Florida Guide to
Writing a Waste Minimization Plan

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FDEP would like to thank all the Large Quantity Generators that submitted their waste minimization plans, which provided the examples used in this Guide. FDEP would also like to thank the members of the Waste Minimization Technical Advisory Group for their contributions during the development of this Guide.

Florida Guide to Writing a Waste Minimization Plan

A. Introduction

The purpose of this guide is to help facilities develop a waste minimization plan. It contains a brief description of waste minimization, the legal requirements of large quantity generators (LQGs), and ten steps to writing and implementing a waste minimization plan. While this guide was written for LQGs, it can be used by any business that produces waste. Use of this guide is voluntary.

B. Description of Waste Minimization

In 1976 the EPA established, through a policy statement, a hazardous waste management hierarchy to build environmental protection into the industrial waste management process. This agency policy placed source reduction and recycling at the top of the hierarchy as the preferred waste management strategies followed by treatment and disposal as the last resort. With the passage of the Pollution Prevention Act of 1990, the U.S. Congress established pollution prevention as a national objective and the most important component of the hierarchy. In 1991 Florida established a similar hierarchy (see Section C of Appendix 4.)

The first level of the hierarchy is source reduction, the most desirable method of waste minimization. It is defined as the practice of reducing at the source, the amount of hazardous substances, pollutants, or contaminants entering any waste stream or otherwise released into the environment. Source reduction reduces or eliminates the hazards to employees, the public, and the environment along with the liability of regulatory compliance. The term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign products, substitution of raw materials, and improvements in housekeeping, maintenance, training, or inventory control. Examples of source reduction are listed in Table 1, in Appendix 4. Examples of activities not considered to be source reduction are also provided.

The terms source reduction, pollution prevention, and waste minimization are often used interchangeably. All three include practices that reduce or eliminate the creation of pollutants through increased efficiency in the use of raw materials, energy, water or other resources, or protection of natural resources by conservation. Waste minimization often places more emphasis on reducing chemicals in waste that can be harmful to human health and the environment over time if released to the environment. Examples of waste minimization are listed in Section B of Appendix 4.

The second level, recycling, is the practice of using, reusing, or reclaiming a waste material; it is the preferred method of waste minimization for those hazardous substances, pollutants, or contaminants that cannot be reduced at the source. A waste material is used or reused if it is employed as an ingredient in an industrial process to make a product or employed in a particular function or application as an effective substitute for a commercial product. A waste material is reclaimed if it is processed to recover a usable product or regenerated. Table 2 in Appendix 4 lists examples of recycling materials.

Treatment options should only be employed when wastes cannot be prevented or recycled. Treatment is any method that physically, chemically, or biologically changes the character or composition of the waste; recovers energy or material resources from the waste; renders the waste non-hazardous or less hazardous; reduces the volume of the waste; renders the waste safer for transport, storage, or disposal; or, makes the waste amenable for recovery or storage.

Disposal is the discharge, deposit, injection, dumping, spilling, leaking, or placing of a waste into or on land or water or into the air so that hazardous constituents may enter the environment. Disposal must only be used when the waste could not be prevented, reduced or recycled.

C. Legal Requirements

Generators who ship hazardous waste off-site must sign the certification statement on The Uniform Hazardous Waste Manifest (EPA Form 8700-22) stating they have a program in place to reduce waste. On September 5, 2005, generators began using a new uniform manifest form that references the certification statements in 40 CFR Part 262.27. Generators of hazardous waste are also required to report their efforts to reduce the volume and toxicity of waste generated, and the resultant changes on the Biennial Report (40 CFR, Part 262.41). These Federal regulations are provided in Section C of Appendix 4.

Florida Statutes also address waste minimization efforts. They gave the Department responsibility to promote waste minimization. As part of that effort, this *Guide to Writing a Waste Minimization Plan* has been developed to help generators comply with the regulations.

D. Benefits of a Waste Minimization Plan

Every business generates waste. For some, it may be only office paper; for others, it may be hazardous or toxic waste that requires special handling and disposal. Although waste minimization plans were originally developed to concentrate on the reduction of hazardous waste, a more comprehensive plan will continually and systematically reduce all wastes.
Instituting a Waste Minimization Plan (also referred to as the Plan) is a matter of good, sound business practice. The Plan formalizes the business goal to reduce waste, facilitates compliance with environmental regulations, outlines the structure for managing a waste minimization program, and helps personnel manage a waste minimization program. Nationally, waste minimization programs have contributed positively to the bottom line of those companies that have chosen to implement them.

In summary, the Plan will:

- Reduce environmental impacts
- Promote environmental stewardship
- Increase company profitability

E. Steps to Writing a Waste Minimization Plan

The numbered items below describe each section that would be included in a comprehensive Plan. The level of detail in the Plan will depend upon the complexity of the business and resources available to implement the Plan. Appendix 1 shows each section in a “fill in the blank” template. Appendix 2 has example wording that might be considered for each section of the Plan. These examples were taken from companies who have written formal plans. Appendix 3 is a checklist. Use it to make sure you cover all the topics as you write your Waste Minimization Plan.

1. Policy Statement with Top Management Commitment

The first, and foundational, step in writing a Plan is to develop the Waste Minimization Policy Statement. The Policy Statement emphasizes the Company’s commitment to excellence and stewardship in protecting the environment, encourages waste minimization approaches to all

activities, involves employees as part of the waste minimization team, and states senior management's support of the Plan. The key to achieving these objectives is commitment to sound environmental policy.

The Policy Statement should include an overall company goal, a periodic review and improvement, and a method of communication to employees and the public. Companies can choose from a number of policy components and complete examples provided in Appendix 2 or develop their own. The Policy Statement may contain any of the following points:

- Operate the facility in a manner that protects human health and the environment, avoids business interruption due to environmental concerns, and provides solutions that will assure cost-effective compliance.
- Pursue continuous improvement to ensure environmental performance consistent with environmental visions and principles.
- Be active in pollution prevention efforts to reduce or eliminate pollution and waste at their sources.
- Incorporate waste minimization into management practices to ensure ongoing efforts with respect to product design, capital planning, production operations, and maintenance.
- Incorporate waste minimization as an integral part of organizational strategies to increase productivity and quality.
- Periodically review performance versus objectives and redesign programs as necessary.
- Urge suppliers to develop products and procedures that will assist in reducing waste.
- Set targets for the reduction of both the volume and toxicity of waste streams consistent with those established.
- Develop an employee awareness and training program to involve employees in waste minimization planning and implementation.
- Commit to implementing recommendations identified through assessments, evaluations, and the Waste Minimization Team.

Senior management support is critical for the Plan's success. Therefore, the President/CEO and senior managers should sign the Policy Statement and provide support as needed to:

- Incorporate waste minimization into organizational strategies to increase productivity and quality.
- Set center-wide targets for the reduction of both volume and toxicity of waste streams.
- Authorize work and capital expenditures for raw material and process changes.
- Include waste minimization in annual strategic business planning.

2. Scope and Objective of the Plan

The next step in developing the Plan is to determine its Scope and Objective based on the company's Policy Statement. The Scope and Objective apply to all aspects of company operations included in the Plan. Methods for developing the Scope and Objective and some helpful tools are described below.

a. Scope

The Scope of the Plan describes what wastes, departments, activities, processes, and services are covered by the Plan. At a minimum, the Plan applies to all RCRA hazardous wastes. However, non-hazardous wastes, recyclable material, as well as, water and energy conservation may be included in the Plan. Several examples of scope statements are provided in Appendix 2.

b. Objective

The Objective of the Plan sets the broad statements or measures of success, but not as broadly as the Policy Statement. Objectives can be qualitative or quantitative. An example of a qualitative objective would be: "Reduce the volume of hazardous wastes shipped offsite for disposal." An example of a quantitative objective would be "Achieve 60% reduction of all waste streams by the end of 2006 as compared to 1999 baseline." Additional examples of both qualitative and quantitative objectives are provided in the Appendix 2.

