TOXICS USE REDUCTION

PLANNING AND PLAN UPDATE GUIDANCE

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and
310 CMR 50.00

Massachusetts
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of
ENVIRONMENTAL
PROTECTION

Developed in collaboration with:
Office of Technical Assistance for Toxics Use Reduction
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I. Introduction

The Toxics Use Reduction Act (TURA, MGL c. 21I) and its regulations at 310 CMR 50.00, establish toxics use reduction as a central component in the Commonwealth's efforts to protect public health and the environment and to promote the competitive advantage of Massachusetts businesses through efficient materials use and management. TURA requires certain facilities that manufacture, process, or otherwise use listed toxic materials in their operations above specific thresholds to file annual reports detailing their management of toxics, and to undergo a planning process to identify opportunities for toxics use reduction. The outcome of the planning process is a toxics use reduction plan (TUR plan). Because TUR planning is intended to be a continuous process, a Plan Update documenting progress is required every two years.[1]

The purpose of this guidance document is to provide guidance on the requirements of the planning process and to describe the required elements of a TUR plan (see also 310 CMR 50.40) and Plan Update. This guidance will prove helpful to new Toxics Use Reduction Planners and new TURA filers

This guidance document describes each section of a TUR Plan and explains the requirements. The regulations contain two broad sets of requirements -- requirements for the planning process and for the contents of the TUR plan. The planning process is made up of the analyses and decisions that facilities must make in order to develop a complete and certifiable plan. The content requirements describe what must be included in the plan. The guidance poses a number of questions that will assist you in your evaluation and plan update. It is not necessary to include answers to these questions in your Plan Update, but you may find it useful in documenting your update activities. We strongly recommend that you use these questions to guide you when evaluating and documenting your TUR efforts. We also advise you to keep the information you collect on file (TURA requires documentation to be kept for 5 years) and make notations on the Plan Update Worksheet as to its location and the date of your last review. This will document your Plan Update efforts and should be kept with your TUR Plan.

This document includes "model" plan components, both simple and complex examples, and blank tables that facilities may use in their plans. These examples illustrate a range of approaches a facility might use. Other approaches to planning and formats for presenting plan information also may be appropriate. Best management practices are outlined in this guidance and examples of actual TUR success have been included to help you accurately characterize chemical use and byproduct generation. The best practice in process characterization for TUR Planners is from a report done for a U.S. Environmental Protection Agency grant project. The report is entitled, "Measuring Progress in Toxics Use Reduction and Pollution Prevention," and is the result of a combined effort on behalf of the Massachusetts TURA Program. This report develops and refines descriptions of the most advanced process characterization practices currently used by industry. You may obtain a copy of this report on the TURI web site at http://www.turi.org/content/view/full/4124.

In addition to reductions in toxics use and byproduct, some facilities have documented significant cost savings, better materials tracking, decreased energy and water use, improved manufacturing efficiency, and product quality as a result of TUR planning. TUR planning also has resulted in competitive advantage and improved management awareness of environmental issues. Some facilities have reduced the need for MassDEP permits and costly pollution control devices as a result of their TUR efforts, while others have used TUR planning as the foundation for environmental management systems and programs leading to better pollution prevention. Experience proves that TUR works.

An Act Amending the Toxics Use Reduction Act (Chapter 188 of the Acts of 2006) was signed into law on July 28, 2006, representing the first major overhaul of the Toxics Use Reduction Act (TURA, MGL c. 21I) since it was enacted in 1989. The amendments make significant changes to a number of sections of the TURA statute, including new toxics use and byproduct reporting metrics, establishing categories of higher hazard and lower hazard substances with different thresholds and fees, and allowing for alternative resource conservation planning or

[1] Under the following circumstances Plan Updates are not required: when a chemical has been eliminated, when a chemical is below the reporting threshold, or when a facility is scheduled to close. *For further information, please refer to Exceptions to Plan Requirements in Appendix A.*

Environmental Management Systems (EMSs) in lieu of toxics use reduction (TUR) plans.

The 2006 legislation allows TURA facilities that have completed a TUR plan and two plan updates to choose alternative planning options: they can choose to develop either a Resource Conservation plan every other planning cycle, to implement an Environmental Management System (EMS) in lieu of a TUR plan, or to conduct a TUR plan update. This provides flexibility for TURA filers to focus on source reduction opportunities in water, energy, solid waste or non-TURA regulated chemicals and to voluntarily implement facility improvements that result in greater economic and environmental benefits. This guidance only covers TUR planning. MassDEP has prepared separate guidance documents on TURA Resource Conservation Planning and Environmental Management Systems that can be found on the MassDEP web site at http://www.mass.gov/dep/toxics/toxicsus.htm. Additional information and assistance is also available from the Toxics Use Reduction Institute (TURI) at www.turi.org or from the Office of Technical Assistance and Technology at www.mass.gov/envir/ota.

A. What is the purpose of planning?

TUR planning is designed to bring about a new management approach to environmental protection. TUR planning is based on the premise that minimizing or eliminating the use of toxic chemicals or reducing the generation of toxic byproduct (waste) will result in less pollution requiring treatment or control and will reduce potential exposure of workers and releases to the environment.

TURA requires companies to develop a planning process and to complete a toxics use reduction (TUR) plan. The planning process is designed to help facilities identify opportunities for toxics use reduction that make economic sense for them.

The purpose of this document is to assist you in updating your Toxics Use Reduction (TUR) Plan and in preparing the Plan Summary, which must be submitted to the Massachusetts Department of Environmental Protection (MassDEP) by July 1, 2010. MassDEP requires plan updates to be completed only in even-numbered calendar years. Therefore, facilities that filed a toxics use report for 2008 and are required to file a report for 2009, must complete a TUR Plan Update by July 1, 2010[2]. A good faith effort to identify and evaluate toxics use reduction (TUR) opportunities through the TUR planning process will benefit your facility by identifying opportunities to eliminate waste, cut costs, and achieve a cleaner, healthier workplace and environment. This Plan guidance will help make the planning process easier for you and will provide the documentation necessary to have your Plan Certification Statement approved and signed by a TUR Planner.

B. What is "Toxics Use Reduction"?

Toxics use reduction (TUR) involves changes in the ways chemicals are manufactured, processed, or otherwise used, or byproducts are generated, in the production process. Toxics use reduction can be accomplished through a variety of means: input substitution, product reformulation, production unit modification, production unit modernization, improved operations and maintenance, and in-process recycling or reuse. The law does not require companies to use less of a substance. Reducing production levels would not be considered TUR, and neither the law nor the regulations require Massachusetts industries to take such a step.

TUR, as defined by the law, can be accomplished in two main ways:

1) Reducing or eliminating the use of a chemical per unit of product produced,
2) Decreasing the generation of byproduct per unit of product produced (thereby increasing the efficiency of the production process by reducing the amount of the substance "wasted" during production).

One way to reduce or eliminate the use of a chemical per unit of product is through input substitution. However, for

[2] Unless the facility is developing a Resource Conservation Plan or implementing an Environmental Management System for that planning cycle.

many facilities in Massachusetts input substitution is not feasible. For example, stamped metal parts containing a TUR listed metal may be the product a company sells so the company could not eliminate or reduce the metal and remain in business. Or the toxic chemical may be a significant part of a company's product or the production process for which there is no practical substitute.

The other TUR approach is for companies to change their production processes so that the chemical is used more efficiently so that less is wasted during production and there is less byproduct generated per unit of product produced. For example, painting methods can be changed to reduce overspray and increase transfer efficiency so that less of the paint ends up as hazardous waste, or cutting procedures can be changed so that less material ends up as scrap. Improved efficiency reduces the quantity of a toxic chemical used per unit of product -- if less is wasted in production, less will be used per product produced.

C. What does TUR Planning Involve, and What does it Commit My Facility To?

The planning process involves:

- Examining how toxic chemicals are manufactured, processed, or otherwise used, and byproducts are generated
- Identifying TUR techniques
- Evaluating the technical feasibility of potential TUR techniques
- Evaluating the costs and savings of potential TUR techniques

The process provides a means for toxics users to identify any changes in their production processes that will both reduce toxic chemical use or waste AND save the facility money.

A completed TUR plan must specify which toxics use reduction techniques the facility plans to implement. Companies are not required to implement any techniques; however, past experience indicates that when companies have done TUR plans, they often discover TUR techniques they want to implement because doing so is in their best interest.

If a company decides to implement a TUR technique, the TUR plan must contain an implementation schedule developed in good faith. However, facilities are not required to abide by the implementation schedule. Companies may find, with time, that markets change or they may learn new information about the TUR technique. If a facility decides to alter or abandon an implementation schedule, the regulations require that an explanation for the decision must be included in the next plan update (plan updates are required every two years).

D. General Guidelines for Developing Plans and Plan Updates

The planning process is designed to complement a facility's existing planning processes as much as possible. The TURA regulations are flexible, leaving companies free to use whatever process and format works best for them. Paperwork and procedural requirements are limited to those required by the statute. Companies are encouraged to use available data when appropriate. In fact, many companies routinely compile much of the information needed to do an adequate plan in the normal course of their business.

There are three standards to which companies must adhere in preparing a TUR plan:

- Good engineering practices
- Standard accounting practices
- Completing the plan in good faith

Decisions made during toxics use reduction planning and implementation are like other business decisions companies make. Each of these standards addresses, to some extent, how much information the company needs to gather and evaluate to make informed decisions about toxics use reduction options. The rule of thumb is that the analysis has to be good enough to make informed business decisions. For some decisions, virtually no analysis is appropriate or required. Other choices require a great deal of in depth study, monitoring, and testing.

There are no specific engineering procedures or cost evaluation techniques for meeting these standards. This guidance will explain each of the principles by example in the latter part of this document.

When calculations need to be done for a plan, the calculations and any assumptions used to do the calculations must be included in the plan. Supporting data and other documents used as the basis for the calculations may be referenced in the plan. The plan must specify the location of all referenced documentation and supporting data.

Analyses and calculations that are developed for a plan may be presented in the plan in a variety of ways. The analyses can be included in the plan in their original form, whether handwritten, a formal consultant's report, a computer printout, etc. There is NO need to reformat or retype the work done. As long as the information is legible, it can be included as is. Also, companies may cross reference duplicate information in the plan. Information and calculations must be retained at the facility for at least five years, after the date that the plan is due.

E. Developing Plan Updates

The first step in developing the Plan Update is employee notification. Facilities should notify all employees by January 1 of each even numbered calendar year that the Plan Update process is underway and any teams or committees that previously worked on TUR planning should be reconvened. Facility management should reissue the facility's Management Policy on toxics use reduction to reinforce the goals of TUR planning.

The task of updating your facility's TUR Plan consists of going through each element of the Plan to evaluate its effectiveness, quantify progress, and determine if modifications would produce better results. Only you can define a successful TUR Plan. Consider using the Plan Update Worksheet in each section to guide you in preparing your update. Challenge your TUR team during this Plan Update process. Many facilities have succeeded in improving their business and increasing their productivity through TUR planning.

The Plan Update must be signed by a certified TUR Planner. In addition, a senior management official must certify it as true, accurate, up-to-date, and complete. The standard of compliance is the same as for the original planning process: a good faith effort to identify and evaluate TUR options.

Keep in mind that, while implementation of TUR strategies is not mandated, you are required to make a good faith effort to plan for TUR and to explain if you did not meet your previously projected reductions in chemical use or byproduct generation. The Plan Summary Form allows you to explain why there may be differences in your previously projected and actual reductions in use or byproduct.

For each section of the planning process and plan contents, the guidance specifies what is required for a Plan Update. The Plan Update Worksheet lists the **required** sections of the Plan in the boxed areas and allows you to document the date and location of the updated sections. You can use the *questions* listed under each section to indicate what has changed, what progress has been made, and what obstacles have been encountered. This is an opportunity for you to identify and document your good faith effort in updating your Plan. The Plan Update Worksheet is optional but can be useful for facilities that do their own Plans to check their work. The Plan Update Worksheet can be placed in the front of the existing Plan, referencing the pages of each current section. This documentation will make the update process easier and also will aid you in the event of a MassDEP inspection. The full Plan Update Worksheet is included as an appendix.

Below are two examples of how facilities can use the Plan Update Worksheet. Both facilities satisfied the requirements of the Plan Update by reviewing the Management Policy. However, only one of the facilities found that it needed to change its Management Policy. Each documented their progress in the space supplied.

Example 1 - Plan Update Worksheet Management Policy Section: Facility 1

Action Item	Date Reviewed*	Date Revised
Management Policy has been reviewed and revised as needed.	2/2/2010	3/2/2010
Management Policy is located at:	Page 2a of Original Plan	

Narrative Section (You may use this section to comment on such questions as: How has the Management Policy been refined over the past two years? How has the Management Policy been communicated to employees? Has the Policy resulted in greater employee awareness or increased implementation of TUR? If so, how?)

The Management Policy has changed since the last update. At the time the original Management Policy was written we did not fully realize the benefits of materials accounting. After implementing the original Management Policy we realized that materials accounting was not just an exercise - it saved us money in raw materials and waste disposal. We changed the new Management Policy to require materials accounting for all processes, not just those involving toxics. The new version of the Policy was inserted after the old version in the original Plan.

Example 2 - Plan Worksheet Management Policy Section: Facility 2

Action Item	Date Reviewed*	Date Revised
Management Policy has been reviewed and revised as needed.	2/2/2010	See note Below
Management Policy is located at:	Page 2 of Original Plan	

Narrative Section (You may use this section to comment on such questions as: How has the Management Policy been refined over the past two years? How has the Management Policy been communicated to employees? Has the Policy resulted in greater employee awareness or increased implementation of TUR? If so, how?)

The Management Policy was reviewed and it was determined that while the Policy accurately represented top management's attitude toward TUR, the Policy had not been supported through middle management, and therefore did not reach the workers. Although the Policy did not require a change, it was determined that it could be communicated more effectively. Since the Policy was reviewed, more efforts have been made to communicate the Policy through middle management. The Policy has been posted, sent by E-mail, and discussed at weekly meetings. The Policy has been useful in marketing the facility as environmentally responsible.

II. GENERAL PLAN GUIDANCE

A. Applicability of the Planning Process (310 CMR 50.41)

Facilities that are large quantity toxics users (LQTUs) are required to file annual toxics use reports and develop biennial TUR plans. A facility is an LQTU only if it meets the following three criteria:

- employed the equivalent of at least 10 full-time employees (FTEs);

- conducted any of the business activities described by Standard Industrial Classification (SIC) codes 10 - 14, 20 - 39, 40, 44 - 51, 72, 73, 75 and 76; and

- manufactured, processed, or otherwise used a TURA-regulated chemical in excess of a reporting threshold.

The term "manufacture" includes coincidental production of a TURA-listed substance (e.g., as a byproduct or impurity) as a result of the manufacture, processing, otherwise use, treatment, disposals or other waste management of other chemical substances. For example, neutralization of wastewater containing nitric acid can result in the coincidental manufacture of a nitrate compound (solution), reportable as a member of the nitrate compounds category. As another example, combustion of sulfur containing fuels can result in the coincidental manufacture of sulfuric acid.
Each facility required to file a toxics use report must develop a TUR plan for each chemical included in their report.

B. Plan and Plan Update Due Dates (310 CMR 50.41) and Exceptions to the Plan Due Dates/Planning Requirements

MassDEP requires plans and plan updates to be completed only in even-numbered calendar years. For example, facilities that filed a toxics use report by July 1, 2009 (for use in 2008) and are required to file a toxics use report by July 1, 2010 (for use in 2009), must complete a TUR plan or plan update by July 1, 2010. If a facility first reports a chemical by July 1, 2010 (for use in 2009), the first TUR plan for that chemical would need to be completed by July 1, 2012. A good faith effort to identify and evaluate toxics use reduction (TUR) opportunities through the TUR planning process will benefit your facility by identifying opportunities to eliminate waste, cut costs, and achieve a cleaner, healthier workplace and environment.

Under the following circumstances plans or plan updates are not required: when a chemical has been eliminated, when a chemical is below a reporting threshold, or when a facility if scheduled to close. Please refer to the Certification Statement/Exceptions to Plan Requirements in Appendix A, Plan Summary Form and Guidance.

C. Waste Treatment Chemicals

Plan requirements differ for waste treatment chemicals. Only the facility-wide elements of the plan apply to waste treatment chemicals. Thus, if a company used chemicals only for waste treatment, the plan would consist of a certification statement, management policy, employee participation section, scope of the plan, and the plan summary (including the certification statement and facility-wide projections for use and byproduct). When a company uses a chemical in a production unit and in waste treatment, and the total of the two uses exceeds the chemical's reporting threshold, all elements of the plan must be done for the chemical used in the production unit, regardless of the quantity, as is the case with any other covered toxic.

D. Where the Completed Plan is Kept/Recordkeeping Requirements [310 CMR 50.42(7)]

Plans must be kept at the facility. However, all the referenced supporting information need not be kept together or even with the plan itself. The TUR plan must state where at the facility supporting materials can be found. The plans and supporting documentation must be kept for at least five years after the plan completion date.

