epa.gov/p2/index.htm>

EPA Industry Sector Notebooks

<http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/index.html>

EPA Clearinghouse

<http://www.epa.gov/ppic/pubs/ppicdist.html>

EPA Pollution Prevention Resources

<http://www.epa.gov/lean/environment/toolkits/environment/app-d.htm>

Pollution Prevention Resource Exchange <http://www.p2rx.org/>

U.S. Department of Energy (DoE) Industrial Technologies Program Best Practices

<https://www1.eere.energy.gov/industry/bestpractices/>

P2 Info House <http://www.p2pays.org/infohouse/>

Zero Waste Network <http://www.zerowastenetwork.org/P2Options/index.cfm>

Part II - Facility Information

(To Be Created by Your Facility Trainer)

Discussion of **Your** Facility P2 Policy,
Your Management Initiatives and Directives,
Your Facility P2 plan,
Your P2 team,
and Examples of
Your Facility P2 Process Studies.

Final Quiz

END