Including objectives in the Plan encourages the following:

- Plant-wide awareness about waste reduction among all employees.
- On-going analysis of factors that impact the generation of waste.
- Continuous employee training about waste awareness.

c. Developing Scope and Objective Statements

There are two general approaches to developing scope and objective statements: the "top-down" and the "bottom-up" approaches. The approaches are not mutually exclusive; both can be used. In the "top-down" approach, the scope and objective are established by the corporation. All potential sources of the targeted material (using the waste and emissions inventory) are identified and potential solutions for each are evaluated in order to achieve the established objective. Using the "bottom-up" approach, the current waste generating and release data are reviewed, priorities established, and then the scope and objectives is developed. Establishing objectives may or may not be preceded by other evaluations including identification of associated existing and future regulatory restrictions, employee exposure issues, and general brainstorming of opportunities.

3. Waste Minimization Team

It is important to identify a Waste Minimization Team (hereinafter, the Team) to implement the Plan. The Team identifies all plant waste, reviews the effectiveness of waste minimization activities, implements new waste minimization programs, and assists with personnel training and community outreach.

Team members may include Senior Management, Environmental Health and Safety Specialist, Operations Manager, engineering staff, purchasing representatives, and most important, line operators ("people in the trenches" who really know the processes). Each member has specific responsibilities. For example, the Team Leader is responsible for making sure the Plan is accomplished and for measurement and documentation of waste minimization activities. Examples of responsibilities for other Team members are described in Appendix 2.

When necessary, temporary teams, work groups, or committees may be established to assist in various waste minimization projects such as water conservation, materials and processes, and environmental health, and safety.

All personnel should be knowledgeable of the Plan, provide input on day-to-day waste minimization efforts, and serve on the Team as directed. All personnel participating on the Team should receive additional training as needed to perform their duties.

Good communication should exist between the Team and the Purchasing Department. This management strategy ensures hazardous material purchases are limited to those required. This helps reduce waste due to unused quantities, and the procurement of environmentally friendly products.

4. Waste Stream Assessments

After the Team is formed, one of its first jobs is to conduct a waste stream assessment. The waste stream assessment identifies the wastes, the source of each waste, and what can be done to eliminate the waste. The ultimate goal is to reduce each waste stream to the minimum quantity technically feasible and economically practical.

A thorough assessment will include conducting the following steps for each waste stream:

- Waste identification:
  - ✓ Identify the source (process that generated the waste).
  - ✓ Categorize by type (solid, hazardous, etc.).
  - ✓ Determine its toxicity, if any.
  - ✓ Determine the method of disposal.
  - ✓ Calculate the quantity generated every year.
- Cost allocation: includes identifying waste management costs for each waste, factoring in liability, transportation, record keeping, personnel, pollution control, energy expenses, disposal, compliance, and oversight cost to the extent feasible; describing how departments are held accountable for the waste they generate; and comparing waste management cost with cost of potential reduction and recycling techniques applicable to each waste. An example of how to determine the cost allocation of the waste is the following:
  - ✓ Calculate the total disposal cost of each waste including storage, permit applications, transportation, tipping fees, etc., on a pound or gallon basis per year.
  - ✓ Calculate the total pounds or gallons of finished product per year.
  - ✓ Calculate the ratio of finished product to pound or gallon of each waste.
- Minimization potential determination: takes into account whether changes can be made easily and whether the changes may have a significant impact on the amount of waste. Factors that may affect whether a change is possible or whether it should be considered:
  - ✓ Customer requirements (such as, the product must meet military specifications)
  - ✓ Injury or illness rates
  - ✓ Capabilities of suppliers (such as, ordering a smaller quantity would cost just as much as ordering the larger quantity of chemical)

  The determination can be a qualitative analysis (such as, high, medium, low) or an objective scale with a numerical scale can be established.

Additional guidance for conducting waste minimization assessments can be found in Appendix 2.

5. Ranking/Prioritizing Waste Streams

After the waste types and quantities are identified from the waste stream assessment, they are prioritized to determine which waste streams need to be considered for reduction. It may be necessary to conduct a more detailed analysis of the selected waste streams before proceeding. Once the Team is satisfied with the amount of information they have for each waste stream, they can proceed with ranking and prioritizing the waste streams.

The ranking and prioritizing should reflect the values and concepts stated in the Policy Statement and emphasized in the Objectives.

The following are examples of criteria that could be used to rank the waste streams:

- The severity of impact that the use or release of the material or waste could produce
- The probability of an occurrence/impact

- The frequency of the activity or how often the activity occurs relative to operations and processes
- The views and/or concerns of all interested parties

These criteria are more fully described in Appendix 2.

6. Identify, Evaluate, and Select Options

After the waste streams have been ranked in order of priority, the Team identifies, evaluates and selects the technically and economically most feasible options for reducing the highest priority wastes.

The first step is to identify the available waste minimization options for reducing or eliminating the wastes (usually either process changes or methods of recycling/reclamation of waste). This includes developing cost estimates for capital investment and implementation of the options.

The second step is to evaluate and select the options for the identified waste streams based on criteria your company establishes. Ideas for possible criteria are the following:

- Waste management hierarchy of reduce, reuse, or recycle
- Best return on investment
- Potential of increase of pollution in another media
- Ease of implementation
- Cost of implementation

Examples of waste minimization option evaluation and selection are provided in Appendix 2.

7. Set Waste Stream Minimization Targets

Once the best option is selected for each identified waste stream, the Team sets performance targets and develops an implementation schedule for each waste. The targets should be specific with a short timeline. The targets can be based on saving money, or reducing weight of waste (for example, pounds generated per unit of production), or other measurable criteria. The selected option may also reduce toxicity and/or volume of waste.

The following are several examples of targets:

- Install and operate a silver recovery system by (date) to reduce hazardous spent X-ray fixer solution waste. During the first year of operation, recover xx pounds of silver and reduce the hazardous fixer solution waste by xx pounds.
- Achieve 40 percent solid waste diversion by FY06.

Additional examples are provided in Appendix 2.

8. Implement Selected Waste Minimization Option

Final decisions regarding which projects will be implemented are made at this point. Each company has its own procedures for approving changes to operations. The Waste Minimization Team must determine who needs to be involved with the approval process and the amount of information required in the Plan. Even for minor changes, the Plan should describe “who has to do what by when.” The Plan should also identify each person who must approve aspects of the implementation and overall plan. Without management commitment, especially if monetary resources are needed, the likelihood of success is diminished.

Implementation requires the development of project schedules, which include: project descriptions, dates, points of contact, and specific tasks or results for each project. The following are possible implementation sections for the Plan:

- Conceptual design.
- Implementation requirements, including equipment or other capital cost needs.
- Identifying tasks and personnel assignments, including management requirements.
- Implementation schedule, especially setting dates for completion of each step.
- Cost estimates.
- Establishing outcome objectives and ranges of acceptability.
- Training needs. (Be sure to involve all personnel who may be affected.)

If senior management questions aspects of some projects, the Team or project champions may be asked to produce additional data. They should be flexible enough to develop alternatives or modifications. They should also be willing to do background and support work; they should anticipate potential problems in implementing the options.

Many waste minimization projects will require changes in operating procedures, purchasing methods, or materials inventory control. Company policies, procedures documents, and employee training will also be affected by the changes.

Once Management approves a Waste Minimization Plan, employees must be trained in implementing the Plan. The Team Leader ensures waste minimization training is provided for everyone, from management to the line operators. Training has two purposes:

- The first purpose of training is to provide employees with the big picture. Employees are told that waste minimization is important because it protects their health and safety, protects the environment, and ensures that their company meets its regulatory obligations. Increased awareness of Environmental Health and Safety programs and procedures, as well as key responsibilities, such as the importance of environmental controls to prevent emissions, minimize wastes, etc., are emphasized. Computer-based training courses can be made available to assist with training employees in waste management, hazard communication, waste minimization, safe chemical handling, and emergency response.
- The second purpose of training is to instruct employees on the use of new equipment and changes in process and procedures. Whenever possible, use existing project implementation systems and in-house staff to implement the Plan. During implementation, give periodic briefings to the appropriate operating and maintenance personnel and to all levels of management to reinforce the importance of the Plan. Eventually, project performance must be evaluated to ensure continued implementation.

Several examples of waste minimization implementation are provided in Appendix 2.