The TUR plan as well as any supporting documentation must be made readily available for review if requested by a MassDEP inspector. Only MassDEP has the authority to review the TUR plan.

Because the entire plan is confidential, companies may not designate portions of the plans confidential and therefore exclude those portions from MassDEP inspector review. All inspectors must be allowed to review the plans in their entirety after receiving special training in reviewing confidential reports.

Plan summaries must be submitted to MassDEP. Portions of the plan summaries may be claimed confidential. A

sanitized version (i.e., one that does not contain confidential information) of the plan summary will be available for public review. (See MassDEP's confidentiality regulations at 310 CMR 3.00.)

III. THE PLANNING PROCESS AND PLAN CONTENTS

It is important to note that some portions of a TUR plan cover the entire facility, while others cover specific production unit/chemical combinations. Certification statements, management policy, employee participation and the plan scope apply to the entire facility. The remainder of the planning -- process characterization; options identification, evaluation and implementation planning -- is done at the production unit level. These sections must be completed for each covered toxic in each production unit in which the chemical is used (i.e., each chemical production unit/chemical combination reported on the annual Form S). The plan summary, which is the document that must be submitted to MassDEP, has facility-wide chemical-specific information.

The plan sections are discussed below in the order in which they are likely to be completed.

A. Management Policy [310 CMR 50.43(1)]

The facility must describe its policies regarding toxics use reduction in a statement of management policy. Strong management commitment is central to successful development and implementation of toxics use reduction programs. Since a toxics use reduction program encompasses many facets of the facility operations, such as process engineering, environmental management, financial analysis, research and development, it is essential that support and coordination for toxics use reduction occur at the management level.

Management policies may be in a variety of formats including:

- Narrative statement;
- Concise bullet points;
- Logo with a statement of philosophy.

The policy must include, at a minimum, the following:

- Description of the ways in which the company encourages toxics use reduction; and
- Description of any policy applicable to the company that encourages toxics use reduction.

The policy also may include descriptions of the company's policies or decision rules that are designed to promote TUR within a facility. These policies could be in the areas of:

- Research and development;
- Financial investments or capital investments;
- Hiring promotions, or bonuses, or other incentives for company employees; and
- Any other policy applicable to the company that encourages toxics use reduction.

The management policy in example 3 meets the two minimum requirements: it describes the ways in which the company encourages TUR and the policies affecting TUR. This management policy is a broad statement of company philosophy.

Example 4 meets the two minimum requirements and it elaborates on the basic requirements by discussing toxics use reduction in relation to research and development, financial decisions, and training for new employees.

These two examples illustrate two types of management policies. **Facility 3** chose to state specific numeric goals for reducing air emissions and waste entering the environment. **Facility 4** discussed its policies in a more philosophical manner. In addition to these approaches, a management policy could include a company commitment to evaluate a particular production process for TUR opportunities or a phase-out of an older process line in favor of a modernized version.

It would not be acceptable to have a management statement dealing only with pollution control or waste minimization.

The management statement must describe the company's policy toward reducing either the use of toxic chemicals or the generation of toxic byproducts.

Example 3

Management Policy

We, the management of **Facility 3**, aim to produce the highest-quality products possible while minimizing our use of toxic materials. In this effort, our highest priority will be the proactive pursuit of cost-effective process changes which reduce or eliminate the use and/or generation of toxics at the point of production. Where toxics cannot be eliminated at the source, reuse and recycling of materials will be explored and implemented wherever possible. These objectives will be incorporated into the design of new production processes, the redesign of existing processes, and the construction of new facilities. We encourage all employees to forward their suggestions for helping to reduce our reliance upon toxic substances.

Example 4

Management Policy

In example 4, the facility has a broad environmental policy goal of minimizing impacts on the environment by increasing raw material use efficiencies, improving manufacturing processes, and reducing wastes entering the environment. **Facility 4** has pledged to reduce all Section 313 air emissions by 90% by the end of 2010 and all EPCRA listed waste entering the environment or being transferred off-site by 70% by the end of 2013.

The attainment of these short and long-term goals is every employee's responsibility with the Plant Manager being ultimately responsible. To assist the Plant Manager and the facility, a Toxics Use Management (TUM) Team has been formed to oversee the development, assessment and implementation of the plant's TUM policy and techniques. The TUM team is headed by the plant's Environmental Protection Superintendent and consisted of 15 other members representing; accounting (2), manufacturing (2), engineering (2), environmental engineering (3), research and development (2), marketing (2), and sales (2).

While no formal TUM employee incentive program has existed, the TUM team has developed a program to supplement its New Employee Orientation and Professional Orientation Programs training. Additionally, all members of the plant and departmental TUM teams have received a special orientation and training on TUM planning. Supplemental to these programs, there is an informal program in place where employees are given personal recognition for outstanding reduction efforts. These forms of recognition could include corporate certificates, awards, and monetary bonuses.

The facility’s corporate policy and its emission reduction goals has been given preference over normal capital investment criteria. This means that the company would implement projects which would help achieve the reduction goal despite being uneconomical. Typically, the facility has expected a XX% return on money invested on new projects and would only proceed with projects that met these criteria. However, with the new reduction policies in place, projects which reduced chemical emissions would be implemented if they were required to ensure that the company has met its goals.

The toxics program has affected research and development by requiring consideration of alternatives which eliminate or reduce environmental impacts in the development of new products or processes. This has typically influenced research and development into evaluating water-based materials versus organic based materials, and low hazard materials versus higher hazard materials. While this would reduce the use of certain chemicals, the most significant reductions to be expected would be reduced wastes in the production line.

All managers and technical professionals are to be held accountable for their area's environmental compliance record as well as their efforts towards achieving their reduction goal. Byproduct and emissions reduction are an important part of an employee's job description and will be evaluated for their contributions at the time of their annual review.

Plan Update: Management Policy

Important! You must review your Management Policy, and you must revise it if changes have occurred at your facility that would affect the Policy. [310 CMR 50.43 (1)]

***Questions to Consider**:*

- *Did the original Management Policy result in TUR at the facility?*
- *Did the original Management Policy result in employee involvement and participation?*
- *What changes can be made to the Management Policy to further encourage greater implementation of toxics use reduction at the facility? To encourage greater employee involvement?*
- *Since you wrote your Management Policy, have changes occurred in your facility that would affect the Policy.*
- *Has there been an implicit change in Management Policy since the Plan was crafted which should be noted as part of the update?*
- *Has the Management Policy taken shape and refined itself over the past two years? Does it need to be re-communicated as part of a refresher to the facility?*
- *Has the Management Policy been incorporated into, or coordinated with, your facility's business plan?*

See examples 5 and 6 for a revised management policy.

Example 5 – Plan Update Management Policy 2010

We, the management of National Metal Devices are committed to manufacturing quality products with the absolute minimum use of toxic materials. Because a cleaner, safer environment is so important to everyone, especially our families, we will continue to be pro-active in our pursuit of cost effective process changes that reduce or eliminate the use and/or generation of toxic materials. These objectives will be incorporated into the design of new products, the redesign of existing manufacturing processes, and into the construction of new facilities. We encourage all employees to forward their suggestions for helping to reduce our reliance on toxic chemicals to Bob Walker in the Engineering Department.

To support our facility's Management Policy, we will:

- Continue to develop manufacturing processes designed to eliminate or minimize pollution;
- Maintain compliance with all environmental regulations including OSHA, TURA, wastewater discharges, air permits and RCRA;
- Cooperate with government agencies to develop and comply with environmental regulations based on scientific standards; and
- Hold all National Metal Devices managers accountable for their area's environmental compliance records and their efforts towards achieving the facility's toxic use reduction goal.

Example 6 – Plan Update Management Policy 2010 (<u>emphasis on materials accounting added</u>)

We, the management of National Metal Devices are committed to manufacturing quality products with the absolute minimum use of toxic materials. Because a cleaner, safer environment is so important to everyone, especially our families, we will continue to be pro-active in our pursuit of cost effective process changes that reduce or eliminate the use and/or generation of toxic materials. These objectives will be incorporated into the design of new products, the redesign of existing manufacturing processes, and into the construction of new facilities. We encourage all employees to forward their suggestions for helping to reduce our reliance on toxic chemicals to Bob Walker in the Engineering Department.

To support our facility's Management Policy, we will:

- Continue to develop manufacturing processes designed to eliminate or minimize pollution;
- Maintain compliance with all environmental regulations including OSHA, TURA, wastewater discharges, air permits and RCRA;
- Cooperate with government agencies to develop and comply with environmental rules and regulations based on sound scientific standards;
- Hold all National Metal Devices managers accountable for their area's environmental compliance records and their efforts towards achieving the facility's toxic use reduction goal; and
- <u>Perform materials accounting for every production process in order to minimize waste and keep production costs down.</u>

B. Scope of Plan (310 CMR 50.43(2))

The scope of plan section describes the production units and chemicals included in the plan and the types of TUR techniques evaluated. It serves as an executive summary of the plan.

The scope of plan must include a description of each production unit, including production unit number, process, product, unit of product, and the chemicals and CAS numbers from each Form S associated with the production unit (this description may be the same as that used in the Form S's). In addition, it must include the process for identifying TUR options and a summary of all the toxics use reduction techniques that were considered appropriate and underwent a comprehensive technical and economic evaluation (see section F below).

The plan scope also may include any other information about the planning process and the company's environmental activities the facility chooses to include. The company may choose to submit this additional information to MassDEP as a part of the plan summary. The scope of plan may be used as an opportunity to tell the public all of the environmentally beneficial things that the company is doing. This can include those actions that meet the definition of toxics use reduction, as well as other environmentally beneficial actions such as recycling, water or energy conservation, or pollution prevention of waste streams that are not listed TURA chemicals.

For example, an environmentally beneficial action such as non-integral recycling onsite often results in very high byproduct numbers. The scope can be used to explain the reasons for the high byproduct numbers and why the facility is choosing to do non-integral recycling rather than doing toxics use reduction as defined by the law. It is important to remember, however, that while the scope MAY be used in this way, doing so is OPTIONAL.

Below are two sample scopes of plans. Example 7 is in a narrative format. Example 8 is a less elaborate version of the same scope of plan. Both sample scopes of plans are acceptable.

The scope of plan cannot be completed until TUR options have been identified and evaluated. Though it serves as an introduction to the plan, it is likely that companies will finish the scope of plan once the rest of the plan has been completed.

Examples 7 and 8 were developed for one production unit and two chemicals. However, if a company has more than one production unit/chemical combination, it must clearly show which chemicals are associated with each production unit.

Example 7

Scope of Plan

Facility 7, located at Main Street, Boston is a manufacturer of soft urethane foam products. The foam produced by **Facility 7** is primarily used in the manufacture of mattresses and seat cushions. Scrap foam generated by the plant is ground and pressed into carpet pads. **Facility 7** employs 250 people at its 42,000 square foot manufacturing, warehouse and headquarters facility.

Since the use, storage and byproduct generation of the facility's reportable chemicals is associated with a single production step, **Facility 7** considers the entire facility to be one production unit (Production Unit #1 on the facility's Form S). Foam is produced at the plant by the controlled expansion of the reaction caused by mixing a urethane polymer with a reactant containing toluene diisocyanate (CAS # 26471-62-5) (TDI). The softness of the foam is controlled by the simultaneous addition of a low boiling point blowing agent. **Facility 7** utilizes methylene chloride (CAS # 75-09-2) as its auxiliary blowing agent. Processes associated with this production unit include: foam production, curing and cutting. Scrap foam from cutting operations is recycled and resold whenever possible.

During the foam reaction TDI is completely reacted with the urethane resin. Presently, the methylene chloride is vented to the atmosphere under a MassDEP air emissions permit. Due to a number of reformulation changes, process modifications, the use of additives and housekeeping controls, methylene chloride use, on a unit of product basis, has dropped by over 66% during the past three years.

In developing and evaluating additional potential toxics use reduction strategies, **Facility 7** concentrated on approaches which would greatly reduce or eliminate methylene chloride from the process. Options for reducing TDI use and byproduct were limited since the chemical is an integral part of the reaction which produces the foam and industry-wide research on altering the basic reaction of foam generation has yet to find any acceptable substitute for TDI.

In developing reduction strategies for consideration, **Facility 7** reviewed trade publications and EPA databases, attended trade association meetings on toxics reduction, hired an outside technical consultant to examine current operating practices, and conducted brainstorming sessions among all production supervisors and line personnel. This review produced over 35 potential reduction options for the two chemicals used on-site. Some of these options included additional minor process adjustments, the use of new additives, more stringent chemical handling procedures, alternative blowing agents, and newly developed production technologies.

Based on a screening review of the technical feasibility, potential toxics reduction and cost savings, most of the options were eliminated for the reasons stated later on in this Plan. Three options dealing with chemical handling procedures and production scheduling were obviously favorable and already have been implemented. Of the options which involve substantial investment or process modifications, three options for methylene chloride and one for TDI were deemed appropriate and therefore underwent a more complete economic and technical evaluation.

For methylene chloride, **Facility 7** considered: 1) the purchase of a processing technology which does not require a blowing agent; 2) substituting a water and acid mixture as the blowing agent; and 3) an air emission control system which would allow the blowing agent to be recycled. The option fully examined for TDI was installing a system that would allow TDI emissions to be vented back to the delivery truck.

Example 7 (continued)

Using a present value analysis, **Facility 7** determined that the option involving the purchase of a new production line which utilizes state-of-the-art foam application technology, would provide a 20% return on investment, while simultaneously reducing methylene chloride use by 100%. Free from the restrictions of its air emissions permit, **Facility 7** anticipates a substantial growth in production over the next three years. The option involving substitution of a water and acid mixture as the blowing agent, and an air emissions control system which would allow the blowing agent to be recycled, were rejected because the present value analysis showed a lower return on investment than the state-of-the-art foam application technology.

During the time that it will take to get the new system operating, **Facility 7** implemented 3 of the chemical handling options identified during the screening process for a 15% reduction from current use levels. Because the TDI venting changes only would result in a one-pound reduction of TDI byproduct at a significant cost this option was not selected for implementation.

Example 8

Scope of Plan

Facility 8

Production Unit
#1 - Foam production using curing and cutting.
The product is soft urethane foam products.

Chemicals
Methylene Chloride (75-09-2)
Toluene Diisocyanate (26471-62-5)

Process for Identifying TUR Options
Review of trade publications
Review of EPA databases
Trade meetings on TUR
Hired outside consultant
Brainstorming sessions – production supervisors and line personnel

TUR Options to be Implemented
New process technology not requiring Methylene Chloride
Revised chemical handling and production scheduling (immediately implemented)

TUR Options Requiring Further Evaluation
Substituting a water and acid mixture as the blowing agent
Air emission control system that allows recycling of blowing agent

TUR Options that Were Rejected
TDI Venting Changes

Plan Update: Scope of Plan

Important! The Scope of Plan must be updated to reflect any changes in production units or chemicals covered by the Plan. The Scope also must reflect any new processes for identifying TUR options or new TUR techniques. [310 CMR 50.43 (2) (a), (b), and (c)]

Questions to Consider:

C. Employee Participation [310 CMR 50.42(5)]

As part of the planning and plan update process, facilities must notify all employees to solicit ideas on increasing the efficiency of chemical use and reducing waste. Facility personnel in various fields such as engineering, environmental compliance, marketing, finance, purchasing, sales, production, management, quality control, legal, health and safety, materials control, and research and development, represent a wide range of expertise and all may have TUR ideas to contribute.

To comply with the planning requirement, the company is required to do the following at least six months before the plan due date (i.e., by January 1st of each planning year):

- Notify all of its employees of the requirements of the plan or plan update
- Identify the toxic chemicals and production units included in the plan or plan update
- Make available the requirements and criteria for the plan; and
- Solicit comments and suggestions from employees on toxics use reduction options.

The plan need only describe the steps it took to notify employees. It is not necessary that the employee notice be in writing. If the company notified the employees through a written notice, then the plan should include the written notice and a description of how and when it was distributed (see Example 9 for an example written employee notice).

Example 9

Employee Notification

The notice shown below was posted on the employee bulletin board from October 1, 2009 - January 1, 2010. It also was included with each employee's paycheck the week of October 14th.

Pursuant to MGL 21I, The Massachusetts Toxics Use Reduction Act, Facility 9 will be preparing a toxics use reduction plan. The purpose of the plan is to describe how, where, and the amount of toxic chemicals used at our plant and to identify, evaluate and select methods for reducing toxics use and toxic waste.

The plan will be developed in accordance with Massachusetts regulations 310 CMR 50.40. Copies of these regulations may be obtained from the shop foreman and the personnel director. Facility 9 uses methyl ethyl ketone (MEK) in the inks used on presses two and three, and to clean the presses between runs.

The toxics use reduction plan must include:

- A management policy about toxics use reduction,
- A process flow diagram for the use of MEK in each press, including the quantity of MEK used and the amount that becomes waste MEK
- Options for reducing the quantity of MEK used in production or wasted during production, including input substitution, process modernization, process changes, product changes, improved housekeeping, integral recycling, reuse of the waste
- An evaluation of the above options based on technical and economic feasibility
- A decision about which options, if any, the company will implement, and an implementation schedule for each option.