9. Measure Results and Evaluate Progress

After the Plan has been implemented for a period of time, it is important to evaluate how well the selected options have actually reduced waste. To evaluate performance, the Plan should include a procedure for measuring results and evaluating progress towards technical and economic targets. Measurement information can be provided by regularly scheduled reporting of wastes generated, reduced or recycled. As you evaluate your progress, you may have to make adjustments or conduct additional assessments. A progress report should be given to senior management, periodically. Also, reuse the knowledge gained by continuing to evaluate and fine-tune pollution prevention projects.

The Team Leader should be responsible for collecting and analyzing measurement data, and periodically reporting progress to senior management (for example, quarterly). The report should include:

- An analysis and quantification of progress made relative to each performance target established and each reduction technique to be implemented
- Amendments to the Plan, and identification and description of waste streams and processes that developed during the previous year which were not included in the original Plan.
- Explanation and documentation regarding impediments to hazardous waste reduction specific to the individual facility

Several examples of evaluating progress are provided in Appendix 2.

10. Establish Plan Review Cycle

To close the loop of accountability and ensure continuous improvement, the Plan needs to establish a process for periodic (such as, every "x" year) review of the entire Plan, especially re-accomplishing the waste stream assessments. The Waste Minimization Team and other in-house resources can be used. Outside resources should be used to assist the Team with periodic assessments on a case-by-case basis. The Team Leader should be responsible for reporting results to senior management.

Further, senior management should conduct department level accountability reviews for environmental performance. Site managers should periodically review processes and operating practices to identify new wastes and waste minimization opportunities. These reviews are used to revise the Plan to include new waste streams/processes and new strategies/targets. The makeup of the Team may need to change to reflect the changes in the Plan. The Team should continue evaluating and developing the most reliable means of measuring reductions and evaluating the Plan.

Lastly, employees should be recognized for significant ideas that reduce the generation of wastes, discharges and releases.

F. Conclusion

Waste minimization is accomplished through an effective Waste Minimization Plan. A Plan will be effective if it includes the following elements:

- A policy statement with top management commitment
- A clear scope describing what the Plan covers
- An objective that sets the broad measures of success
- A competent, responsible, enthusiastic Waste Minimization Team
- A thorough waste stream assessment
- Analyzed and prioritized waste streams
- A minimization target for each selected waste
- An implementation and employee training program
- A procedure for measuring and evaluating progress
- An established review and feedback cycle

If all of these elements are in place, waste minimization will become the standard way a company does business. The company will become an environmental leader and steward, setting an example for other companies to follow.

G. Appendices

1. Template for a Waste Minimization Plan

2. Examples for Steps to Writing a Waste Minimization Plan

3. Checklist for a Waste Minimization Plan

4. Additional Information and Ideas

5. Internet Resources

APPENDIX 1
Template for a Waste Minimization Plan

Waste Minimization Plan for: _____

1. Develop a Policy Statement with top management commitment (preferably CEO signs below) that includes an overall company goal, a periodic review and improvement process, and a method of communication to employees and the public.

Signed_____ Title _____ Date____/____/_____

Signed_____ Title_____ Date____/____/_____

2. Determine the Scope and Objective of the Plan

a. The Scope describes what wastes, departments, activities, process, and services are covered by the Plan. For example, does the waste minimization plan only address hazardous waste or does it cover all waste streams, the recyclable program, energy conservation, etc.? (This section may be updated as the Plan is finalized.)

b. The Objective sets the broad statements or measures of success, but not as broadly stated as the Policy. Objectives can be qualitative or quantitative. A quantitative example would be "Reduce all waste streams by 40% by the end of 2010." Additional examples are provided in the Guide and Appendix 2.

Note: Specific waste stream targets will be documented later in the Plan.

c. See the Guide for an explanation of two general approaches to developing scope and objective statement.

3. Identify a Waste Minimization Team to develop and implement the Plan. Describe each member's responsibilities for making sure the Plan is accomplished. A Team Leader should be selected from the members.

Name	**Section**	**Responsibilities**

4. Summarize results of waste stream assessments: What waste is generated? By what process? What can be done to reduce the waste?

Waste Stream Name / Description / Waste Type (see Note 1)	RCRA Waste Codes (if applicable)		Waste Generated	Minimization Potential (See Note 2)
			Annual Tons:	
			Annual Cost: $	
			Process:	
			Raw Materials:	
			Annual Tons:	
			Annual Cost: $	
			Process:	
			Raw Materials:	
			Annual Tons:	
			Annual Cost: $	
			Process:	
			Raw Materials:	

Note 1: SW – solid waste; HW – hazardous waste; IIW - Industrial wastewater; NW - non-regulated waste
Note 2: Also indicate whether there is a specification that must be met (Mil Spec, special customer requirement, etc.)

5. Rank and prioritize the waste streams identified in Table 4. This should reflect the values and concepts stated in the Policy Statement, Scope and Objective.

Waste Stream Name	Rank/Priority

Note: It may be necessary to conduct a more detailed analysis of the selected waste streams before proceeding.

6. Identify, evaluate, and select options (order in Table 5 by rank). Criteria may include the waste management hierarchy, best return on investment, potential of increase of pollution in another media, ease of implementation, and cost of implementation.

Waste Stream Name	Minimization Methodology	Cost	Return on Investment	Ease of Implementation	Cross-Media Pollution	Implementation Options

Note: Use separate pages with these headings if necessary.

7. Set waste stream minimization targets and implementation schedule. The targets should be specific and measurable.

Waste Stream Name	Minimization Target	Implementation Time	Project Completion Time	Cost Savings Target	Volume/Weight Reduction Target	Other Factors

8. Implement selected waste minimization option. Make final decisions regarding selection and implementation of projects and list as many details as possible in table below.

Waste Stream Name	Procurement	Process Design	Training	Reorganization

9. Measure results and evaluate progress.

Waste Stream Name	Full Implementation	Cost Savings	Volume/Weight Reduction	Other Factors	Project Complete

Note: Periodically report progress to senior management. Make adjustments as needed.

10. Establish plan review cycle to close the loop of accountability and ensure continuous improvement.

Describe Review Activity	How Often Review is Scheduled	Next Scheduled Review	When Review is Completed

Note: After review is completed, revise the Plan to include new waste stream processes and new strategies/targets. It may be necessary to change the make-up of the Team to reflect changes in the Plan. Lastly, recognize employees for their contributions.

APPENDIX 2
Examples for Steps to Writing a Waste Minimization Plan

1. Policy Statement with Top Management Commitment

Examples:

- ABC Company is committed to excellence and stewardship in protecting the environment. All employees are responsible for the elimination, reduction, and proper disposal of waste. Source reduction and waste minimization are prime considerations in product development and the design of manufacturing processes. They are also essential elements for controlling pollution to prevent adverse impact to the air, land, and water. The key to achieving these objectives is our commitment to a sound environmental policy. Simply stated, our environmental policy is as follows: We will eliminate waste generation at the source wherever possible without compromising product quality. When waste generation occurs, we will employ practical measures to reduce its volume. These guidelines provide the foundation required to develop and maintain an effective pollution prevention program. Our commitment to this policy will allow achievement of our pollution prevention goals.

- XYZ Company Environmental Policy emphasizes our commitment to protecting the health and safety of our employees and the community in which we operate, and to exercise responsible stewardship of natural resources that may be impacted by Company activities.

- The University is a generator of hazardous waste as defined by the United States Environmental Protection Agency. As a generator of hazardous waste, the University requires all persons to implement waste minimization practices. Waste minimization effectively reduces the amount of hazardous material that permanently leaves the process areas as waste. Minimization of hazardous wastes results in a reduced need for disposal facilities, a lessened risk to the community from hazardous waste releases and conservation of natural resources.

- The Corporation is committed to environmental protection. The following section is a part of the Corporation's *Standards of Business Conduct*, which is signed by all employees:

- "XYZ Corporation complies with laws and regulations of the countries in which the company operates, and has adopted specific company policies and procedures to meet or exceed these requirements. Employees must take appropriate actions to minimize and, whenever possible, discontinue the use, generation, and disposal of hazardous materials in manufacturing and other operations, and actively pursue reuse, recycling, and other beneficial waste management practices."

- Corporation Policy holds the corporation and its employees responsible for compliance with applicable environmental laws and regulations, conservation of natural resources, waste minimization and pollution prevention. Division presidents are held responsible for identifying environmental, health and safety impacts applicable to their operations, products and services, and for establishing appropriate objectives for continuous improvement.

- The Corporation's commitment to protecting the environment is identified in the division policy. This policy requires all functional organizations to ensure that appropriate consideration is given to the reduction or elimination of hazardous materials and wastes. The policy also assigns specific responsibilities to division employees and support organizations. The manager or director of each chemical use area is responsible for designating an area representative to act as the 'lab custodian.' The lab custodian is directly responsible for control of lab activities as they relate to environmental matters. Interface between the lab custodians and the Environmental, Health and Safety Department helps to ensure the review of new, existing and modified processes where pollution prevention considerations can be taken into account. Division policy establishes a procedure for acquisition of chemicals to both assure compliance with appropriate regulations and protect the health of employees, the local community, and the environment. The policy requires all new chemical purchases be approved by the Environmental, Health and Safety Department, and restrict or deny use of highly toxic chemicals in order to limit their use.

- The Company is committed to excellence and leadership in protecting the environment from being adversely affected by any materials emitted from our manufacturing operations. We recognize waste of any kind is a cost, which must be reduced to economically and technically achievable minimums.

2. Scope and Objective of the Plan

a. Scope

Examples:

- Historically, our resource conservation efforts have focused on the reduction of hazardous waste. The resource conservation program is applicable to solid wastes, air emissions, water, and energy consumption. In our current reduction program the emphasis has been expanded to include all waste: hazardous waste, non-hazardous, non-recycled waste and recycled waste.
- Waste Minimization includes source reduction and environmentally sound recycling that results in either (a) the reduction of the total volume of hazardous waste, (b) reduction of the toxicity of the hazardous waste or (c) both. Treatment and disposal methods are alternatives of last resort and are not considered waste minimization.

b. Objective

Examples of quantitative objectives:

- Reduce all waste streams by 40% by the end of 2010.
- Fully identify all waste streams and continue to strive for a 15% reduction in all recurring hazardous waste streams annually.
- Replace the use of paper wipes with reusable cloth towels in several manufacturing areas. Within 12 months, evaluate all processes using paper wipes to identify which can be replaced with cloth towels. Within three months of the identification, convert all identified processes to cloth towels.

- Use a puncturing device to allow for reclamation of aerosol cans. During the first year puncture and recycle at least 50% of all aerosol cans that are purchased. By the end of the second year, puncture and recycle 100% of all aerosol cans that are purchased.
- Use high volume-low pressure spray coating equipment. Within six months identify all processes that do spray coating. Within nine months determine which of those processes can benefit from using high volume-low pressure spray coating equipment. Within 18 months complete the conversion of all identified work processes to high volume-low pressure spray coating equipment.

Examples of qualitative objectives:

- Review modifications to process, raw materials, or products to reduce the toxicity and quantity of pollutants.
- Progressively change product formulations and replace toxic raw materials with non-toxic raw materials whenever appropriate.
- Capture and reuse waste and by-products when feasible.
- Fully identify all waste streams and continue to strive for a percentage reduction in all recurring hazardous waste streams annually.
- Continue to achieve significant reductions, working toward the ultimate goal of zero waste through reduction and/or reuse programs.
- Continue evaluating and developing the most reliable means of measuring reductions.
- Develop waste minimization as core value or part of everyone's normal work activities.
- Establish contracts with recycling companies that recycle non-hazardous wastes.
- Recycle raw material and finished goods scrap.
- Whenever possible, return drums to chemical suppliers.
- Recycle fluorescent bulbs and other types of light bulbs.
- Establish a common stock inventory of frequently used chemicals to reduce the number of chemical storage locations and the amount of virgin chemicals sent off-site.
- Find alternate use opportunities for surplus chemicals.
- Use shelf life testing to extend the useful life of expired chemicals.
- Continue to review replacement products that eliminate and/or reduce hazardous waste.
- Continue to review products to lower the facilities emission levels.
- Collect and reclaim lead solder.
- Collect and recycle used oil, ballast, fluorescent lamps, scrap metal, and batteries.
- Achieve compliance through pollution prevention opportunities resulting from analysis of hazardous material use, waste generated, air emissions, or water pollution data and technology or process improvements.
- Use low volatile organic compound (VOC) containing surface coating materials.
- Use surface coatings that do not contain heavy metals.
- Consider dry processes versus chemical intensive processes.
- Minimize buying chemical and hazardous materials.
- Reduce wood, cardboard, and paper purchased and used for packaging of aluminum extrusions; explore innovative packing methods.

3. Waste Minimization Team

Examples of Team member responsibilities:

- Senior Management - provides leadership, direction and support to foster an environment for waste minimization; conducts annual review of the waste minimization program.
- Team Leader – implements the waste minimization plan, documents and measures waste minimization activities, and provides training for management and employees.
- Frontline Operator – provides insight into practicality of changing processes and chemicals
- Environmental Health and Safety Specialist – provides regulatory and technical guidance to team. Address environmental and safety related activities to reduce the use of natural resources and minimize waste.
- Operations Manager – provides resources (funding and personnel) as required to successfully implement waste minimization projects.
- Engineering Staff - provides the technical knowledge and equipment to support waste minimization efforts; provides sound predictive and preventative maintenance programs to assure equipment integrity.
- Purchasing Staff – provides insight into how purchases of materials and equipment can be controlled.

Examples of waste minimization workgroups:

- Water Conservation – focuses on reducing the volume of water used and industrial wastewater generated by manufacturing processes.
- Materials and Processes - evaluates the possible impact of new production equipment, processes, and chemicals on both product and environmental, health and safety.

4. Waste Stream Assessments

Additional guidance for assessments:

- When conducting the waste stream assessments, solicit employee involvement: A good program encourages site wide employee participation. Employee involvement has been found to be instrumental in pointing out areas not previously considered. Initiate programs that encourage employees to submit ideas. Collect feedback through submittals or through direct employee interface.

- Analysis of emissions: Analysis of emissions from the calendar year should be performed to identify the top drivers. For each of these sources, the team should evaluate alternatives for reducing these emissions including product substitution and more efficient utilization of the product.

- Analysis of hazardous waste: Analysis of hazardous waste generated during the calendar year should be performed to identify the largest waste streams. Oftentimes, companies identify the three largest waste streams. Ideas that can provide significant reductions should be implemented when they provide a positive return on investment

Examples of <u>waste generation ratios</u>:

- Solid Waste Generated Ratio (MT/MT) = Total waste generated / production;
- Solid Waste Generated Ratio excluding C/D (MT/MT) =
  (Total waste generated - C/D waste) / production;
- Facility Solid Waste Ratio (MT/MT) = (Total waste generated - waste recycled) / production;
- Facility Solid Waste Ratio excluding C/D (MT/MT) =
  (Total waste generated - waste recycled - C/D waste) / production.

  NOTES:
  - MT = Metric Ton; 1 Metric Ton = 1.1023 Ton; C/D = construction/demolition waste.
  - All ratios are linked to production (extrusion, log, and billet shipments) to normalize waste generation figures. C/D waste is subtracted from each ratio and tracked separately because this type of waste stream is highly variable, both in frequency and volume. These elevated figures tend to skew the ratios due to the relatively low volume of other waste streams that are routinely generated.
  - The ratios are tracked using periodic reports. Activities included in the Plan are the actions that allow the company to proactively reduce waste and the reports are the tools used to document and guide these activities.

Example list of typical activities and waste streams:

Activity	Typical Waste Streams
Regular Operations	Absorbent pads and rags, empty bottles (from samples), Petroleum Contact Water (PCW), domestic waste, and air emissions.
Maintenance	Absorbent pads and rags, used chemicals, jet fuel filters, and PCW
Projects	Tank bottoms, PCW, Sand Blast Media, absorbent pads and rags, and tank seal material.
Emergency Response/releases	Contaminated soil, PCW, absorbent pads and rags and contaminated debris.

Note: This list is illustrative, not exhaustive.

5. Ranking/Prioritization of Waste Streams

Examples of criteria that can be used for ranking and prioritizing waste streams:

<u>Criteria for Determining Significance</u> (excerpt from a company's environmental management system): Inputs and outputs from each department operation were determined. The potential environmental impact for each department operation was considered and rated using the criteria specified below. Potential environmental impacts included air emissions, wastewater discharge, generation of solid waste, contamination to land or water, water consumption, use of raw materials/chemicals, and energy consumption. The following four criteria were used to determine significance. The scores for the aspects are used as a basis for determining significant environmental concerns and the initiation of new projects.