The plan must be completed by July 1, 2010, and approved by a Toxics Use Reduction Planner. The plan remains on-site but a summary must be submitted to MassDEP. We are seeking employee input on ways in which the company could reduce the quantity of MEK used or wasted in production. Please offer any ideas you may have to either your foreman or myself. You may do so verbally, or preferably, in writing. There will be a box in the employee cafeteria for suggestions.

Plant Manager, 10/1/2009

Plan Update: Employee Notification

Important! Completion of the Employee Notification for the 2010 Plan Update is required by January 1, 2010. If past years' employee notifications of TUR planning generated little interest or participation, facilities should consider a more aggressive, interactive approach. [310 CMR 50.42 (5)] See example 10 below.

Questions to Consider:

- *Was the method of employee notification effective and efficient at reaching all employees? Could this method be improved?*
- *Did the employee notification generate interest and participation?*
- *Were employees given feedback on their ideas? Have you considered rewards or recognition?*
- *Did you have active participation of employees at all levels of management and labor? How can broader participation be achieved?*
- *Have employees continued to identify TUR options and look for effective ways to implement TUR?*

Example 10 – Plan Update Employee Notification

For the 2008 Plan Update, a facility posted the employee notification on all facility bulletin boards. This generated little participation. For the 2010 Plan Update the facility tried a different approach. It announced the employee notification at all staff meetings during the first week of January. Along with the announcement by the Group Manager, the Environmental Manager gave a five-minute overview of the benefits of toxic use reduction. The facility found that this new form of employee notification generated a greater interest, as employees felt that their supervisors appreciated their efforts.

D. Process Characterization (310 CMR 50.44)

Process characterization is performed for each production unit/chemical combination to accurately identify the steps and chemicals involved in manufacturing a product. Process and chemical flow diagrams are developed to aid in the definition of production units. Production units are the fundamental planning unit for tracking chemical use, byproduct generation, and chemical use efficiency. The process characterization section of the Plan includes:

- Defining the production unit
- Defining the purpose of the chemical and the unit of product
- Creating a process flow diagram for each production unit
- Developing materials accounting information for each production unit
- Defining the unit of product

The process characterization will serve as the foundation for the rest of the TUR planning process. This data will help pinpoint where in the process the chemicals are used and where byproduct originates. It also identifies opportunities for toxics use reduction. By clearly delineating the quantity of the chemicals that are used and the byproduct generated during the use, the company will have important information for quantifying the total cost of using the toxic.

Defining the Production Unit

A production unit is a "process, line, method, activity, or technique or a combination or series thereof, used to produce a product (or family of products)." The manner in which a facility groups its processes into production units defines the depth of information available for analysis. Byproduct measurements in particular are usually more accurate when processes are split up into several production units rather than grouped into one.

Plan Update: Defining Production Units

Important! If you have revised your production unit, your facility's Plan Update should reflect that change. [310 CMR 50.42(2)]

Questions to Consider:

- *Does your production unit make sense to you? Is it effectively tracking your TUR progress?*
- *What changes need to be made to your production unit?*

Unit of Product/Purpose of the Chemical

The plan must include a statement which explains the purpose the toxic chemical serves in the production process.

The unit of product for the production unit/chemical combination must be stated in the plan. This metric for measuring the amount of product produced has already been identified in the annual toxics use reports (i.e., Form S). In the course of developing TUR plans, facilities may decide to change their unit of product. This is acceptable, provided that the same unit of product is used on the current and future toxics use reports.

The unit of product is a measure of the product outputs or the amount of work produced by a process. An accurate unit of product allows a facility to measure TUR progress while correcting for changes in business activity. In general, non-physical measures are less accurate than physical measures of production. The more closely the unit of product is related to chemical use, the more accurate the measure.

Plan Update: Unit of Product

Important! If you have revised your unit of product, your Plan Update should reflect that change. [310 CMR 50.44(3)]

Questions to Consider:

- *Does your unit of product make sense to you? Is it effectively tracking your TUR progress?*
- *What changes need to be made to your unit of product?*

Plan Update: Purpose of Chemical

Important! If the purpose of the chemical in the production process has changed, the facility's Plan Update should reflect that change. [310 CMR 50.44(4)]

***Questions to Consider**:*

- *Is the process characterization you completed for the Plan still accurate? Have you implemented procedures to ensure that it stays up-to-date?*
- *Has the process for manufacturing the product changed during the past two years? If so, how: Chemical changes? Process changes? Equipment changes?*

Best Practice - Chemical Use Tracking

Diversified Metals Manufacturing Co. Uses "Just in Time" Inventory Control
A diversified metals manufacturing facility uses a "Just in Time" inventory system and therefore carries little chemical inventory (no more than two weeks' supply at any time). As a result, each chemical is brought in specifically for each production unit and their production unit level tracking is very precise.

Computerized MSDS System at a Flexible Web Coating Facility
A flexible web coating facility has a computerized material safety data sheet (MSDS) system which is used to monitor the components of the coatings formulations used at the facility. This system helps to identify the reportable chemicals and monitor use for reporting and planning purposes, as well as satisfying certain record keeping requirements with MassDEP's air quality program.

Using Wash Tickets to Track Clean-Up Solvents at a Flexible Web Coating Facility
A flexible web coating facility generates batch tickets for both product formulations as well as equipment cleaning. While many facilities employ batch tickets for products, this firm uses wash tickets, enabling them to accurately track solvent use in an ancillary operation. This method gives them a wealth of production unit level data.

Best Practice - Choosing Production Units

Designing Production Units Based on Data Collection and Management Structure
Best practice production unit definition is exemplified by a diversified metals manufacturing facility. The facility designated 42 production units using a team process involving plant-wide personnel, which was facilitated by the facility's environmental manager. The production units correspond with cost tracking, production control and management responsibility. However, these production units were designed to fit an existing data collection and management reporting structure and were not invented for the purposes of TUR. The facility's production control system tracks a surprisingly high level of materials accounting data in each of the 42 production units, producing reliable TUR progress data.

Best Practice - Choosing Production Unit/Unit of Product Combinations

A Paper Manufacturing Facility Uses a Single Production Unit and Unit of Product
A paper mill runs a single, continuous process that produces a single product. Thus, a single production unit is the most logical (and simplest) way to track progress for this facility. But generally when facilities designate greater numbers of production units, they retain the ability to track TUR progress more closely. More production units, however, translate into more data collection, such as production-level use, byproduct, unit of product and emissions tracking. Excessive numbers of production units with poor production unit level data may not benefit the facility as well as fewer production units with more accurate information would.

Best Practice - Choosing a Unit of Product

A Flexible Web Coating Facility Chooses Unit of Product
A flexible web coater uses "square yards coated" as a unit of product. Its coating machines have various capacities ranging from single to multiple coating heads. Depending on the product, the machine may coat one or both sides of the substrate. Rather than just using production numbers of "square yards coated," they have developed a database which tracks the number of times each square yard is coated and with which coating formulation. This database was originally developed for tracking VOC emissions, but provides excellent information for TUR purposes as well.

Process Flow Diagram

A process flow diagram is required for each production unit and chemical combination. It must be a visual representation of the movement of the covered toxic through the processes within a production unit. The locations on the process flow diagram where chemicals enter and exit the process as products or byproducts, and the ultimate fate of the byproducts, whether treatment, recycling, transfer or direct release to the environment, must be noted. The production unit number indicated on the Form S must be included on the diagram.

While the points where the covered toxics are lost from the production unit as byproduct must be identified, they do not need to be quantified in this phase of the planning process. However, the company will need to quantify the releases from particular points in the process in the course of completing the required technical and economic evaluation of TUR options.

A process flow diagram is required because these diagrams are the best manner in which to understand how chemicals are used "in process" and to identify opportunities for reductions in either toxics use or byproduct generation.

If several covered toxics are used in the same production unit, the process flow diagram (PFD) need not be repeated as long as the places each of the covered toxics enter and exit the production unit are clearly shown on one diagram.

Example 11 shows the general locations on a PFD where the chemicals enter and exit the production units as input, byproduct, emissions and product, and the materials accounting for each chemical (materials accounting requirements are discussed below). Example 12 shows a PFD, but the quantities of chemicals are indicated elsewhere in the plan. Either type of PFD is acceptable.

Plan Update: Process Flow Diagram

Important! If any production unit has been altered in a way that would affect the discovery and evaluation of new TUR options, the process flow diagram should be revised accordingly in your Plan Update. Production unit alterations include changes in production units resulting from implementing TUR, and also new chemicals added to existing production units. [310 CMR 50.44(1)]

Questions to Consider:

- *Is your Process Flow Diagram useful, accurate and up-to-date?*
- *What changes need to be made to the process flow diagram?*

Materials Accounting

A detailed materials accounting describes total inputs and outputs of the covered toxics in the production unit for the year on which the plan is based. Input data includes the quantity of chemical used in the production unit. Output data describes the losses as byproduct, the quantities treated on-site, and the quantities released or transferred off-site to the air, water, or publicly owned treatment works, and as solid and hazardous wastes.

The materials accounting process serves as a basis for measuring the success of the TUR changes you have implemented. It is a method for determining the volume of toxic byproducts produced by your facility so that you can eventually measure how effectively those byproducts have been reduced. In addition, this process is used to track and allocate chemical use. Data on chemical use will help designate which areas of your process on which to focus TUR efforts.

Materials accounting is required so that planners gain an understanding of where and how the substances are used, where there are opportunities for reducing losses, and to help quantify the costs of using the chemicals.

A materials accounting must be done for each production unit/chemical combination. The materials accounting includes the total amount and the amount per unit of product of each covered toxic that is:

- Manufactured, processed or otherwise used,
- Generated as byproduct,
- Released to the environment or transferred off-site (i.e., emissions).

Optional Table 1 (in Appendix B) may be used in the plan to show the total amount of the chemicals used, generated as byproduct, and released or transferred as emissions.

Byproducts and emissions are further quantified to determine the amount:

- Treated on-site,
- Treated off-site,
- Recycled on-site,
- Recycled off-site,
- Disposed of on-site,
- Disposed of off-site,
- Released to the environment.

The plan must quantify the amount of the chemical that went to each of the environmental media. Environmental media are defined as air, water (surface water, groundwater, and wastewater treatment facilities), and transfers off-site to solid waste disposal, hazardous waste disposal, and recycling. Optional Table 2 (in Appendix B) may help companies present the data for byproducts and emissions.

Byproducts are all non-products (or wastes) generated during production released directly to the environment or sent to on-site or off-site recycling, treatment or disposal. Emissions are only those substances that are released directly to the environment, disposed of on-site, or transferred off-site. Any materials destroyed in on-site treatment or non-integrally recycled on-site would be counted as byproduct, but would not be counted as emissions. In other words, a byproduct is any non-product output of a listed chemical prior to handling, transfer, treatment, or release to the environment. All process outputs from a recycling operation also are counted as byproduct. An emission is any byproduct that leaves the facility boundary directly or after treatment or recycling.

When doing the materials accounting, companies need to consider the level of precision they desire. A rule of thumb is "the number has to be good enough to make informed business decisions." Measurements, estimations or engineering calculations are all acceptable approaches for obtaining byproduct and emissions amounts. Methods of quantification will probably differ from company to company, and may differ within a company for each chemical or

production unit. In addition, facilities may choose to refine their calculations later in the planning process when they are trying to decide whether or not to implement a particular TUR technique.

All of the following methods fall within the criteria of "standard engineering practices" and can be used for determining byproducts and emissions, provided they are accurate enough to meet the rule for making good business decisions. Other methods may also be appropriate.

- EPA published or facility determined emissions factors
- Continuous monitoring
- Extrapolations from periodic monitoring
- Design calculations (e.g., estimating yield for a chemical manufacturing operation)
- Mass balance calculations such as the assumption that the amount otherwise used equals byproduct (e.g., no direct measurement of emissions)
- Engineering calculations using physical and chemical property data found on material safety data sheets or other sources
- Laboratory results (e.g., solvent content of coated product)

The calculations and assumptions used in the materials accounting must be included in the plan. The source of the data used (e.g., consultant reports, monitoring data) in the calculations may be referenced. MassDEP does not expect the calculations to be typed.

To the extent that the calculations and reference documents used to support the Form S and Form R calculations meet the planning requirements, they can be used in the plan. However, the information required for the plan is more specific than that for the Form S and Form R. Therefore, the documentation for the Form S and Form R may not be sufficient.

Example 11

Process Flow Diagram and Materials Accounting

Facility 11
Production Unit: 1, Paper Filter and Sheet Production
Chemical: Sulfuric Acid

PRODUCTION UNIT 1

Description of Unit

Facility 11 produces specialty paper products for a variety of applications. Sulfuric acid is used in the paper manufacturing process. There are two paper production lines, one for each paper line, which make up this production unit. All sources of wastewater for each production line are combined and are sent to the on-site wastewater treatment plant. This includes any wastewater or sulfuric acid spills which are collected in trenches. Discharges to Bubbling River are continuously monitored for pH.

Example 11 (continued)

Chemical Specific Information

Sulfuric acid is used in paper manufacturing in order to maintain the pH at the level that achieves optimum fiber dispersion. Sulfuric acid is added directly to the pulper and additional sulfuric acid is added to the white water tower in order to maintain the desired pH.

The unit of product for this production unit is total pounds of paper for the two production lines. For the previous year the amount of product was 6,000,000 pounds of paper.

The total amount of sulfuric acid (CAS NO 7664-93-9) "otherwise used" annually, based upon production records, is 100,000 pounds. On a per unit of product basis this results in:

100,000 lbs H_2SO_4/ 6,000,000 lbs of paper = 0.0167 lbs $H_2 SO_4$/lbs of paper

The sources of byproducts and emissions at each step in the process are shown below and shown in Figure 11-1.

Byproducts

Source	Amount	Estimation Method	Destination
Wastewater	99,000 lbs	Estimated 1% of H_2S0_4	Treated On-Site Wastewater Treatment residual in product. The remainder goes to wastewater treatment

The total amount of byproduct is 99,000 lbs. On a per unit of product basis this results in:
99,000 lbs H_2SO_4 / 6,000,000 lbs of paper = 0.0165 lbs H_2SO_4/lbs of paper

Emissions

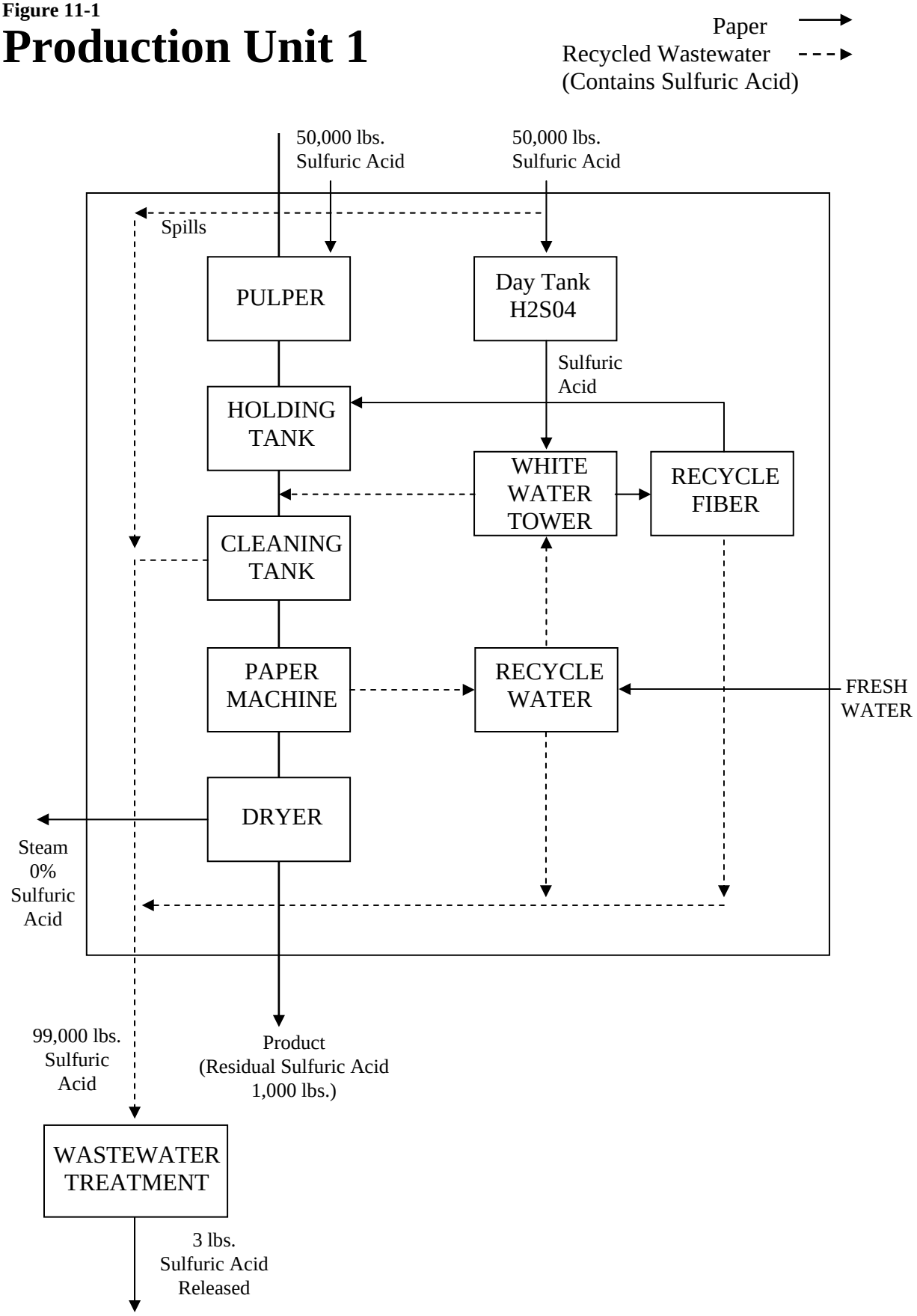
Media	Amount	Estimation Method	Destination
Water	3 lbs	Calculated from discharge pH measurements or determined from pH versus pounds of H_2SO_4 charts	Released to Bubbling River
Air	0 lbs		
Off-site transfers	0 lbs		
On-site disposal	0 lbs		

The total amount of H_2SO_4 emissions is 3 lbs. On a per unit of product basis this results in:

3 lbs H_2SO_4 / 6,000,000 lbs of paper = 5 x 10^{-7} lbs H_2SO_4/lbs of paper

Figure 11-1

Production Unit 1



Example 12

Process Flow Diagram and Materials Accounting

Facility: **Facility 12**
Process: Adhesive Lamination
Production Unit: #1 Laminating Product A
Chemical: Trichloroethylene (79-01-6)

Process Description

Twin Set (registered) Adhesive Laminators are used to apply trichloroethylene (TCE) solvent-based two-part adhesive with 44% adhesive solids to one side of a face fabric. The face fabric is then brought into contact with a lining fabric to form the laminated two-ply fabric. The laminated fabric is rolled up within the laminator enclosure and then set aside to cure. The two-part adhesive reacts and sets up the cure. The cured laminated fabric is then trimmed and packaged.

The majority of the applied TCE is released within the enclosed laminator and is captured with a carbon adsorption system with a recovery efficiency of 98%. There are emissions from the adsorber and the cooling tower that chills the process water. There are emissions from the transfer of adhesive to buckets and from spoiled adhesive not applied to the fabrics. There are fugitive emissions from the laminator, the curing step and from trimming and packaging. Any edge trim and defects do not get shipped and there also are fugitives from them.

The majority of the information used in this assessment was gathered from the facility's emission study conducted by a consultant for completion of a BACT analysis and Air Permit Application. All emissions measurements referenced in this plan were taken as part of this study. This document, including all test results, is maintained in Facility 12's environmental files.

Description of Production Unit

The adhesive lamination process is divided into a number of production units, one for each product type. Each product type has different characteristics in regards to the amount of adhesive applied per linear yard, and percentage of applied TCE emitted at each emission point.

The unit of product for this production unit is M (1,000) linear yards of product type A. For the year used in developing this plan the amount of product produced was 875 M yards of Product A.

The total amount of trichloroethylene (CAS NO 79-01-6) "otherwise used" annually as based upon production records is as follows:

5,482 gal adhesive x 11.366 lbs/gal x 56% TCE = 34,893 lbs plus pure 349 lbs non-integrally recycled TCE added to maintain viscosity **Total = 35,242 lbs TCE**

On a per unit of product basis this results in:

35,242 lbs TCE / 875 M yards = 40.3 lbs TCE/M yds

Example 12 (continued)

The sources of byproducts and emissions at each step in the process are quantified below and shown in Figure 12-1.

BYPRODUCTS

Source	Amount	Estimation Method	Destination
Mixing			
Fugitive Emissions	73 lbs	Measured	Released
Spillage (assumed to have evaporated)	352 lbs	Estimation Factor of 1%	Released
Laminating			
Fugitive Emissions	105 lbs	Measured	Released
Hazardous Waste	1,430 lbs	Manifests, Production Records	Treated Off-Site
Curing			
Fugitive Emissions	479 lbs	Measured	Released
Trimming & Packaging Fugitive Emissions	1,974 lbs	Measured	Released
Carbon Adsorption Unit			
Point Source Emission	493 lbs	Monitored	Released
Cooling Tower Emissions	158 lbs	Process Knowledge	Released
Tote Loading Emissions	17 lbs	Emission Factors	Released
Emissions from Scrap	282 lbs	Estimated from typical production information	Released
Non-Integral Recycling	349 lbs	Measured	Within Process

The total amount of byproduct is 5,712 lbs. On a per unit of product basis this results in: 5,712 lbs TCE / 875 M yards = 6.5 lbs TCE/M yd

The difference in the 35,242 lbs use figure and 5,712 byproduct figure is 29,530 lbs. 4,884 lbs of the 29,530 lbs is shipped in the product. The remaining amount, 24,646 lbs, is vented to the carbon adsorption unit, recovered and reused in the manufacture of the adhesive. The recovered TCE is loaded into Tote containers and is shipped to the adhesives manufacturer for credit against future adhesive purchases. It is therefore considered to be byproduct as product. 349 lbs that is recovered is used for mixer viscosity control as non-integral recycled byproduct.

Example 12 (continued)

EMISSIONS

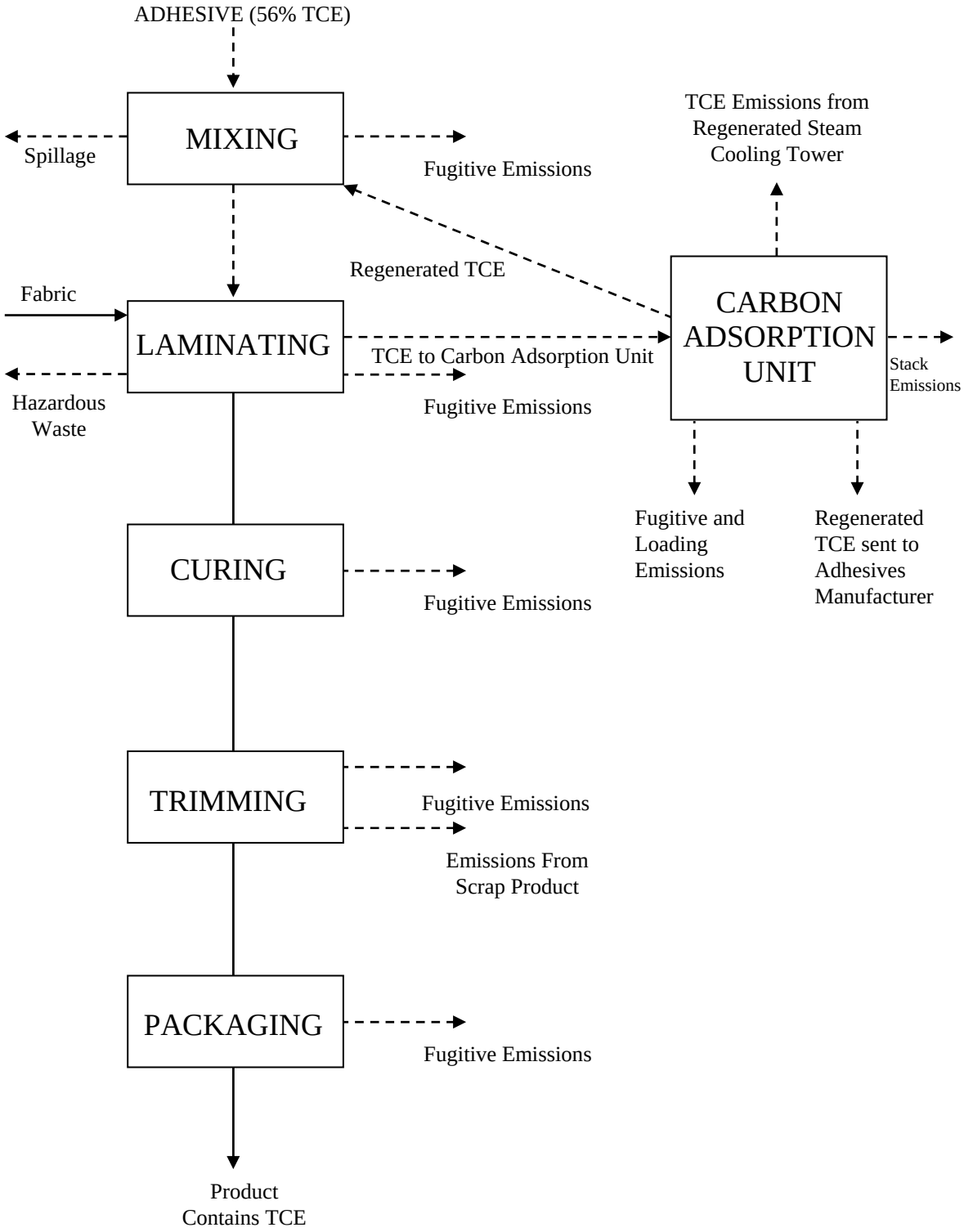
Media	Amount	Estimation Method	Destination
AIR			
Mixing			
Fugitive Emissions	73 lbs	Measured	Released
Spillage (Assumed to have Evaporated)	352 lbs	Estimation Factor of 1%	Released
Laminating			
Fugitive Emissions	105 lbs	Measured	Released
Curing			
Fugitive Emissions	479 lbs	Measured	Released
Trimming & Packaging			
Fugitive Emissions	1,974 lbs	Measured	Released
Emissions from Scrap	282 lbs	Estimated from Typical Production Information	Released
Carbon Adsorption Unit			
Point Source Emission	493 lbs	Monitored	Released
Cooling Tower Emissions	158 lbs	Process Knowledge	Released
Tote Loading Emissions	17 lbs	Emission Factors	Released
TOTAL AIR	3,933 lbs		
WATER	0 lbs		
OFF-SITE TRANSFERS			
Laminating			
Hazardous Waste	1,430 lbs	Manifests, Production Records	Treated Off-Site
ON-SITE DISPOSAL	0 lbs		

The total amount of emissions is 5,363 lbs. On a per unit of product basis this results in:

5,363 lbs TCE / 875 M yards = 6.1 lbs TCE/M yd

Figure 12-1

Production Unit 001



Plan Update: Materials Accounting

For the Plan Update, the total inputs and outputs of the covered toxics in the production unit for 2009 must be calculated. Input data includes chemicals used in the production unit. Output data describes the losses as byproduct, the quantities treated onsite, non-integral recycling, and the quantities released or transferred offsite to the air, water, or POTWs, and as solid and hazardous wastes. Materials accounting must be updated in order to reflect 2009 data, even if there are no other process characterization changes to be made. [310 CMR 50.43(3)]

Questions to Consider:

- *Does your materials accounting system accurately track materials use and wastes?*
- *Is your materials accounting useful, accurate and up-to-date?*

Best Practice - Byproduct Tracking

A Diversified Metals Manufacturing Facility Cross-Checks Engineering Estimates
A diversified metals manufacturing facility employs engineering factors to make estimates, but performs additional testing to adjust these factors. For example, the facility tests its acid baths to refine its understanding of the relationship between acid use, consumption and byproducts in its etching process. In another operation, the facility uses byproduct estimates for their plating chemicals, but cross checks these with RCRA waste data. This type of cross checking makes the estimate a more reliable basis for byproduct data.

Iron/Steel Forging Uses Real Time Process Monitoring to Track Materials
An iron/steel forging facility has a very accurate tracking system for acid use in an etching operation. The facility tests acid baths daily. Acid byproducts in the form of evaporation and carryover have been calculated and are considered constants. They then assume the amount of acid loss in the bath must be consumption. They know that typically 8-10% of the acid is generally consumed, therefore suspect results can be easily identified. This tracking procedure presents an accurate picture of acid use, consumption and byproducts.

E. Options Identification, Evaluation, and Implementation Planning

Overview of The Options Identification and Evaluation Process

This section of the guidance provides an overview to the process for options identification and technical and economic evaluation. It describes an "idealized" approach to the process, some considerations about the amount of analysis needed, and instances when the actual process may differ from the idealized approach.

The Toxics Use Reduction Act requires that the Plan include for each covered toxic used in each production unit "a comprehensive economic and technical evaluation of appropriate technologies, procedures and training programs for potentially achieving toxics use reduction...." Facilities must generate all options that could potentially achieve toxics use reduction, determine which options are technically and economically feasible and develop an implementation schedule to track progress for those options chosen to be implemented. Facilities must evaluate the reductions in cost, chemical use, and byproduct generation achieved by the implementation of the TUR techniques.

Please note that TURA filers are not required to identify and quantify all costs associated with the use of all reportable toxics in all production units and to calculate total costs and costs per unit of product. Instead, filers are required to identify and quantify all direct and indirect costs that are relevant to the economic evaluation of feasible toxics use reduction options when they perform financial analyses of those options. Where no technically feasible options are available, filers must identify, but not necessarily quantify, the costs associated with using the toxic chemical. The methodology for capturing all such costs is described in the following section on Options Evaluation. Additionally, first time filers and/or new TUR Planners may find it beneficial to collect detailed cost information on all or most toxics and production units in order to fully understand the costs associated with the use of toxics in their facilities and to help prioritize TUR opportunities.

The regulations (310 CMR 50.45, 50.46 and 50.46A) establish the following general process for conducting that evaluation:

1) **Identify the universe of TUR options available to the facility**. Companies must identify all of the techniques for *potentially achieving* toxics use reduction that could possibly be implemented.

2) **Screen the universe**. Companies should conduct enough of a technical and economic analysis to determine if a technique is "not appropriate." A technique is not appropriate if it is clearly economically or technically infeasible or it would not result in TUR. Techniques that are not appropriate may be eliminated from further consideration.

3) **Decide which -- if any -- appropriate techniques to implement**. Companies must complete a comprehensive technical and economic analysis on all appropriate techniques. The analysis need only be sufficient to make a good faith business decision about whether or not to implement the techniques.

For those techniques the facility plans to implement, the regulations require that the following steps be taken:

4) **Develop an Implementation Schedule**. Companies must determine how long it will take them to put the selected techniques into practice.

5) **Project the reductions in toxic chemicals used and byproduct generated two years into the future**. These projections are made on the assumption that the selected techniques are implemented as planned. Note that while companies set these projections, they are not required by TURA to achieve them.

Figure 1 provides a diagram of the options identification and evaluation process.
The decisions resulting from each phase of the analyses need to be included in the plan. Optional Table 3 (in Appendix

B) may be used to summarize the results of the entire options identification, screening and evaluation process. Using such a table will minimize the need to repeat information.

There are three important considerations to keep in mind during this phase of planning.

1) First, the amount of technical and economic analysis to determine if a technique is not appropriate or to decide to implement a technique will vary from technique to technique and from facility to facility.

The “good business decision” criterion applies here as elsewhere in the planning process. In other words, a company should conduct an analysis sufficient to be able to make a good business decision, as they would any other business decision.