A. <u>Severity of the Impact</u>. This is a measure of the magnitude of the impact the event has on the environment. Severity is measured by such factors as toxicity to humans, the negative effect on flora and fauna, impact of wildlife habitat, the reduction of natural resources,

contamination of water and air, the potential for reversible versus irreversible environmental damage, short term versus long term recovery of the environment. Other factors such as noise, heat, odor, vehicular traffic and visuals are also used to determine severity. Severity was given a numerical rating of 1 for low impact, 3 for medium impact and 5 for high impact. We believe that severity of impact is the best indicator of significance; hence higher numerical weighting was used.

1. Low Impact (score 1) - There is little or no impact on the environment.
2. Medium Impact (score 3) - There is impact on the environment that falls within regulatory guidelines. The impact is considered short term and reversible.
3. High Impact (score 5) – There is high and lasting impact on the environment.

B. Probability of an Occurrence/Impact. This is a measure of the likelihood that an impact will occur. In the case of an abnormal operating condition, this probability is measured after a release has occurred. Probability was given a numerical rating of 1 for low probability, 2 for medium probability and 3 for high probability. Probability was considered to be lower if operational controls were in place and higher is there were no operational controls. We also considered past events to help determine probability (i.e. has there ever been an environmental incident in the past?).

1. Low Impact (1) - Operational controls are in place if feasible and/or necessary.
2. Medium Impact (2) – Operational controls are in place, however, these controls may not totally mitigate or eliminate the impact.
3. High Impact (3) – No operational controls are in place.

C. Frequency of the Activity/Aspect. This is a measure of how often the activity or the aspect occurs relative to our operation and processes. Frequency was given a numerical rating of 1 for low frequency, 2 for medium frequency, and 3 for high frequency. We believe this to be a good indicator of significance because generally, the greater the activity, the greater the potential for environmental impact and the greater the impact.

D. Interested Parties. We consider the views and/or concerns of all interested parties important in the consideration of aspects for significance. Interested parties include any individual or group (including employees or government agencies) concerned with or affected by our environmental performance. Interested parties were given numerical rating of 0 for No and 2 for Yes.

6. Identify, Evaluate, and Select Options

Ideas are evaluated for feasibility and implemented if cost effective. The economic evaluation should include transport and disposal costs, energy costs, raw material/input material costs, by-product revenues, and waste management costs (drums, labels, analytical work, container rental, etc.).

Examples of waste minimization evaluation and selection:

- Cardboard Recycling - The facility implemented a facility-wide cardboard recycling program. The program is yielding beneficial environmental results (i.e., saving landfill space) and economic results.
- Reusable Packaging - The continual reuse of the high-strength containers eliminates the waste that would otherwise be generated by the discarding of waste containers.

- Wood Recycling - The facility implemented a wood recycling program. Reusable pallets are kept on-site and used until they are no longer reusable. The program will yield beneficial environmental results (i.e., saving landfill space) and will reduce the Facility Solid Waste Ratio by subtracting out that portion that is recycled from the numerator of the ratio. Materials that would otherwise be disposed of in the plant trash but could be captured by a wood recycling program include broken pallets, scrap pieces of wood, and sawdust. The material is sent off-site and made into mulch or compost.
- Mercury-Containing Lamps - The facility collects and recycles all mercury-containing lighting devices. The facility plans to replace all spent fluorescent lamps and high-pressure sodium lamps with lamps that will pass the TCLP test. If feasible, this change will reduce the toxicity of this waste stream. Beginning in 2000, all new straight fluorescent bulbs that are ordered are low toxicity bulbs. As other low toxicity bulbs become available, (i.e., metal halide, high pressure sodium, etc.) technical assessments will be conducted to determine the feasibility of substitution.
- Used Aerosol Cans - In an effort to reduce the volume of this hazardous waste stream, all aerosol cans are punctured. The punctured aerosol cans are no longer considered hazardous waste and are recycled with other scrap metal. Although the aerosol can contents are collected and still managed as a hazardous waste, this is a low volume waste stream.
- Plant Trash – The facility has focused on reducing plant trash by first removing recyclable materials from the waste stream (i.e., cardboard, wood). The next step is to continue eliminating recyclable or potential recyclable materials and to reduce the amount of these materials being purchased and the rate at which they are being disposed.
- Packing Wood, Cardboard, and Paper - A goal has been established to reduce wood, cardboard, and paper purchased and used for packaging of aluminum extrusions. The goal is to reduce each of these sources by exploring innovative packing methods and by communicating with vendors and customers.

Two examples of how a paint company conducted waste minimization option evaluation and selection:

Project 1: Wash Solvent

A. Options recommended by Team participants to reduce the amount of wash solvent generated:
   1. Schedule the production and canning of light and dark batches separately.
   2. Use high-pressure wand for tub wash.
   3. Purchase and install two additional sand mills so products can be separated by type and color.
   4. Install a flush-n-fill filling machine, so dark colors can be filled separately from light colors.
   5. Train employees on source reduction procedures and hold them accountable for meeting program objectives.
B. Technical Considerations: No technical changes are required to implement option 1. However, advance planning and coordination between scheduling and production is needed for optimum scheduling of light and dark colors. Feasibility studies need to be accomplished to determine technical requirements to implement options 2, 3, and 4. An employee training program can be developed and conducted in-house to implement option 5.

C. Economic Considerations: No costs are involved over current expenditures to implement options 1 and 5. Cost benefit analysis, budget approval, equipment purchase, layout, and installation will need to be accomplished before options 2, 3, and 4 can be implemented.
D. Decisions:
   1. Option 1 - Approved
      Office of Primary Responsibility: Scheduling
      Deadline: Procedure in place.
   2. Option 2 - Approval to conduct feasibility and cost benefit study
      Office of Primary Responsibility: Director of Operations
      Deadline for study completion: September 30, 2002
   3. Option 3 - Approval to conduct feasibility and cost benefit study
      Office of Primary Responsibility: Director of Operations
      Deadline for Study Completion: September 30, 2002
   4. Option 4 - Approval to conduct feasibility and cost benefit study
      Office of Primary Responsibility: Director of Operations
      Deadline for Study Completion: September 30, 2002
   5. Option 5 - Approved
      Office of Primary Responsibility: Regulatory Compliance Manager & Director of Operations
      Deadline: September 30, 2002
E. Print Name and Title:
F. Sign and Date:

<u>Project 2: Wash Water</u>

A. Options recommended by Team participants to reduce the amount of wash water generated:
   1. Install a closed loop high-pressure system for tank washing.
   2. Install a 2000-gallon tank w/agitation to facilitate the reuse of wash water.
   3. Train employees on source reduction procedures and hold them accountable for meeting program objectives.
B. Technical Considerations: The high-pressure wash system has been installed at the tub wash area and is in use. However, a study will need to be conducted to determine the technical requirements necessary to set up a closed loop wash water system to implement option 1. Work is underway to install the 2000-gallon tank to facilitate the reuse of wash water to implement option 2. An employee training program can be developed and conducted in-house to implement option 3.
C. Economic Considerations: A study needs to be conducted to determine the economic impact of installing a closed loop wash system to fully implement option 1. No costs are involved over current expenditures to implement option 2 and work is underway to install the 2000-gallon tank to facilitate the reuse of wash water. No additional costs are involved over current expenditures to develop a training program and train employees to implement option 3.
D. Decisions:
   1. Option 1 - Approval to conduct feasibility and cost benefit study.
      Office of Primary Responsibility: Director of Operations
      Deadline: September 30, 2002
   2. Option 2 - Approved
      Office of Primary Responsibility: Director of Operations
      Deadline: September 30, 2002
   3. Option 3 – Approved

Office of Primary Responsibility: Regulatory Compliance Manager & Director of Operations
Deadline: September 30, 2002

E. Print Name and Title:
F. Sign and Date:

7. Waste Stream Minimization Targets

Examples of objective/target combinations:

- Objective: Reduce Hazardous Waste Disposed. Target: Implement cost effective opportunities within 12 months of funding.
- Objective: Reduce Waste from use of Hazardous Material. Target: Reduce Hazardous Materials turned in as hazardous waste by an average of at least 10 percent from the previous year.
- Objective: Reduce VOC and HAP Emissions. Target: Implement cost effective opportunities within 12 months of funding. Reduce emissions by 10 percent by the end of the second year.
- Objective: Reduce NAAQS Pollutants, CO, PM-10, NO_2, O_3, Pb, and SO_2. Target: Implement cost effective opportunities within 12 months of funding. Reduce emissions of each pollutant by 20% by the end of the third year and 50% by the end of the fifth year.
- Objective: Operate Recycling Center Process. Target: Average break even for expenses and revenues by the end of the second year.
- Objective: Identify P2 Opportunities to reduce compliance burden. Target: Identify P2 Opportunities at our funded level during the next fiscal year. Implement at least two of the opportunities within 12 months of their identification.
- Objective: Compliance Sites. Target: Achieve 90 percent compliance at each compliance site during periodic self-inspections.
- Objective: Reduce Hazardous Waste. Target: By the end of the next fiscal year, reduce hazardous waste disposal to 50 percent based on 1992 baseline.

8. Implement Selected Waste Minimization Option

Examples of waste minimization implementation for planned air emissions reduction strategies:

- Objective: Reduce emissions of solvents by improving the vapor degreasing process. Current status: Operations and engineering staffs have identified several potential improvements to both the back flush booth and vapor degreaser and have implemented some of them. Included in the scope is the potential replacement of solvent by isopropyl alcohol in solvent cleaning and revisions to parts cleaning requirements. EHS has also provided recommendations for reducing potential solvent emissions from the back flush system. External resources such as the degreaser booth vendor have been used to address solvent emissions.
- Objective: Reduce the HAPs from coating/painting activities by substituting materials with lower concentrations of HAPs or less hazardous components whenever possible. Current status: Identified that oil-based, HAPs containing paints are mostly used in coating structural steel used in test stands.

Other examples of waste minimization implementation:

- Research and trial test substitute cleaning solvents to replace lacquer thinner, which are safer, non-flammable, and contain little or no volatile organic compounds.
- Train employees to reduce waste at the source by minimizing their use of chemicals.
- Conduct and document annual employee training on the topic of waste awareness.
- Continuously review and use standardized returnable or recyclable dunnage and packaging for incoming parts and materials.
- Train gel coat gun and resin gun operators on environmentally friendly SOPs to reduce spent solvents and material application.
- As feasible, expand and use robotic material applications to minimize spent solvents and raw material usage.
- Research and develop recycling sources for wood waste.
- As feasible, recycle cardboard & paper waste.
- Research alternative methods for over-spray and drip containment.

9. Measure Results and Evaluate Progress

Examples of evaluating progress:

- In 2000 the facility switched its highest volume gel coat to a lower emissions gel coat. In 2005 the facility has eliminated one waste stream by eliminating two cleaning solvents and replacing them with one solvent with lower emissions. The facility will continue efforts to use low styrene content resins and gel coats, with corporate support and review.
- Information related to hazardous waste quantities, generating process information, waste location, etc. is maintained in the Waste Information Management System (WIMS) database. The site EHS group maintains this database. Status to waste goals and objectives is presented at the monthly site EHS Council meetings. Status to site goals, status of reduction efforts, new waste issues, etc. are presented and evaluated during site Resource Conservation Committee meetings.
- In 2003, a significant reduction in air emissions as measured by EHS Information Standard (EIS) 7.2 methods was achieved.
  - Total air emissions declined to 8,600 pounds compared to 10,200 in 2002.
  - The overall decrease in 2003 EIS air emissions was 16%. The reduction of Hazardous Air Pollutants (HAPs) was 84%. These improvements were achieved in spite of an increase in coatings and parts cleaning operations overall.
  - The primary reduction strategy was to replace trichloroethylene solvent with a binary fluorinated solvent. By Jan 1, 2003 all trichloroethylene uses/sources were eliminated, resulting in a 2,900 pound reduction compared to 2002.
  - The challenge is the significant increase in vapor degreaser emissions after removal of all trichloroethylene operations.
  - Total 2003 emissions (net increase of 4,300 pounds) more than offset the elimination of trichloroethylene emissions (total decrease of 2,900 pounds). However, emissions are more environmentally friendly than trichloroethylene.
  - This indicates that degreasing operations should be reviewed for anomalies or process improvement.
- As a company committed to both environmental and fiscal responsibility, Company ABC strongly encourages each employee to continuously monitor waste generation and seek

opportunities to reduce the toxicity, quantity and disposal costs of each waste stream. At a local level this is accomplished through:

- Completion of waste generation sheets and logs. This is the manner in which ABC keeps record of the type and amount of wastes generated.
- Monthly records review. These records include waste generation sheets, and waste logs (including air emission spreadsheets, accounting reports, and other records available)
- End of the year records review. These records include annual waste inventories (these help on the preparation of Biennial Reports), Title V Annual Operating Reports (AORs), accounting reports, and any other records available that provide additional information.
- Project meetings. Waste generation activities are analyzed during these project meetings.

10. Establish Plan Review Cycle

Example of review cycles:

Every month the Environmental Coordinator will review the account summary reports generated from the electronic accounting system. These reports provide a summary of charges to Company ABC environmental accounts, some of which are established to capture waste related costs. On a regular basis and at the end of each year, waste information is reviewed for possible additional waste minimization opportunities.

APPENDIX 3
Waste Minimization Plan Checklist

(Check manually on printed copy or click in the box in Microsoft Word.)

☐ **1. Policy Statement**

A good Plan:

- ❑ Emphasizes the Company's commitment to excellence and stewardship in protecting Florida's citizens and the environment
- ❑ Encourages waste minimization approaches to all activities
- ❑ Involves employees as part of the waste minimization team
- ❑ States senior management's support of the Plan

Did you consider?

- ❑ Emphasizing the Company's commitment to waste minimization throughout the organization
- ❑ Directing a continuous process with new targets, periodic review and proven success
- ❑ Providing mechanisms for regular communication to staff and the public
- ❑ Maintaining top officials' signature and dates with each Plan revision

☐ **2. Scope and Objectives**

A good Plan:

- ❑ Specifies what wastes are included in the Plan (as a minimum all hazardous waste streams should be included)
- ❑ Specifies which organizational groups are affected
- ❑ Describes which activities, processes, and services are covered by the Plan
- ❑ Sets Objectives, that is, broad statements or measures of success, but not as broad as the Policy Statement

Did you consider?

- ❑ Whether non-hazardous wastes, recyclable material, and water and energy conservation may be included in the Plan
- ❑ Prescribing procedures for analyzing factors that impact waste generation
- ❑ Designating waste streams to be reduced with objectives

☐ **3. Waste Minimization Team**

A good Plan includes:

- ❑ Senior management represented
- ❑ Environmental, health and safety staff participants
- ❑ Operations supervisor/manager participants
- ❑ Engineering staff participation
- ❑ Frontline Operators
- ❑ Team leader designated

Did you consider?

- ❑ Including staff from all involved organization groups
- ❑ Representing procurement management or staff
- ❑ Defining the structure of Team; responsibilities of team members and departments
- ❑ How to establish, when necessary, temporary teams, work groups, or committees to assist in various waste minimization projects
- ❑ Training for all personnel participating on the Team as needed to perform their duties.
- ❑ Establishing meeting structure and frequencies

☐ **4. Waste Stream Assessments**

A good Plan includes:

- ❑ Sources of the waste streams
- ❑ Wastes categorized by type, for example, solid, hazardous, industrial wastewater, air emissions, etc.
- ❑ Quantity of waste generated annually (measured or calculated)
- ❑ Cost of handling and disposing of the waste
- ❑ Potential for minimization

Did you consider?

- ❑ Calculating the management cost annually per waste stream
- ❑ Giving the rationale for generating each waste
- ❑ Including the impacts of customer specifications (such as, military specifications)

☐ **5. Ranking/Prioritizing Waste Streams**

A good Plan includes:

- ❑ Waste streams ranked in order of need for reduction and/or priority for waste minimization.
- ❑ The method of ranking (factors considered), reflecting the values and concepts stated in the Policy Statement and emphasized in the Objectives.

Did you consider?