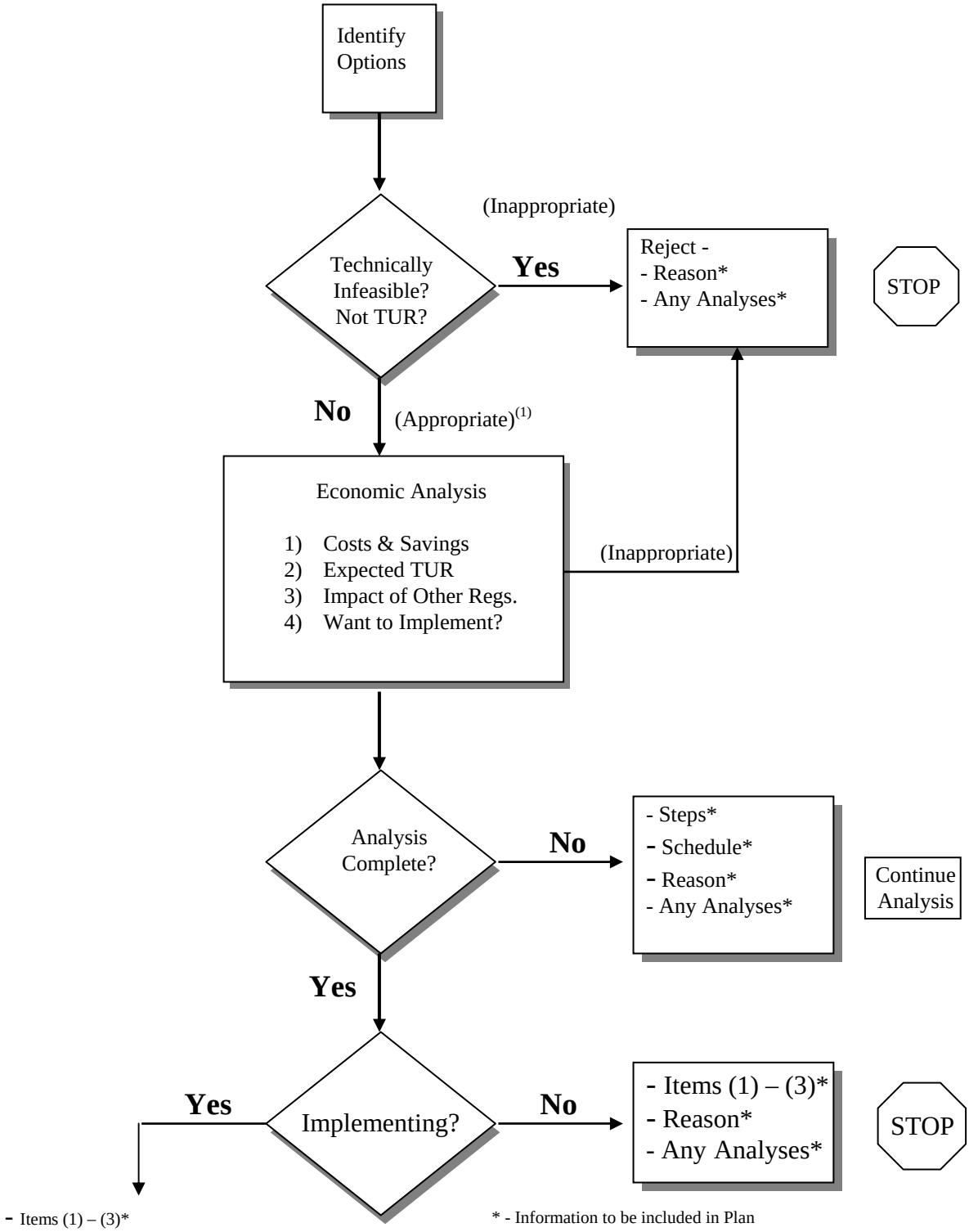
Options may be deemed inappropriate and the evaluation stopped as soon as the planners have enough information to determine that the technique is clearly technically or economically infeasible and/or is not toxics use reduction. This screening evaluation could involve extensive research or analysis but it may be as simple as "back of the envelope" calculations or comments made during the brainstorming session in which the technique was first suggested.

Examples of such simple technical and economic analyses completed during the brainstorming session itself include, “there is no room to install the equipment” or "we tried that last year and it didn't work." Another example would be a simple calculation that showed that a TUR technique would not be economically feasible because the annual cost of implementing the change would exceed the total annual cost of the toxic.

In other situations, the facility may need to do some research into the labor or capital implementation costs, or on the effects on product quality or customer acceptance before it obtains enough information to screen out the technique as clearly technically or economically infeasible.

Alternately, a facility may decide to implement a technique upon its identification, prior to completing any significant evaluation at all. Note that the required comprehensive evaluation would not be much different than what the company would need to do in order to implement the technique in the absence of TURA planning regulations. For techniques that are to be implemented, companies are required to determine the project's costs and savings, evaluate the project's impact on compliance with other regulations, determine the expected toxics use reduction, develop an implementation timetable and determine the two-year projections of use and byproduct generated. The first four items would likely be done for any project. The only additional part may be the two-year projections.

FIGURE 1: TUR OPTION IDENTIFICATION AND EVALUATION



* - Information to be included in Plan

(1) You may have enough information to know you want to implement an option at this point. If you know items (1) -(3), (5), & (6) at this point, the comprehensive technical and economic analysis has been completed.

2) The second major consideration for this phase of the planning process is that the options identification, evaluation, and decision making process is not likely to occur in as linear a fashion as described above.

Though the process of identification, evaluation and implementation of TUR techniques is described in a linear fashion, in all likelihood the process is likely to be non-linear. During the process, new techniques will be brought to light and evaluated, while others will drop out when they are considered inappropriate. Evaluating one approach may give rise to new ideas. Similarly, a facility may have to do an in-depth technical or economic analysis before they can determine that a technique should be screened out as not appropriate (clearly technically or economically infeasible). Finally, it is unlikely that all of the techniques will be in the same phase of the process at the same time.

3) The third major consideration is that it may not be possible to complete the evaluation of the technique prior to the date in which the plan must be completed.

For example, in some situations it may be necessary to do bench scale testing of a technique in order to determine impacts on product quality or to figure out whether the technique actually works. Or, some test marketing may be required to evaluate customer acceptance.

If the facility must do additional research before it can reach a decision about a technique, the plan must include a brief explanation of why the research cannot be completed by the due date of plan completion, and an implementation schedule for the additional research. Note that the facility may take extra time to complete an in-depth technical analysis such as the bench scale testing mentioned above. The company may then need to conduct a follow-up economic evaluation. However, it is not appropriate for a facility to take extra time to complete only the costs and savings analysis or to develop the projected use reductions.

Options Identification Procedure

The options identification procedure is designed to identify all options that could potentially achieve toxics use reduction. 310 CMR50.45(1) requires that companies describe the procedure they used to identify technologies, procedures, or training programs for potentially achieving toxics use reduction in each production unit. The plan also must include a list of technologies, procedures, or training programs identified by the options identification procedure as required by 310 CMR 50.45(2).

The options identification procedure needs to include consideration of each of the 6 types of toxics use reduction techniques (input substitution, product reformulation, production unit redesign or modification, production unit modernization, improved operation and maintenance, and recycling or reuse) defined in 310 CMR 50.10.

The plan needs to include a written description of the procedure used and its results, including:

- Personnel involved,
- Description of information sources consulted,
- Description of information gathering techniques,
- List of technologies, procedures or training programs identified.

This options identification process is not meant to be a burdensome paperwork exercise. Companies should demonstrate that they have gone through a considered process to identify TUR options.

It is important that the TUR team include people representing a variety of responsibilities and expertise in the company. The team members, either by brainstorming, or researching individually or collectively, should come up with a variety of options. All options that were identified must be included in the plan, regardless of when they were developed and even if they were immediately deemed inappropriate. Options that were evaluated prior to the development of the plan or formation of the TUR team may be included.

In the scope of the plan, companies also may choose to describe TUR practices that they have already implemented.

Screening the Options Identified

The options screening involves identifying any inappropriate options and eliminating them from further consideration. 310 CMR 50.46(2) provides the initial screening criteria to determine if a TUR option is inappropriate. The three criteria are:

- TUR technique is clearly technically infeasible,
- TUR technique is clearly economically infeasible,
- TUR technique will not result in a decrease in toxics use or byproduct per unit of product (i.e., it is not TUR).

It is important to remember that the amount of analysis needed to determine that a technique is inappropriate will vary from technique to technique and from facility to facility. Furthermore, an option can be deemed inappropriate at any point in the analysis. The analysis can stop as soon as this conclusion is reached. The regulations are structured so that options can be evaluated first for technical feasibility. Then the economic analysis need only be done on the feasible options.

A TUR technique may be clearly technically infeasible if, for instance: the equipment is not available or cannot be developed, worker skills are inadequate, the impact on product quality is unacceptable, or the space is insufficient to install the equipment. For a TUR technique to be clearly economically infeasible, factors might be that the technique does not meet the company's investment criteria or it does not seem feasible based on a rough analysis of costs and savings. Finally, factors to think about when determining if an option is TUR are:

- Does it reduce toxics use and/or byproduct generation? (Yes, it reduces toxics use and/or byproduct generation.)

- Does it shift all byproducts from one waste stream to another? (No, it does not shift all the byproducts from one waste stream to another.)

- Does it treat/recycle all byproducts outside of the production unit? (No, byproducts are not treated/recycled outside of the production unit.)

The plan needs to include the results of the screening steps and any analyses or studies done that led to the facility's conclusion about an option's feasibility. The reason why a TUR technique is inappropriate must be included in the plan. The analyses do NOT need to be reformatted or copied over. It is perfectly acceptable to include quick calculations done on a pad of paper during a brainstorming session, or a memo written to summarize the results of a bench test.

Example 13 demonstrates the screening process. The TUR team at Facility 13 identified four TUR options that fell under the category of improved operations and maintenance. Two were definitely technically feasible, the other two were not. The improved operations and maintenance methods varied in their potential for toxics use reduction.

Based on this screening analysis, the company rejected the two methods that were clearly technically infeasible. They quickly conducted a cost/savings analysis and determined that both options had good to excellent payback periods. The facility felt that the little technical and economic analyses they did to determine whether techniques which were considered inappropriate had given the facility enough information to decide to implement the two operations and maintenance techniques. The company documented these choices in the narrative and accompanying table.

Facility 13 also considered three input substitution methods. Applying the screening criteria, the company found that only one option, the ShipSolv parts cleaning solvent, had the potential to be technically feasible. Further, that option looked as though it would be economically feasible and would eliminate toxic chemical use (i.e., it is TUR). The

ShipSolv chemical option was a candidate for further technical and economic evaluation. The two other options were rejected from further consideration because they were not technically feasible.

TUR techniques that were not practical two years ago now may be feasible. When you have developed the new or revised list of TUR techniques, you then need to proceed with the rest of the TUR technique evaluation. Please keep in mind that TUR techniques need only be evaluated in a way "sufficient to be able to make a good business decision."

Example 13

TUR Option Development and Screening

Facility 13
Production Unit: Floatation Device Production
Chemical: Methylene Chloride

When it began TUR planning in January 2008, Facility 13 decided that it would incorporate the TUR planning process into its ongoing effort toward continuous improvement. The facility's past experience was that new ideas for production changes were conceived, tried out, permanently implemented, or set aside depending on results and practical experience. Toxics use reduction options generated through TUR planning would undergo the same implementation process, and would employ as screening criteria the factors that the company has found to work through its past experience. The TUR planning process would serve primarily as a way for the company to systematize and document its method of pursuing process efficiency improvements and presenting potential investments to management.

TUR Techniques were identified based on a process review, ideas from management and employee "brainstorming" sessions held as part of TUR team meetings, and information from literature reviews. Each of the six TUR techniques was discussed in order to identify all appropriate options. Initially, all ideas were considered regardless of scope, economic, and technical considerations. Options considered ranged from minor operational changes to chemical substitutions and process changes. Input regarding the technical practicality of potential strategies was gathered and an initial cut of options which were not viable from either a technical or economic standpoint was made.

Criteria used to determine the appropriateness of the listed strategies fell into three categories: technical feasibility, whether or not the option was toxics use reduction, and economic feasibility. Those strategies which were determined to be technically infeasible were the first to be eliminated. Factors used in assessing technical infeasibility of a strategy included: excessive labor requirements; time requirements which would interfere with the overall production schedule; quality requirements; and unavailability of equipment. Marketing impacts were not anticipated for changes in the use of methylene chloride, since it is used in an ancillary operation and is not directly related to product quality.

The second criterion was projected environmental benefit, including TUR chemical reductions and reductions in regulated discharges. Strategies which would result in no environmental benefit were eliminated. Those techniques which would result in only marginal reductions were not considered further if they required significant costs or process modifications. Strategies which involved the substitution of materials underwent further study to determine the environmental impact of the new material. In the event that the new material also contained TUR chemicals or would contribute to a regulated discharge than the relative toxicity of the two materials, the quantity of byproduct, and the amount of regulated discharge generated were examined. An initial assessment of the potential reductions which could be expected for possible strategies was discussed and was used as a means of prioritizing strategies for further study and review.

Example 13 (continued)

An initial payback analysis of the current costs associated with chemical use and waste generation and the anticipated costs of selected strategies was made. A detailed economic assessment was made for those selected strategies which had higher projected costs.

All options were classified into one of three groups: appropriate -- full immediate implementation without further study, appropriate -- further study or implementation with testing as part of TUR plan development, and inappropriate -- elimination from further consideration. Several strategies were identified which could be readily implemented at little cost. These strategies were selected without further study. Other promising strategies identified required research both to determine their true applicability and to gather information regarding costs and implementation requirements.

Flotation Devices Production Unit - Methylene Chloride

Methylene chloride is used for cleaning molds and other parts in the flotation devices production unit. Several potential TUR techniques were identified for the reduction of methylene chloride in the flotation devices production unit as described below. See the table below for a list of all TUR techniques considered.

On-Site Recycling

In 2008, a batch still for on-site distillation and recycling was installed to reduce methylene chloride purchases. It was not practical to hardpipe the still to the parts washing tank. This still reduced new purchases (facility-wide use) and emissions of methylene chloride per unit of product by about 75%, to 10,000 pounds per year in 2008. However, the generation of byproducts per unit of product did not change. Because of the overall environmental benefits, use of the distillation unit will continue as long as methylene chloride is used at the facility.

Use of Disposable Aluminum Mold Liner

Lining the mold with a disposable aluminum mold liner was tested and found to be ineffective. The aluminum could not be properly shaped to fit the mold. This option was eliminated as technically infeasible.

Use of Disposable Plastic Film Mold Liner

Lining the mold with a disposable plastic mold liner was tested and found to be ineffective, since the plastic melted. This option was eliminated as technically infeasible.

Use of a Disposable Plastic Blow Molded Mold Liner

The option of fabricating a durable polyethylene plastic liner through a blow-molding process appeared to be technically feasible. This option had a good potential for reducing toxics use because it would completely eliminate the use of 32,000 pounds per year of methylene chloride. The economic feasibility of the option was considered good, with an estimated payback period of about six months.

Example13 (continued)

This option was elected for implementation on a trial basis during the planning period. Several disposable polyethylene mold liners were fabricated by a job shop and were tested. The method worked well and eliminated the need for methylene chloride use in this process step. It also created unexpected labor savings and a faster than anticipated payback because it was easier to extract the cast product from the mold. The disposable polyethylene liner, which adhered to the work piece, could then be easily cut and removed as part of the parts trimming process. Consequently, this option was selected for full implementation. A capital investment of $5,000 was made to make a permanent metal mold for fabricating the polyethylene mold liners. Full implementation began in November of 2008 and was completed by February 2009.

Restricted Access to Methylene Chloride

Access to methylene chloride was restricted and recorded. This action was taken both to discourage methylene chloride use and to improve knowledge of how it was used. The chemical was placed under lock and key; employees had to make a request and record the amount used and its purpose in a log book. After three months use, the chemical per unit of product was reduced by almost 20%. Implementation of this TUR strategy will continue.

Use of Citric Acid Based Cleaners

Several substitute cleaners (semi-volatile citrus-based terpenes) offered by vendors have been tested but do not effectively clean the molds, so their use has been discontinued and will not be considered as a TUR option any further.

Use of Acetone as a Cleaner

Acetone did not clean the molds as well as methylene chloride. In addition, acetone is a TURA-listed chemical and is extremely flammable, presenting additional safety hazards and storage requirements. The use of acetone will not be considered.

Use of ShipSolv Cleaner

"ShipSolv", a less toxic solvent containing butyrolactone (CAS 96-48-0) or gamma-butyrolactone was considered as an option. The ShipSolv product removed the epoxy, though more slowly than methylene chloride. The TUR team decided to further test and evaluate substitution of this product for methylene chloride in parts cleaning steps. A full technical and economic evaluation of the potential uses and limitations of ShipSolv will therefore be conducted.

Example 13 (continued)

Toxics Use Reduction Option Screening

Flotation Devices Production Unit - Methylene Chloride Use for Parts Cleaning

Toxics Use Reduction Option	**Option Type**	**Technical Feasibility**	**Is it TUR?**	**Economic Feasibility**	**Appropriate/ Inappropriate?**
Develop disposable mold liner-plastic blow molded	Improved O & M or production unit equipment and methods	Feasible - requires capital investment (larger mold)	yes	Feasible - potential payback in 6 months (labor saving in tool preparation)	Appropriate - immediate implementation
Use disposable roll form aluminum as mold liner	Improved O & M or production unit equipment and methods	Infeasible - could not form to tool during test	yes	Feasible - potential payback in 6 months (no capital costs)	Inappropriate
Restrict access to methylene chloride	Improved O & M or production unit equipment and methods	Feasible	yes	Feasible - actual payback less than 3 months	Appropriate
Use disposable plastic sheet film	Improved O & M or production unit equipment and methods	Infeasible - ineffective in test (melted)	yes	Feasible - potential payback in 6 months (no capital cost)	Inappropriate
Use citric acid based parts cleaning substitute for solvents (terpene)	Input Substitution	Infeasible - failed to remove epoxy residue in test	yes	Feasible – payback in one year	Inappropriate
Use acetone as substitute parts cleaning solvent	Input Substitution	Infeasible - failed to remove epoxy residue in test	yes	Feasible – payback in one year	Inappropriate
Use ShipSolv as substitute parts cleaning solvent	Input Substitution	Feasible - fair results in test (removed epoxy more slowly than methylene chloride)	yes	Feasible – payback in one year	Appropriate - conduct further testing/evaluation
On-site recycling	On-site recycling - not integral	Feasible	no	--	Inappropriate

Plan Update: Options Identification

Important! You must identify the universe of TUR options available to your facility. Screen the universe to eliminate inappropriate options. [310 CMR 50.45]

Questions to Consider:

- *Have you held a brainstorming session to generate new options? Have employees from all levels been involved?*
- *What options were originally proposed and why? Review your original list of possible TUR options. Reevaluate those options originally discarded as technically and economically infeasible.*
- *What new options are available now that were not available two years ago?*
- *Have you considered worker training programs/education as possible TUR options?*
- *Have any new technological advances occurred which would introduce the possibility of new options?*
- *Has your Management Policy or capital budgeting criteria for environmental projects changed to allow you to consider new options?*
- *The scope of your Plan outlines a procedure for identifying options. Have you exhausted all sources of information identified there? (Trade associations, journals, vendors, TURI, etc.)*
- *Have you considered implementing all six TUR techniques? (Input substitution, product reformulation, production unit redesign/modification, production unit modernization, improved operations and maintenance, in-process recycling)*

Best Practice - Eliminates Hydrochloric and Nitric Acid Through Process of Options Identification

This job shop manufactures closed die forgings and investment castings from steel parts for facilities in the petrochemical, aircraft, medical and commercial markets. The facility eliminated the use of acids in preparing parts for inspection and saved nearly $47,000 in the first year after making process changes discovered through the TUR planning process.