- ❑ Establishing a method for scoring the waste streams to make the ranking more objective
- ❑ Respecting the opinion of each person on the Waste Minimization Team to ensure consensus
- ❑ Having persons who may be impacted but who are not on the Waste Minimization Team participate in the ranking.

☐ **6. Identify, Evaluate, and Select Options**

A good Plan includes:

- ❑ How to identify and evaluate options for reducing or eliminating the wastes.
- ❑ Cost estimates for capital investment and implementation of the options
- ❑ Feasibility of options and impediments, both technical and economical
- ❑ Potential of increasing pollution in another media considered
- ❑ Plan for implementing recommendations
- ❑ Measurable performance targets set for options selected (such as, dates for achieving and numeric measures for success)

Did you consider?

- ❑ Evaluating based on the waste management hierarchy (reduce, reuse, recycle)
- ❑ Evaluating the minimization options for each waste stream with cost estimates
- ❑ Giving a rationale or explanation for each target and any expected impediments
- ❑ Evaluating technologies to be used for minimizing wastes
- ❑ Providing continuous training to be used for waste minimization awareness

☐ **7. Waste Stream Minimization Targets**

A good Plan includes:

- ❑ Specific targets for each waste steam selected
- ❑ A specified time frame for reaching the targets
- ❑ Procedures for measuring results, making adjustments and reporting progress

Did you consider?

- ❑ Basing the target on reducing toxicity/hazard and volume/weight generated
- ❑ Basing the target on saving money

☐ **8. Selected Waste Minimization Option Implementation**

A good Plan includes:

- ❑ How to get approval of the option selected
- ❑ An implementation schedule developed for options selected
- ❑ Identification of all actions, such as,
  - o procurement needs,
  - o changes to processes,
  - o training, and
  - o reorganization
- ❑ A mechanism for project performance evaluation
- ❑ Training for persons affected by new processes, procedures and equipment

Did you consider?

- ❑ Making the Team Leader responsible for providing training to management and employees not directly involved with the changes
- ❑ Presenting the “big picture” as part of training
- ❑ Using existing implementation procedures and staff when possible
- ❑ Reorganizing work units when needed
- ❑ Giving periodic briefings to operation and maintenance personnel and management

☐ **9. Results Measurement and Progress Evaluation**

A good Plan includes:

- ❑ A procedure for measuring results and evaluating progress
- ❑ Regularly scheduled reporting for wastes generated, reduced and recycled, including progress towards each performance target/reduction technique
- ❑ A method for amending the Plan to include new or modified waste streams quantified and reported

Did you consider?

- ❑ How the Team Leader gathers measurement data and reports progress to management
- ❑ Documenting explanations for facility impediments experienced in reaching targets

☐ **10. Plan Review Cycle Established**

A good Plan includes:

- ❑ A process for periodic (such as, every "x" years) review of the entire Plan, especially re-accomplishing the waste stream assessments.
- ❑ Senior management conducting department level accountability reviews for environmental performance
- ❑ Recognition of employees' significant ideas that reduce the generation of wastes, discharges and releases
- ❑ How the Plan can be revised to include new processes/waste streams/techniques

Did you consider?

- ❑ Whether to use the Waste Minimization Team and other in-house resources for the re-evaluation
- ❑ Including that site managers should periodically review processes and operating practices to identify new wastes and waste minimization opportunities

APPENDIX 4
Additional Information and Ideas

A. Introduction

This appendix provides waste minimization ideas that have worked for others. It also presents the legal requirements for Large Quantity Generators to have a waste minimization program. Small Quantity Generators need to make a good faith effort at waste minimization.

B. Description of Waste Minimization

Waste minimization can be as expensive as replacing a regular vapor degreaser with one that has an airlock, or it can be as simple as using large, refillable containers to reduce the amount of material disposed of on the walls of emptied containers. Other examples include:

- Use High Volume Low Pressure paint guns in place of High Pressure Low Volume paint guns in a painting line to reduce paint loss.
- Use electrostatics with painting to reduce paint loss.
- Keeping containers of liquids covered and cool to minimize evaporation.
- Use processes less likely to produce spills.
- Use rollers instead of sprayers to reduce evaporation loss from atomization.
- Adjust floating lid tanks to keep fixed volume tanks full, reducing evaporation.
- Use counter current rinsing to reduce water use.
- Reduce drag-out to minimize chemical depletion.

Table 1 – Source Reduction Ideas

Actions Prior to Waste Being Generated
• Incorporate environmental considerations into the initial process or facility design to limit or prevent pollution or waste generation from occurring.
• Redesign and modify production processes to generate less waste than those currently used; for example, modify a production process to allow use of recycled wastewater.
• Take actions before the hazardous waste is generated that result in the lessening of the properties that cause it to be classified as a hazardous waste.
• Purchase only what is needed, in the smallest quantities needed. Maintain inventories at a minimum, and redistribute any excess product, to reduce, avoid, or eliminate the generation of hazardous waste.
• Date all chemical containers when received so that the older chemicals will be used first.
• Control hazardous materials in inventory to promote efficient use and to avoid shelf-life expiration and waste generation. Emphasize issuing only the quantity of a material needed for the job. Turn in unused materials as excess. Inventory chemicals and identify their location at least once a year.
• Label all chemical containers.
• Substitute non-hazardous or less hazardous materials to reduce the toxicity of the resulting waste stream. Generally, materials that have a lower degree of hazard require lower levels of control and result in less stringent regulation. Often, the lesser regulation will more than offset the cost of higher priced, lower hazard materials.

Actions Prior to Waste Being Generated
• Implement a preventative maintenance program for the detection and avoidance of equipment problems before failures and associated spills or leaks of hazardous materials occur.
• Improve housekeeping and awareness by personnel regarding the proper management and use of toxic and hazardous materials. This can greatly reduce the amount of accidental spills, releases, and subsequent waste generation.
• Keep supplies and stock out of the weather to eliminate cleaning between processes;
• Have a vendor use a no-clean rust inhibitor on incoming parts.
• Substitute less hazardous metals.
• Reduce Petroleum Contact Water (PCW) and sludge from Tank cleaning by using a controlled thin water spray instead of an uncontrolled water stream.
• Minimize/eliminate contact of storm water with chemicals by storing chemical containers inside buildings or canopies, and performing maintenance work indoors (if possible). This minimizes the amount of rainwater that gets in contact with chemicals.
Actions after Waste Generated
• Return materials, or their components, for reuse within the existing processes or operations, to reduce, avoid, or eliminate the generation of hazardous waste.
• Segregate waste streams to minimize hazardous waste generation by separating hazardous wastes from non-hazardous wastes at the point of generation. Do not mix hazardous and non-hazardous wastes. For example, keep heavy metal solutions separate from other wastes; separate all mercury and mercury-bearing wastes from all other wastes.
• Take care not to mix relatively “pure” unwanted materials that may otherwise lend themselves to recycling, recovery, reclamation, or fuel management options with other wastes that would preclude such beneficial reuse or recycling. This technique is especially applicable for petroleum products, such as, used oil.
Solvents and Cleaners
• Use non-hazardous solutions such as water based solvents for cleaning.
• Replace a vapor degreaser with re-circulating, water-based cleaning process.
• Replace solvent-based inks in printing operation with soy-based inks.
• Keep halogenated wastes separate from non-halogenated wastes.
• Use non-halogenated solvents.
• Use nonflammable, alternative solvents.
Paints, Stains, and Coatings
• Use latex-based paints, which are typically non-hazardous.
• Use UV cure paint to eliminate the solvents in ordinary paint.
• Use darker wood to eliminate solvents in ordinary staining.
Other Substitution Ideas
• Use red liquid (spirit-filled), digital, or thermocouple thermometers in place of Mercury thermometers.
• Consolidate the use of products. Minimize the number of different types and brands of materials and mixtures coming on site. Favor those that have lower inherent hazards. Overcome the natural inclination to select products and materials that have the lowest cost of purchase. Instead, consider the total cost of having and holding a chemical from purchase through waste disposal (i.e., use life cycle costing/full cost accounting).
• Use a painted or plastic surface instead of chrome plated surface such as those found on lawnmower handles and the "Euro-look" cars and bumpers.

Actions Prior to Waste Being Generated
• Eliminate the release of CFC by sending electronic parts for sterilization to a plant that can use pure ethylene oxide instead of the more common ethylene oxide/Freon mix.
• Use propylene carbonate instead of acetone to clean tools used in fiberglass parts manufacturing.

Source reduction does NOT include:

- Off-site recycling such as sending used process water to be reused at a golf course, sending used motor oil or coolant off-site for reclamation or incineration, off-site solvent recovery, or regeneration of ion exchange columns;
- Treatment, such as, wastewater treatment to remove contaminants prior to disposal, evaporation of a waste stream to remove water from contaminants, sludge de-watering to reduce volume, air stack scrubbers to remove gaseous contaminants or catalytic incinerators to remove VOCs from air;
- Disposal, such as landfilling or incineration.

Table 2 – Recycling Ideas

Implement on-site recycling, such as:
• Using an ion exchange system for the recovery of dissolved metals in a rinse water
• Using a batch solvent still for the recycling of a cleaner
• Using a cart that rolls up to a vehicle, filters oil or coolant, and returns the clean fluid to the vehicle
• Using a solvent still to clean solvent for reuse
• Filtering machining fluids for reuse
• Installing a paint gun cleaner that filters and re-circulates the cleaning solvent
• Using electro-winning to remove dissolved metals from plating rinse water and allowing the water to be reused
• Capturing solvent vapors from printing operations for their distillation and reuse
Purchase compressed gas cylinders from manufacturers who will accept the return of the empty or partially used cylinders.
Keep used oil from being contaminated and return it for recycling.
Re-distill used-solvents. [Stringent standard operating procedures should be developed for recovering solvents since solvents can be extremely flammable or explosive. Recovering some solvents like ethers should be avoided.]
Send metallic mercury for recycling.
Use a waste exchange service so that the material can be reused rather than become a waste.
Operate a collection and redistribution program for computers and other electronic products; sell the electronics through an employee equipment purchase program, donate to local schools or send to an environmentally sound off-site company for further evaluation for use or recycling.

C. Legal Requirements

Code of Federal Regulations (CFR):

40 CFR, Part 262.41 Biennial Report.

(a): A generator who ships any hazardous waste off-site to a treatment, storage or disposal facility within the United States must prepare and submit a single copy of a Biennial Report to the Regional Administrator by March 1 of each even numbered year. The Biennial Report

must be submitted on EPA Form 8700-13A, must cover generator activities during the previous year, and must include the following information:
(6): A description of the efforts undertaken during the year to reduce the volume and toxicity of waste generated.
(7): A description of the changes in volume and toxicity of waste actually achieved during the year in comparison to previous years to the extent such information is available for years prior to 1984.

40 CFR Part 262.27 Waste minimization certification (applicable on September 5, 2005**).**
A generator who initiates a shipment of hazardous waste must certify to one of the following statements in Item 15 of the uniform hazardous waste manifest:
(a) "I am a large quantity generator. I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; or
(b) "I am a small quantity generator. I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford."

Florida Statutes (F.S.):

In **403.061(33**), F.S., the Florida legislature gave the Department of Environmental Protection the responsibility to establish and administer programs providing appropriate incentives that have the following goals, in order of importance:
(a) Preventing and reducing pollution at its source.
(b) Recycling contaminants that have the potential to pollute.
(c) Treating and neutralizing contaminants that are difficult to recycle.
(d) Disposing of contaminants only after other options have been used to the greatest extent practicable.

In **403.702(2)(g)**, F.S., the Florida legislature declared a purpose of the "Resource and Recovery Management" statute is to promote the reduction, recycling, reuse, or treatment of solid waste, specifically including hazardous waste, in lieu of disposal of such wastes.

403.721(3)(f), F.S. states "The department, with respect to generators of hazardous waste identified or listed pursuant to this act, shall adopt rules governing submission of reports and inspection of manifests to describe the … certification of the generator's efforts to reduce their amount and toxicity."

D. Benefits of a Waste Minimization Plan

Examples of Wastes:
- Hazardous waste, such as, solvents, paints, acids
- Municipal-like solid waste that might be recycled, such as, wood, cardboard, metal cans
- Wastewater, such as, cooling water, pretreatment water, wastewater from pretreatment systems
- Airborne pollutants, such as, VOCs, dust, wood chips

Benefits of Waste Minimization:
- Reduce liability associated with the generation of hazardous wastes.
- Improve company image.
- Reduce operating costs from better material control and utilization.

- Eliminate the negative impact on the environment and human health.
- Reduce volume and toxicity of waste generated by the facility.
- Minimize the present and future threat to human health and the environment.
- **S**implify compliance with State and Federal regulations.
- Provide for a safer work place.
- Reduce company disposal costs.
- Ensure that changing legal requirements or directives, objectives and targets, are addressed.
- Make employees aware of the environmental and financial impacts of hazardous chemical waste; encourage them to actively seek to minimize the volume of hazardous waste that is generated.
- Make the management of waste an integral part of manufacturing, laboratory and operating procedures.

APPENDIX 5
Internet Resources

U.S. Environmental Protection Agency Waste Minimization Resources

The National Waste Minimization Program http://www.epa.gov/wastemin/

National Partnership for Environmental Priorities
http://www.epa.gov/epaoswer/hazwaste/minimize/partnership.htm

Elements of an Effective Facility Waste Minimization Program (includes link to *Facility Pollution Prevention Guide*) http://www.epa.gov/reg3wcmd/wmplan.htm

State and Other Waste Minimization Resources

Waste Reduction Resource Center (Region 4 clearinghouse for technical, state, and EPA resources) http://wrrc.p2pays.org/

Ohio Pollution Prevention and Waste Minimization Planning Guidance Manual
http://www.epa.state.oh.us/opp/guide/p2ptoc.html

Rail Road Commission of Texas Waste Minimization User Guide
http://www.rrc.state.tx.us/divisions/og/key-programs/userguide/GUIDE.HTML

Michigan Department of Environmental Quality Guidance:
Guidance Manual for LQ HW Generators and SARA Section 313 Toxic Release Inventory Filers
http://www.deq.state.ms.us/MDEQ.nsf/pdf/ERC_Waste_Minimization_Guidance_LQ_Hazardous_Waste_and_SARA_Section_313/$File/Waste_Minimization_Guidance_Manual_for_Large_Quantity.pdf?OpenElement

Summary of Steps for Waste Minimization Plan and example actions
http://www.deq.state.mi.us/documents/deq-ead-tas-wmd-wastemin.pdf

Tennessee Department of Environment and Conservation, 1999, *Writing a Waste Reduction Plan*
http://64.233.187.104/search?q=cache:vJu8sP36lqkJ:www.cis.utk.edu/EHSP/wrplan.pdf+writing+a+waste+reduction+plan&hl=en

University of South Florida Waste Minimization Guide
http://usfweb2.usf.edu/eh&s/Hazardous_Waste/Waste%20Minimization%20Guide.pdf

FDEP CONTACT INFORMATION

Tallahassee Offices:

Hazardous Waste Regulation Section
2600 Blair Stone Road
Tallahassee, FL 32399-2400
(850) 245-8707
http://www.dep.state.fl.us/waste/categories/hwRegulation/default.htm

Pollution Prevention Program
2600 Blair Stone Road
Tallahassee, FL 32399-2400
(850) 245-8707
http://www.dep.state.fl.us/waste/categories/p2/default.htm

District Offices:

Northwest District 160 Government Center Pensacola, Florida 32501-5794 (850) 595-8300 http://www.dep.state.fl.us/northwest/	**Northeast District** 7825 Baymeadows Way, Suite 200B Jacksonville, Florida 32256-7590 (904) 807-3300 http://www.dep.state.fl.us/northeast/
Southwest District 3804 Coconut Palm Drive Tampa, Florida 33619-1352 (813) 744-6100 http://www.dep.state.fl.us/southwest/	**Central District** 3319 Maguire Boulevard, Suite 232 Orlando, Florida 32803-3767 (407) 893-7555 http://www.dep.state.fl.us/central/
South District (PO Box 2549) 2295 Victoria Avenue, Suite 364 Fort Myers, Florida 33902-2549 (239) 332-6975 http://www.dep.state.fl.us/south/	**Southeast District** 400 North Congress Avenue Ste 200 West Palm Beach, Florida 33401 (561) 681-6600 http://www.dep.state.fl.us/southeast/