Prior to TUR planning, the forging unit used an acid passivation operation for in-process inspection of parts. The process of identifying options to remove metals from rinse waters led to consideration of alternatives to the acid process. The result was a process change to the use of a tumblast abrasive cleaning machine which, using a mixture of grit and glass shot, provides a surface finish suitable for inspection. The $47,000 savings consisted of a conservative estimate of the value of avoided treatment costs as well as the reduction of hydrochloric and nitric acid use by 100%.

Best Practice - Eliminates TCE Cleaning

This facility previously used TCE to clean oil off parts supplied from a foreign source. They had identified alternative cleaners in their 2008 Plan, but had not found one that cleaned the parts well enough. As part of the 2010 Plan Update they identified purchasing parts that were not packed in oil as an option. They then found a local supplier, which could directly supply the parts eliminating the need for oil. The parts were slightly more expensive per piece from the new supplier but when the facility factored in the costs associated with TCE cleaning (raw materials, labor, production time, waste disposal) and the transportation costs, the facility found that they actually saved money and reduced lead time by using the local parts.

Evaluating Technical and Economic Feasibility [310 CMR 50.46 and 50.46A]

In this phase of TUR planning, TUR techniques that were identified in the first phase undergo an analysis to determine:

- Costs and savings associated with the option,
- Expected changes in the total use and byproduct generation and the use and byproduct amounts per unit of product from the amounts of use and byproduct in the planning year that would result from implementation of the option for a full year of operation at planning year production levels.
- Relationship between the option and other applicable laws and regulations including whether implementation will violate any other law or regulation.
- Whether or not the facility plans to implement the option and if so, an implementation schedule and the projected TUR.

Again, some or all of these bulleted items may already have been answered during the screening phase. Conversely, work done in this phase may reveal that a technique is actually inappropriate. Or, new options may be identified during this phase. Companies may go about the evaluation in whatever way they generally evaluate projects. The evaluation of any option is complete as soon as the option is deemed inappropriate or the bulleted items above are known.

The plan needs to include:

ALL appropriate techniques whether or not they are being implemented:

- Description of each appropriate technique,
- Information required in the bulleted items above,
- All technical and economic analyses that were done (Note: facilities are encouraged to simply append these in their original form as calculations, spreadsheets, memos, reports, etc.).

Appropriate techniques that will not be implemented:

- Reasons why an option is not being implemented (these may be technical, economic, or a combination of the two).

Appropriate techniques that are being implemented:

- Implementation schedule (include the start date of implementation),
- Projected total and per unit of product changes in use and byproduct generation for the chemical in 2 years. [See 310 CMR 50.46(1)(b)]. These changes are based on the amounts used and generated in the year on which the plan is based),

Finally, if the company has not completed its full technical and economic evaluation by the time the plan is due, the plan needs to include:

- Description of the option,
- Description and schedule of the steps to be taken to further evaluate the option,
- Explanation of why the evaluation cannot be completed by the due date of the plan, and
- Analyses completed to date.

Optional Tables 4, 5, and 6 (in Appendix B) may help companies organize the information to be included in the plan for appropriate techniques whether they are ones to be implemented, not implemented, or requiring further study.

Technical Evaluation [310 CMR 50.46]

The technical evaluation is done to assess the benefits and drawbacks of the TUR techniques that are appropriate. There are no explicit criteria for a technical evaluation. As mentioned above, companies need to employ good engineering practices and plan in good faith. Companies may go about the evaluation in whatever way they generally evaluate projects. Companies need to have completed enough of an analysis and documented it sufficiently to make the technical conclusions listed above and to make a good business decision about whether or not they will implement the technique.

Some considerations that may be useful in doing the technical evaluation are: reliability of the technique, implementation time, effect on worker health and safety, effect on product quality, space requirements, utility requirements, worker skills/experience required, worker acceptance, need for preliminary research and development and/or testing, environmental impact, need for additional equipment, expected TUR, and impact of other regulations.

Plan Update: Technical Evaluation

Important! You must reevaluate the technical feasibility of the options which you previously considered and rejected, and identify any new options to be evaluated. [310 CMR 50.46]

Questions to Consider:

- *Have the criteria that you originally used to evaluate the options changed?*
- *Has an alternative you originally considered and rejected become technologically feasible through advancements in the technology?*
- *Have you performed a thorough technical assessment for each option?*
- *Have you made changes to the process that would allow reconsideration of options originally discarded?*
- *When comparing current use and equipment investments that have previously been made to potential alternatives that would require new investments in equipment, have you considered the useful life of the equipment currently in use?*

Best Practice- Metal Finisher Switches to Water-Based Paint

A metal finisher once used solvent-based paints to coat metal parts. The facility identified water-based paints as an alternative in its 2004 Plan. The option was not chosen for implementation in 2004 after testing showed that the water-based paints did not give a glossy finish. Water-based paints were reevaluated in the 2006 Plan Update and testing showed that the new improved water-based paints gave an excellent quality glossy finish when dried in a drying oven. An economic evaluation then determined that switching to water-based paints was not economically feasible if a drying oven had to be purchased. Water-based paints were evaluated for a third time in the 2008 Plan Update. The reevaluation showed that a switch to water-based paints combined with the addition of a drying oven would improve throughput enough so that the oven would pay for itself in six months. The facility's persistence in reevaluating water-based paints as they became more technologically advanced allowed the facility to eliminate the use of 50,000 pounds of solvent-based paints per year. As a result, the facility was no longer required to have an air permit and eliminated the need to report under TURA and TRI.

Economic Evaluation [310 CMR 50.46A]

TURA filers are not required to identify all costs associated with the use of all reportable toxics in all production units and to calculate total costs per unit of product. Instead, filers are required to consider all direct and indirect costs that are relevant to the economic evaluation of feasible toxics use reduction options when they perform financial analyses of those options. Where no technically feasible options are available, filers must identify, but not necessarily quantify, the costs associated with using the toxic chemical.

In evaluating costs, only the incremental costs need be considered, i.e., costs of the existing process that will be avoided and those new costs, including initial and operating costs that will be incurred. Indirect costs, such as storage or insurance, are not typically charged to products or processes. Estimates may be used as long as the assumptions are stated.

First time filers and /or new TUR Planners may find it beneficial to collect detailed cost information on all or most toxics and production units in order to fully understand the costs associated with the use of toxics in their facilities and to help prioritize TUR opportunities.

The economic evaluation provides a comparison between the baseline (i.e., current) process and the alternative process that includes the TUR technique. The economic evaluation of the TUR option tells a company whether or not it makes economic sense to proceed with implementing the TUR option. It is important that this evaluation be as detailed as any other capital budgeting exercise the company undertakes.

This economic evaluation must identify all relevant costs and savings associated with implementing the option including those costs that reside in overhead accounts. These costs may include environmental compliance costs and fees. A list of costs that may be appropriate to consider is shown in Example 14.

While the facility may evaluate the costs and savings in whichever way it chooses, the facility should use the same depreciation rate, cost of capital, and economic performance criteria (e.g., payback period, internal rate of return, net present value) it would normally use for capital budgeting, assuming the facility typically considers these factors in capital budgeting decisions. However, the facility does not need to base its decision to implement an option on as stringent factors as it normally uses. It might, for example, allow a longer payback period or lower rate of return for a technique that reduces byproduct from a chemical that has a high potential for liability.

The plan must include the economic calculations performed. The labor and material rates should be specified, as should the depreciation rates, cost of capital, and economic performance criteria used.

In Example 15, Facility 15 has evaluated the costs and savings associated with implementing solvent-less coating operation. Facility 15 used a net present value (NPV) analysis and rate of return (ROR) calculation. The company used their standard 20% rate of return. In their cost calculations, they considered the savings resulting from not having to purchase toluene, the reduced labor and disposal costs and yield increases.

The savings associated with reduced labor costs for compliance were developed from the impact analysis of other regulations. These costs included capital, research and development and testing. Facility 15 projected the costs over a 10-year estimated life of the project.

In this economic analysis, Facility 15 stated their assumptions about the rate of return, increases in the cost of material and their exclusion of income taxes, depreciation, and salvage value from the evaluation. If the initial calculations of ROR were closer to the 20% benchmark, the company would have undergone a more extensive economic analysis that included evaluation of the impact of income taxes, depreciation, and salvage value. Since the project did not seem to be viable at the time, the company stopped the analysis at the point it felt it had sufficient information to make a decision.
Keep in mind that all of the assumptions, costs, and savings are company specific. Companies do not need to use the specific assumptions and categories of costs and savings shown in this example, but companies do need to state their own

assumptions and show the costs and savings in the plan.

In Example 16, Facility 16 compared three different options. Throughout the discussion, the company described its financial analysis method, assumptions, and costs and savings categories. The facility also learned after their options screening that their low cost option did not meet the facility's criteria for a one-year payback. Instead, they decided to do further testing and evaluation of a higher cost option which had a significantly higher net present value, higher profitability index, and payback period of less than one year. It should be noted that the facility chose to perform the economic evaluation of options on a before-tax basis and excluding depreciation of capital expenditures. It is, however, recommended that economic evaluations be performed on an after-tax basis and that depreciation is included. This gives a better indication of the real cash flows.

After completing the options identification and technical/economic evaluation, companies must develop an implementation schedule for all TUR techniques that will be implemented. Example 16 shows an implementation schedule.

Example 14

Typical Costs and Activities to Consider in Pollution Prevention Economic Analysis

USUAL COSTS	COMPLIANCE COSTS	OVERSIGHT COSTS
Depreciable Capital Costs	Receiving Area	Purchasing
Engineering	Spill response equipment	Product/vendor research
Procurement	Emergency response plan	Regulatory impact analysis
Equipment		Inventory control
Materials	Raw Materials Storage	
Utility connections	Storage facilities	Engineering
Site preparation	Secondary containment	Hazard analysis
Facilities	Right-to-know training	Sampling and testing
Installation	Reporting and record-keeping	
	Safety training	Production
Operating Expenses	Safety equipment	Employee training
Start-up	Container labels	Emergency planning
Training		Medical monitoring
Initial raw materials	Process Area	Re-work
Working capital	Safety equipment	Waste collection
Raw materials	Right-to-know training	Disposal management
Supplies	Waste collection equipment	Inspections and audits
Direct labor	Emission control equipment	
Utilities	Sampling and testing	Marketing
Maintenance	Reporting and record-keeping	Public relations
Salvage value		
	Solid & Hazardous Waste	Management
Operating Revenues	Sampling and testing	Regulatory research
Revenues	Containers	Legal fees
Byproduct revenues	Labels and labeling	Information systems
	Storage areas	Penalties and fines
	Transportation fees	Insurance
	Disposal fees	
		Finance
	Air & Water Emissions Control	Credit costs
	Permit preparation	Tied-up capital
	Permit fees	
	Capital costs	
	Operating expenses	
	Recovered materials	
	Inspection and monitoring	
	Record-keeping and reporting	
	Sampling and testing	
	Emergency planning	
	Discharge fees	

Example 14 (continued) **Sources of Cost Information**

Primary Sources	Types of Raw Data
Interviews with operational and environmental staff. **Records** from purchasing, payroll, accounting. **Logs** of activities or material use. **Receipts** and **Invoices** from suppliers and vendors. **Vendors** of new equipment and industry price trends. **Measurements** of times, volumes, flow rates.	**Time:** Actual hours, percentages. **Labor Costs:** Total compensation rate. **Materials:** Actual quantities, percentages. **Fees:** Per toxic substance, facility charge percentage. **External Costs:** Maintenance, waste disposal. **General:** Percentage of insurance, utilities.

Examples of Environmental Costs

Regulatory

- Notification
- Reporting
- Monitoring/testing
  Studies/modeling
- Remediation
- Record keeping
- Plans
- Training
- Inspections
- Manifesting
- Labeling
- Permitting
- Preparedness
- Protective equipment
- Medical surveillance
- Environmental insurance
- Financial assurance
- Pollution control equipment
- Maintenance
- Repair
- Spill Response
- Stormwater management
- Waste management
- Taxes/fees

Upfront

- Site studies
- Site preparation
- Permitting
- R & D
- Engineering
- Procurement
- Installation

Back End

- Closure/de-commissioning
- Disposal of inventory
- Post-closure care
- Site survey

Conventional Costs

- Capital equipment
- Materials
- Labor
- Supplies
- Utilities
- Structures
- Salvage value

Voluntary (Beyond Compliance)

- Community outreach
- Monitoring/testing
- Training
- Audits
- Qualifying suppliers
- Environmental reports
- Insurance
- Planning
- Feasibility studies
- Remediation
- Recycling
- Environmental studies
- R & D
- Habitat protection
- Landscaping
- Environmental projects
- Financial support of NGOs

Contingent Costs

- Future compliance costs
- Penalties/fines
- Response to future releases
- Remediation
- Property damage
- Personal injury damage
- Legal expenses
- Natural resource damage
- Economic loss damages

Image / Relationship Costs

- Corporate image
- Relationship with customers
- Relationship with investors
- Relationship with insurers
- Relationship with professional staff
- Relationship with workers
- Relationship with suppliers
- Relationship with lenders
- Relationship with communities
- Relationship with regulators

This list is adapted from EPA's publication: ***An Introduction to Environmental Accounting As a Business Tool: Key Concepts and Terms***

Example 15

Economic Feasibility Evaluation

Facility 15
Production Unit: Mixing and Coating Operations
Project Title: Solventless Coating Development and Implementation
Chemical: Toluene
Expected TUR: 25%

Based on the TUR Planning Team's assessment of various options, it has been determined that the development of a new coating formulation process is a technically feasible option for some of the facility's products. The new technology uses mechanical means to prepare rubber compounds into a workable texture without the use of toluene in the process. Current production methods utilize toluene to create a solution which is coated onto a substrate. It is projected that the new production method applied to one product line could reduce the use of toluene by 25%. Toluene byproducts and emissions would be reduced by the same amount.

Preliminary research indicates that successful implementation of this major process modification will also yield a higher quality and more consistent product. Currently, this modification is only considered to be technically feasible for the facility's A1000 line of printing blankets.

In order to evaluate this option, a net present value analysis was performed. A 20% rate of return (ROR) was applied to all anticipated savings and costs projected over the economic life of the project, which the facility's marketing department estimates is 10 years. This ROR is standard for all of the facility's capital appropriations. Assumptions used in the analysis are a 3% annual increase in the cost of materials, labor and disposal costs and a 3% annual increase in the value of increased production. Income taxes, depreciation, and salvage value of the new equipment were not considered in this initial analysis. If the analysis showed the ROR to be close to the target 20% rate of return, a more detailed analysis including these factors would be done. The salvage value for the replaced equipment was considered.

The spreadsheet on pp. 50-51 contains a breakdown of the areas in which savings would be expected from the anticipated reduction of 25% in the use of toluene. All known or anticipated savings and costs have been projected out to 2015 and adjusted into present dollars.

Description of Savings

Facility 15 anticipates that direct production labor would be reduced as a result of the new production method. Current mixing and coating operations for this family of products requires six employees. It is projected that 1/2 of an employee could be reassigned in the second year and a full employee could be reassigned beginning in the third year.

Disposal costs would also be reduced by making this change, and those savings are evaluated in the table. It has been assumed that a reduction in purchasing toluene by 25% would also result in a 25% reduction of toluene wastes.

Example 15 (continued)

Indirect compliance labor, which includes the cost of labeling barrels, handling drums, and completing reports and manifests, is expected to decrease by 15%.

Other costs that were considered are storage costs, insurance premiums, and training costs. It was not possible to project any reductions in these areas because these costs would probably remain the same until toluene is totally eliminated from production.

The major projected cost advantage in going to a solvent-less system is that bench scale R&D has shown that this new production method will produce a higher quality product and a higher yield. Presently, there is no simple way to arrive at the dollar value for this increase, but a figure of $70,000 was felt to be realistic and could be seen in the second year of production. This value would also increase by 3% annually.

Miscellaneous savings from reduced power consumption, reduced maintenance, and freed space are presently undocumented, but are estimated to be $30,000 in the first year of operation, and were also assumed to increase by 3% each successive year of the project life.

The stainless steel mixing tanks for this product line are expected to be sold for scrap. Based on the current price of steel, $10,000 is expected from the removal and sale of the tanks. This savings is not expected until the second year of the project.

Description of Costs

The new equipment purchase costs will be paid out of a capital appropriation fund which will be paid in full at the beginning of the project. Installation and start-up costs also will be paid at the beginning of the project.

The research and development plan for this project is projected to run over the next two years with a budget of $75,000 each year. These costs will be considered to be paid out after the end of the first year and at the end of the second year. Along with the R&D program, a pilot test procedure must be performed to test the new products. It is estimated this will cost an additional $50,000 over a three-month trial period at the beginning of the first year.

While power consumption will be less, the new calendar process is expected to create a cost due to regular roller refurbishment and periodic replacement. This will add about $20,000 a year to the project in the first full year of operation, and is expected to increase 3% annually.

Summary

In comparing the net present value of the projected savings against the projected costs, at the facility's standard ROR of 20%, the project is not met. Based on this analysis, Facility 15 will not proceed immediately with the implementation of this project. However, due to the potential for completely eliminating the use of toluene and potential product improvements, Facility 15 has decided to continue funding its R&D efforts for this process. The facility will reevaluate its feasibility annually as cost estimates solidify, and other factors such as disposal and labor costs change.

Example 15 (continued)

ITEM	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	TOTAL
PURCHASE OF TOLUENE												
SAVINGS \COSTS	$0	$12,740	$13,123	$13,516	$13,922	$14,339	$14,770	$15,213	$15,669	$16,139	$16,623	$146,055
PRESENT DOLLARS	$0	$10,617	$9,112	$7,822	$6,714	$5,763	$4,946	$4,246	$3,645	$3,128	$2,685	$58,678
PRODUCTION LABOR												
SAVINGS\COSTS	$0	$0	$20,600	$42,436	$43,709	$45,020	$46,371	$47,762	$49,195	$50,671	$52,191	$397,955
PRESENT DOLLARS	$0	$0	$14,305	$24,558	$21,081	$18,094	$15,530	$13,330	$11,443	$9,820	$8,429	$136,589
DISPOSAL												
SAVINGS\COST	$0	$20,000	$20,600	$21,218	$21,854	$22,509	$23,186	$23,881	$24,598	$25,336	$26,095	$229,276
PRESENT DOLLARS	$0	$16,666	$14,305	$12,279	$10,540	$9,047	$7,765	$6,665	$5,721	$4,910	$4,214	$92,112
COMPLIANCE LABOR												
SAVINGS\COSTS	$0	$4,500	$4,635	$4,774	$4,917	$5,065	$5,217	$5,373	$5,534	$5,700	$5,871	$51,587
SAVINGS IN PRESENT DOLLARS	$0	$3,750	$3,219	$2,763	$2,372	$2,036	$1,747	$1,500	$1,287	$1,105	$948	$20,725
YIELD AND QUALITY INCREASE												
FUTURE EARNINGS	$0	$0	$70,000	$72,100	$74,263	$76,491	$78,786	$81,149	$83,583	$86,091	$88,674	$711,137
PRESENT VALUE	$0	$0	$48,608	$41,724	$35,817	$30,742	$26,385	$22,649	$19,442	$16,684	$14,321	$256,372
MISCELLANEOUS SAVINGS												
SALVAGE STEEL	$10,000											$10,000
AFTER NEW PROCESS	$0	$30,000	$30,900	$31,827	$32,782	$33,765	$34,778	$35,822	$36,896	$38,003	$39,143	$343,916
PRESENT DOLLARS	$0	$24,999	$21,457	$18,418	$15,811	$13,570	$11,647	$9,998	$8,582	$7,365	$6,322	$138,169
PRESENT WORTH OF SAVINGS												$712,644
NEW EQUIPMENT												
CAPITAL	$500,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$500,000
ROLLER REFURBISHING	$0	$20,000	$20,600	$21,218	$21,855	$22,510	$23,185	$23,881	$24,597	$25,335	$26,095	$229,278
PRESENT DOLLARS	$0	$17,000	$17,510	$18,035	$18,576	$19,134	$19,708	$20,299	$20,908	$21,535	$22,181	$194,886

Example 15 (continued)												
INSTALLATION												
CAPITAL	$75,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$75,000
STARTUP												
CAPITAL	$40,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$40,000
R&D EFFORT												
CAPITAL	$0	$75,000	$75,000	$0	$0	$0	$0	$0	$0	$0	$0	$150,000
COST IN PRESENT DOLLARS	$0	$62,498	$52,080	$0	$0	$0	$0	$0	$0	$0	$0	$114,578
PILOT TESTING												
CAPITAL	$100,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$100,000
COST IN PRESENT DOLLARS	$100,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$100,000
COST IN PRESENT DOLLARS												$921,690
NET PRESENT WORTH												($209,046)

Example 16

Economic Feasibility Evaluation

Facility 16
Production Unit: #4 - Film Integrated Circuitboard Manufacturing
Project Title: Glycol Ether Reduction/Replacement
Chemical: Glycol Ether
Expected TUR: 100%

Based on its initial screening, Facility 16 has determined that there are three technically viable options which could significantly reduce the glycol ether used in the production unit. Each option involves significant upfront costs and no clear economic advantage was identified. All three options were therefore subjected to a full economic evaluation.

Option 1 involves hard-pipe recycling of the photo-resist stripping solution from the second stripping step to the first stripping step. This would save 50% of the current usage of glycol ether. Option 2 involves the 100% substitution of a non-TUR listed chemical, anhydrous citric acid, for the current stripping solution. This option would involve a new storage tank and piping, due to the incompatibility of the chemical with the currently-used stripping tank. Option 3 involves another 100% input substitution using a hydroxide/carbonate alkaline stripping solution. The spent solution could be piped to the facility's wastewater treatment plant, rather than the existing on-site storage tank. Thought had been given to using Option 2 or 3 as a long-term solution, to be switched to after initial implementation of Option 1.

The TUR team developed estimates of the new equipment purchase and installation costs for each option. In addition to these initial capital and installation costs, all options required some further testing and development prior to full implementation to re-qualify the products according to specifications, since they involved a change in the production process. The TUR team obtained estimates of the probable time and labor cost involved for both development labor and development product quality testing from the company's Research and Development section. These costs were added to new equipment purchase and installation costs to determine the total capital and one-time costs of project implementation (the initial investment amount, to be used in subsequent evaluation).

The TUR team conducted a full economic evaluation of the three options summarized in the table on p. 54. The analysis was completed in April 2008. The TUR planner in the company obtained data from the accounting department and process engineers to conduct the evaluation. Three indices of economic feasibility were calculated: 1) a simple payback period (years); 2) the Net Present Value (NPV); and 3) a profitability index (the net present value of total cash inflows divided by the initial investment amount). A discount rate of 15% was selected for use in the evaluation. In accordance with its TUR Management Policy, Facility 16 has no set minimum rate of return for TUR projects, though typically a payback period of one year or less is considered favorable. The 15% ROR was suggested by the accounting department as a reasonable midpoint that would require a moderately good return on investment for a TUR project to be considered feasible. Due to the typical short lifetime of a process at the facility, a three-year period was selected as the project lifetime for each option. January 1, 2009 was selected as the assumed start date for implementation.

Example 16 (continued)

The three economic indices all required estimation of the annual changes (savings or increased cost) in six areas of operating costs: 1) chemical purchase; 2) production labor; 3) treatment and disposal; 4) regulatory labor and fees; 5) utilities; and 5) ongoing laboratory product testing and analysis. The TUR planner had previously estimated the current cost for each of these categories from committee input. The annual changes from the current cost of toxics in each area were projected for each operating cost area over the next three years, using an assumed 3% inflation rate for labor, raw material purchase, and disposal costs. The net present value of savings in each future year were determined using the appropriate present value factors, and summed. The table on p. 54 summarizes the initial year (2009) direct savings or increased cost and the total net present value of all savings or costs over the three-year period to show where the major cost savings or increases occurred.

The results surprised the committee and led to a change of expected direction. The completed analysis indicated that Option 1, previously considered a good first step, would have a payback period of 1.53 years, greater than the facility's one-year rule of thumb for an acceptable investment, and only a moderate rate of return. With a total present value of $38,406, this was an acceptable investment at a 15% discount rate, but not an outstanding one. The chemical purchase savings of this option were partly offset by the higher cost of testing and analysis, and the initial product quality testing and development labor. Option 2 is economically infeasible (negative payback and net present value). The higher chemical purchase costs, ongoing testing cost increases, and need for a high initial investment in equipment, overweigh the moderate treatment and disposal cost savings of this option.

However, Option 3 appears to be an excellent investment. This option has high chemical purchase savings as well as moderate savings in production labor, treatment and disposal, after only a moderate initial investment. It has a projected payback period of only 0.39 years, a high net present value of $665,741, and a much higher profitability index than Option 1 (5.926 as compared to 1.3491). In addition, there were several qualitative economic benefits. Option 3 will improve the wastewater treatment process (the alkaline wastewater can neutralize acids from other waste streams) and its use reduced potential liability to the company stemming from the concern of female production workers about the impact of glycol ethers on their reproductive capacity.

Based on the results of the analysis, the company has decided to proceed immediately to further development testing and eventual implementation of Option 3, without prior implementation of Option 1.

Example 16 (continued)

Economic Evaluation of Options for Reduction of Use of Glycol Ethers in Film Integrated Circuit Board Manufacture Production Unit, Photoresist Stripping Operation

	Option 1 - Recycle Photoresist Stripping Solution	Option 2 – Substitute Citric Acid -Based Stripper	Option 3 – Substitute Hydroxide/Carbonate Stripper
Capital & One-Time Costs of Option			
Implementation	$ 50,000	$250,000	$ 50,000
New Equipment Purchase	$ 40,000	$ 50,000	$ 10,000
(piping, tanks)	$ 10,000	$ 20,000	$ 25,000
Installation – Labor	$ 10,000	$ 5,000	$ 50,000
Development – Product Quality Testing	$110,000	$325,000	$135,000
Development – Labor			
Total of Capital & One-Time Costs	$ 67,000	($103,000)	$207,000
	$151,576	($233,020)	$468,301
Annual Operating Savings (Costs)			
Chemical Purchase	0	0	$ 20,000
Initial Year Savings *(Costs)*	0	0	$ 46,918
Total Present Value of Savings *(Costs)*			
	$ 25,000	$ 50,000	$100,000
Production Labor	$ 58,648	$117,296	$234,592
Initial Year Savings *(Costs)*			
Total Present Value of Savings *(Costs)*	0	$ 1,000	$ 2,000
	0	$ 2,282	$ 4,565
Treatment/Disposal			
Initial Year Savings *(Costs)*			
Total Present Value of Savings *(Costs)*	0	0	$ 20,000
	0	0	$ 46,918
Regulatory Labor & Fees			
Initial Year Savings *(Costs)*	($20,000)	($20,000)	($ 5,000)
Total Present Value of Savings *(Costs)*	($46,512)	($46,512)	($11,628
Utilities			
Initial Year Savings *(Costs)*			
Total Present Value of Savings *(Costs)*			
Testing & Analysis Labor			
Initial Year Savings *(Costs)*			
Total Present Value of Savings *(Costs)*			

Total Initial Year Savings *(Costs)*	$ 72,000	($72,000)	$344,000
Total Present Value of Operating	$148,406	($175,259)	$800,741
Savings *(Costs)*	1.53	(-4.51)	0.39
Payback Period *(Years)*		No payback	
	$ 38,406	($500,259)	$665,741
Net Present Worth at 15% Discount	1.3491	(-0.539)	5.926
Rate		Unprofitable	
Profitability Index			

Example 17
Selected Techniques Implementation Plan

Facility 17
Production Unit: #2 - Plastics Manufacturing
Chemical: Turacet

A summary of the implementation status for each selected TUR technique for the above production unit is provided below. Most selected techniques were implemented almost immediately after their advantage was identified or quantified. Potential issues which may cause the project to be delayed are also presented.

The toxics use management team will solicit periodic (quarterly) status reports regarding the projected implementation of each of the four selected techniques. Milestones and completed projects will be documented with internal memos. Expected delays will be identified at the beginning of the project. If there are any unforeseen delays that occur during project implementation, the reasons for the delay along with a revised timetable will be documented by internal memos. These memos will be forwarded to the chairman of the team and reported to the Plant Manager.

Adjustments to any of these techniques will be made as conditions and knowledge warrant. These changes and any new TUR ideas will be discussed at regular team meetings. Any ideas that are determined to have merit will be documented and further evaluated.

2) NEW PROCESS FILTER

The new filter will offer a better performance over the existing process filters resulting in a greater quantity of Turacet reclaimed. Implementation of this technique involves purchase and installation of new filters. No other modifications to the filters system need to be made.

Implementation date: 1 day
Completion date: Done

3) LEAK DETECTION AND REPAIR (LDAR) PROGRAM

The LDAR program will reduce fugitive emissions from vapor leaks from fittings in equipment by scheduling inspections, testing and repairs on a regular basis. This involves development of a large database of all potential leak points and identifies when they should be tested. Written procedures, purchase of leak detection equipment, and employee training also are required to implement this program. Three people have been assigned to this project as a supplement to their regular duties.

Implementation date: 7/1/2010
Expected delays: This program may encounter delays if leak sensing equipment cannot be acquired. This is not likely to be a problem.
Projected completion date: 6/30/2012

4) RECYCLE OF PROCESS LIQUID WASTE STREAM

The recycling of wastes will reduce the amount of raw material input. Steps required to implement recycling include specification and purchase of recycling equipment, plumbing recycle streams directly into the process, and training employees on the operation of the new equipment. In addition, a start-up testing period will be required to ensure that product quality is maintained.

Implementation date: 7/1/2010
Expected delays: Delays may be caused by any impact the recycling efforts may have on product

quality. Adjustments to the process and/or recycling efforts may take unforeseeable amounts of time to correct.
Estimated completion date: 9/30/2011

Plan Update: Economic Evaluation

Important! You must evaluate the economic feasibility of the technically feasible options that you identified. [310 CMR 50.46A]

In the Plan Update it only is necessary to identify the **incremental** costs of TUR options, i.e., costs of the existing process that will be avoided and those new costs, including both initial and operating costs that will be incurred.

Many indirect costs associated with the use of toxics are lumped into overhead accounts and are not accurately allocated to the products or processes that generate them. Often these costs are charged to the budget of the division handling environmental duties. Financial analyses may fail to capture these "hidden" costs and thus will tend to underestimate the economic savings of TUR initiatives.

The first step in the identification and calculation of incremental costs is to determine what cost generators (activities, materials, equipment) change between the existing and the modified process. Process flow diagrams can help to clarify both where costs are generated and how they will change with the implementation of a TUR project. Example 14, page 47 provides a detailed inventory of possible costs to consider.

The next step is to attach dollar values to those incremental cost items. Because much of the cost information will not be available from a facility's financial and cost accounting systems, it will be necessary to go to ***primary sources*** and collect ***raw data*** to form a full cost picture. Often this work requires an estimate of the amount of time an employee spends on a particular activity (such as manifesting) or the amount of a resource that is consumed in the production process (such as the electricity used by a piece of equipment). Although such estimates often lack precision, if they are made by the people who actually perform the work or who are knowledgeable about a process, the information should be sufficiently accurate. Example 14, page 47 shows sources of cost information.

Questions to Consider:

- *Have the raw material or disposal costs of the toxic increased since the last Plan or Plan Update?*
- *Have the costs of an alternative decreased since the last Plan or Plan Update?*
- *In performing your economic evaluation of TUR options, have you:*
  - identified the incremental costs and savings that are relevant to the financial analysis?
  - examined the following items to see if they are incremental costs and savings, and included an accurate measure or estimate if they are?
    - ◊ your **direct costs**
    - ◊ your **indirect costs,** including: storage, accumulation, treatment, disposal, handling, compliance, health and safety, insurance
    - ◊ potential liability costs and other qualitative costs
    - ◊ all costs of implementing the TUR option
    - ◊ salvage value of currently used equipment that will become unnecessary

Best Practice - Miscellaneous Metal Parts Coater - Switches to Alternative Coating

This facility had identified two technologically feasible alternative coatings in its 2006 Plan. However, neither coating was economically feasible due to their high raw materials costs. The facility reevaluated the coatings for their 2008 Plan Update and found that the raw materials price of one alternative had dropped substantially. The facility was able to eliminate its VOC use due to this reevaluation.

Best Practice - Coatings Manufacturer - Eliminates costly coating color

This facility decided it would be worthwhile to reevaluate the cost of using a toxic in its multiple product lines. They identified the hazardous waste costs as the biggest contributing factor and decided to evaluate them further. The facility found that one particular shade of coating contributed more than twice as much as the other shades to their hazardous waste volume. Further evaluation showed that they were actually taking a loss on that particular shade. The facility decided to discontinue the shade and was able to reduce their use and disposal of toxics as well as improve their profitability.

OPTIONS IMPLEMENTATION

Plan Update: Options Implementation

Important! You must develop an implementation schedule for those options you have chosen to implement. If your original Plan included an implementation schedule for TUR techniques, you must indicate whether or not you implemented the TUR techniques and whether you met the schedule in the Plan. If you were unable to implement the techniques or did not meet the schedule, include an explanation as to why you were unable to do so in the Plan Update. [310 CMR 50.46(4)]

Questions to Consider:

- *Exactly how many pounds of byproduct were avoided? How far-reaching were the changes you made? Did the changes impact other operations in the facility?*
- *Have the TUR projects which were implemented saved your facility money, and if so, for how long?*
- *Have the TUR projects implemented cost your facility money? How much?*
- *Have you developed an implementation schedule for each option? Have the projects been completed on time? (See example 18, Implementation Schedule on page 60)*
- *What barriers to project implementation have you encountered?*

Best Practice- Northrup Grumman Corporation - Process Redesign Yields Gains in Chemical Use Efficiency

- This manufacturer designed an innovative precision cleaning system that achieved order-of-magnitude reductions in emission losses. The new system served as the cornerstone of the company's program to eliminate ozone-depleting chemicals.
- Solvent vapor degreasers were modified to reduce emission losses through the installation of sub-zero freeboard cooling and automatic lifts to reduce dragout.
- Epoxy stripping operations were re-engineered by substituting a less hazardous chemical for certain substrates.
- Through improved process control, the company extended the life of metal cleaning baths, thereby reducing the need to change and dispose these baths as frequently.
- In recognition of these efforts, Northrup Grumman received a Toxics Use Reduction Governor's Award.

Best Practice - Adhesive Coater - Team Building/Process Analysis

The "Solvent Use Reduction Team" at this adhesive coating facility was formed as a result of the TUR planning process to evaluate the use of toluene. The team solicited ideas from machine operators and supervisors from all shifts. Careful evaluation of work practices was performed. The standard procedure had been to add five gallons of toluene to each thin drum of adhesive before application to the substrate. Tests were run on the coating machine and the team discovered that the machine ran well and the product was unaffected when just three gallons of toluene were added to each drum of adhesive. This simple project reduced toluene use by 1,000 gallons per year.

IMPLEMENTATION SCHEDULE

Important! An implementation schedule is required as part of your Plan and is useful for tracking TUR projects. [310 CMR 50.46(4)]

These schedules are useful for tracking the various TUR projects that Planners are working on.

Best Practice - Implementation Scheduling

Implementation Scheduling of a Paint Manufacturing Facility

A print manufacturing facility created written schedules for tracking each of the various TUR projects underway. Recording a schedule on paper helped staff to see each TUR effort as a concrete, workable discrete project for which there was a completion date. The following is an example of a schedule for their Ethylene Glycol substitution project. See example 18.

Example 18
Implementation Schedule for Ethylene Glycol Substitute

Project Name	**Description**	**Testing and Implementation Steps**	Dates	On Schedule?	Comments

Substitute Ethylene Glycol	Replace EG with propylene glycol in all water-based products	prepare test runs	7/08	y	
		verify freeze/thaw results	8/08	y	
		verify quality metrics	9/08	y	
		change formulas in computer	2/09	4/09	Difficulty changing formulas in system delayed project
		train workers	3/09	5/09	
		project complete	5/09	7/09	

F. Certification Requirements [310 CMR 50.42(3) and (4)]

Once the plan has been developed it must be certified by the senior plant manager and a MassDEP certified Toxics Use Reduction Planner. A senior plant manager is an official who has management responsibility for the persons or team completing the plan, and who has authority to act as an agent for the toxics user. The senior manager certifies the accuracy of the statements in the plan and the information used in it, based on the manager's inquiry of persons immediately responsible for developing the plan. The toxics use reduction planner certifies that, in his or her professional judgment, the planning process and the plan conform to MassDEP regulations.

The following page contains the required regulatory language for the certification statements by the senior manager and the toxics use reduction planner.

Plan Certification Form Instructions

Planning Year. *The planning year is 2010 for Plan Summaries due July 1, 2010. Electronic filing will automatically complete this field.*
Facility Name. *As indicated on your Form S and Form R. Electronic filing will automatically complete this field.*
Facility ID Number. *Your MassDEP Facility Number as indicated on the mailing label of MassDEP. This is the number you should have indicated on your Form S. Electronic filing will automatically complete this field.*

Section A - Planner Certification

1 **Signature of Toxics Use Reduction Planner.** *Only a Certified Toxics Use Reduction Planner may sign this statement. Electronic filers will enter their last name, followed by their first name.*
2 **Date.** *Date the TUR Planner is certifying that the plan meets the requirements of 310 MCR 50.40. Electronic filers enter in month, day, year.*
3 **Print Name of TUR Planner.** *Please print the Planner name. Electronic filings will automatically complete this line.*
4 **Email Address.** *Please enter in the Planner email address (if available).*
5 **TUR Planner I.D. Number.** P*lease enter the TUR Planner ID number (from the planner certification letter or certificate received from MassDEP. Electronic filers will be prompted to enter this field first, then to enter field #1).*

Section B - Senior Management Official Certification

1 **Signature of Senior Management Official.** *The same official that signs the Form S Cover Sheet should sign here. Electronic filing will automatically fill this field.*
2 **Date.** *Date that the Senior Management Official signs the form. Electronic filing will automatically fill this field.*
3 **Print name of Senior Management Official.** *Please print the name of the Senior Management Official. Electronic filing will automatically fill this field.*
4 **Email address.** *Please provide the email address of the Senior Management Official. Electronic filing will automatically fill this field.*

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention

Plan Certification Statement

Planning Year

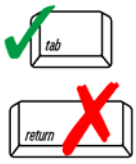
Facility Name

MassDEP Facility ID Number

A. Planner Certification

Based on my independent professional judgment as a Toxics Use Reduction Planner, I certify under penalty of law that the following is true:

Important: When filling out
on the computer, use only th
key to move your cursor - do
use the return key.



(a) I have examined and am familiar with this Toxics Reduction Plan;
(b) the Plan satisfies the requirements of 310 CMR 50.40; and
(c) the Plan demonstrates a good faith and reasonal effort to identify and evaluate toxics use reduction options.

1. Signature of Toxics Use Reduction Planner
2. Date (mm/dd/yyyy)
3. Print Name of Toxics Use Reduction Planner
4. E-Mail Address
5. TUR Planner I.D. Number

B. Senior Management Official Certification

I certify under penalty of law that the following is true:

(a) I have personally examined and am familiar with Toxics Use Reduction Plan;
(b) I am satisfied that any supporting documentation used in the development of the Plan exists and is consistent with the Plan;
(c) based on my inquiry of those individuals immedia responsible for the development of this Plan, I believ that the information in the Plan and any supporting documentation used in the development of the Plan i true, accurate, and complete;
(d) the Plan, to the best of my knowledge and belief, meets the requirements of 310 CMR 50.40; and
(e) I am aware that there are penalties for submitting false information, including possible fines and imprisonment.

1. Signature of Senior Management Official
2. Date (mm/dd/yyyy)
3. Print Name of Senior Management Official
4. E-Mail Address

G. Plan Summary (310 CMR 50.47)

Instead of submitting the complete plan to MassDEP, companies are required to submit a summary of the plan. The plan summary is due on July 1st of the applicable year. It includes:

- the certification statement by the TUR Planner.
- projected facility-wide **changes** in the **total quantities** of each listed toxic chemical used and generated as byproduct between the year on which the plan is based and 2 years later.
- the toxics use reduction options considered and those selected to be implemented.
- any other information the company believes would be beneficial for MassDEP or the public to review, such as the scope of the plan.

The facility-wide amounts are developed from the projections of reductions in chemical use and byproduct after implementation of TUR options in each production unit. This requirement is found in 310 CMR 50.43.

APPENDIX

A. PLANNING FORMS AND INSTRUCTIONS

B. OPTIONAL TABLES 1-6

C. PLAN UPDATE WORKSHEET

APPENDIX A

PLANNING FORMS AND INSTRUCTIONS

PLANNING FORMS AND INSTRUCTIONS

I. EXCEPTIONS TO PLAN REQUIREMENTS

A facility is exempt from completing a 2010 Plan Update for a chemical if the facility:

- **has eliminated the chemical or reduced the chemical use below its reporting threshold (and will not exceed the reporting threshold in 2010); or**
- **has closed or expects to close in 2010.**

Facilities may have exceptions for some but not all chemicals. In that case, the facility should complete a Plan Update for those chemicals where there is no exception to plan requirements.

If your facility has eliminated or reduced **ALL** chemical use to below reporting thresholds, or has closed or expects to close in 2010, please send the Exceptions to Plan Requirements Form to MassDEP by July 1, 2010.

Please note that Exceptions to Plan Requirements do not apply to reporting. If a facility exceeded the reporting threshold for a chemical in 2009, the facility must file a toxics use report by July 1, 2010 and pay the toxics use fee for that chemical.

FORM KEY:

Planning Year. *The planning year is 2010 for Plan Summaries due July 1, 2010. Electronic filing will automatically complete this field.*
Facility Name. *As indicated on your Form S and Form R. Electronic filing will automatically complete this field.*
Facility ID Number. *Your MassDEP Facility Number as indicated on the mailing label of MassDEP. This is the number you should have indicated on your Form S. Electronic filing will automatically complete this field.*

1. *This facility is submitting an Environmental Management Systems Progress Report (can only be used if the facility has been through –3- prior TUR Planning cycles (i.e., completed a plan and 2 plan updates)*

2. *This facility is submitting a Resource Conservation Plan Summary Form(s) for the following assets: (can only be used if the facility has been through –3- prior TUR Planning cycles (i.e., completed a plan and 2 plan updates)*

Pick 1 or more 'assets' as needed.

☒ *2a Energy*
☒ *2b Water*
☒ *2c Materials that contribute to Solid Waste*
☒ *2d Toxic substances on the TURA list used below thresholds*
☒ *2e Chemical substances exempt from TURA reporting*

3.This facility is submitting a Toxics Use Reduction Plan Summary Form.

This facility has no exceptions to planning requirements. *Facilities that do not meet the conditions of #'s 2, 3 or 4 of the Exceptions to Plan Requirements do not need to complete this form on paper, if filing electronically ☒ this box and continue as directed to the Plan Summary form.*

3a. **This facility has eliminated, or reduced below threshold, the chemicals indicated in #3.** *Facilities that eliminated a TURA reportable chemical or reduced below TURA reportable thresholds should indicate with a ☒ here, and continue to Section 3.*

3. **Indicate CAS# Chemical Name, Method and Steps taken.** *For those chemicals that meet the qualifications of #2 above, please complete the information as noted below.*

3._.1 CAS#. *Indicate the Chemical Abstract Service Identification number here; please note that MassDEP does not use the EPA Chemical Category 'N' numbers, but uses a 4-digit numeric*

identification found in the Form S reporting guidance, Appendix B.

3._.2 Chemical Name. *Paper filers indicate the name of the chemical that corresponds with the CAS number here. Electronic filing will automatically complete this field.*
Method ☐ E *If the chemical use has been completely eliminated, please indicate with a* ☒
Method ☐ R *If the chemical use has been reduced below reporting thresholds, please indicate with a* ☒

3._.4 By taking the following steps. *Indicate in text the steps that you have taken to accomplish the elimination or reduction of the chemical use.*

h. Do you have additional chemicals to list? ☐ yes ☐ no *If filing on paper, please complete this with a* ☒ *and attach an additional sheet (copy) if necessary. If filing electronically, please* ☒ *the appropriate box and, if necessary, continue to add additional chemicals that are eliminated or reduced below threshold.*

4. ☒ **The facility is scheduled to close.** *If the facility is scheduled to close in 2010, please* ☒ *the box and indicate the month, day, and year (2010 only) in mm/dd/yyyy format.*

5. **I am aware that there are penalties for submitting false information, including possible fines.** *The signature of the Sr. Management Official, printed Sr. Official's name, date signed and e-mail address of the Sr. Management Official should be indicated here. The TUR Planner may sign here only if s/he is the Sr. Management Official as well as the Certified TUR Planner. Electronic filing of this information will automatically complete this information based on the input in the Form S Cover Sheet.*

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention

Plan Summary Submittal Selection Form

Planning Year

Facility Name

DEP Facility ID Number

I certify under penalty of law that to the best of my knowledge and belief the following is true:

Select either 1, 2 (a-e) , 3 (a-c) or 4 as allowed per 310 CMR 50.40, 50.80 and 50.90.

1 ☐ This facility will submit an Environmental Management Systems Progress Report.

2 ☐ This facility is submitting a Resource Conservation Plan Summary Form(s) for the following asset(s):

SELECT 1 or MORE

2a ☐ Energy
2b ☐ Water
2c ☐ Materials that contribute to solid waste
2d ☐ Toxic substances on the TURA list used below threshold amounts
2e ☐ Chemical substances exempt from TURA reporting

3 ☐ This facility is submitting Toxics Use Reduction Plan Summary Form(s). (If all chemicals used and reported at the facility have either been eliminated or reduced below reporting thresholds, please select this option as well as 3b, and indicate the chemicals below).

SELECT 3a or 3b

3a ☐ This facility has no exceptions to Toxics Use Reduction planning requirements.
3b ☐ This facility has eliminated or reduced below threshold the following chemicals – indicate CAS# Chemical Name, Method, and Steps taken. (below)

Toxics Use Reduction Plan Summary Exceptions:

1 CAS#	2 Chemical Name	3 Method*	4 By taking the following steps:
3b.a.1	3b.a.2	E ☐ R ☐	3b.a.4
3b.b.1	3b.b.2	E ☐ R ☐	3b.b.4
3b.c.1	3b.c.2	E ☐ R ☐	3b.c.4
3b.d.1	3b.d.2	E ☐ R ☐	3b.d.4
3b.e.1	3b.e.2	E ☐ R ☐	3b.e.4
3b.f.1	3b.f.2	E ☐ R ☐	3b.f.4

3b.h Do you have additional chemicals to list? Yes ☐ No ☑
If filing on paper, please attach an additonal sheet to continue.

4 ☐ This facility is scheduled to close:

Date (mm/dd/yyyy)

I am aware that there are penalties for submitting false information, including possible fines.

a Signature of Senior Management Official

b Date (mm/dd/yyyy)

c Print Name of Senior Management Official

d E-Mail Address

II. PLAN SUMMARY FORM

A Plan Summary Form must be completed and submitted to MassDEP for **EACH** chemical for which you file a Toxics Use Report for 2009 (due July 1, 2010). If you will no longer report on a chemical that you planned for in the past, you do not need to complete a Plan Summary Form for that chemical; however, you should submit the Exceptions to Plan Requirements form for that chemical. You also may choose to provide MassDEP with information regarding your success in reducing the use of the chemical in the narrative section of the Plan Summary Form, Section C.

FORM KEY:

Planning Year. *The planning year is 2010 for Plan Summaries due July 1, 2010. Electronic filing will automatically complete this field.*
Facility Name. *As indicated on your Form S and Form R. Electronic filing will automatically complete this field.*
Facility ID Number. *Your MassDEP Facility Number as indicated on the mailing label of MassDEP. This is the number you should have indicated on your Form S. Electronic filing will automatically complete this field.*

Section A. Facility-Wide Data

1. **Chemical Name.** *Paper filers should indicate the name of the chemical that corresponds with the CAS number here. Electronic filing will automatically complete this field.*

2. **CAS#.** *Indicate the Chemical Abstract Service Identification number here; please note that MassDEP does not use the EPA Chemical Category 'N' numbers, but uses a 4-digit numeric identification found in the Form S reporting guidance, Appendix B*

Projected Changes in Use from 2009. *Field 3 records the projected increase or decrease in the quantities of toxic chemicals used on a facility-wide basis. The amount that should be entered is the **difference** between the amount of the chemical **expected** to be used in the **future** and the amount **actually** used in 2009.*

3. **Use.** *Indicate the expected difference in **USE** between **20011** and **2009**.*

Projected Changes in Byproduct from 2009. *Field 4 records the projected increase or decrease in the quantity of toxic chemicals generated as byproduct on a facility-wide basis. The amount that should be entered is the **difference** between the amount of the chemical **expected** to be generated as byproduct in the **future** and the amount **actually** used or generated in 2009.*

4. **Byproduct.** I*ndicate the expected difference in **BYPRODUCT** between **20011** and **2009**.*

5. **Is this chemical used only in wastewater treatment?** ☐ **yes – skip to Section C** ☐ **no – go to Section B**

If the facility uses the chemical ONLY to treat wastewater, and for no other reportable reason, the production unit level data is not needed (waste water treatment is not a production unit). If this is the case, please complete additional Plan Summary Forms as needed, and be sure to complete the filing with the Plan Certification Form.

Example for Completing Section A

2009 lbs. used:	100,000 (from your Form S)
2011 estimate, lbs. used:	110,000
Two Year Use Projection:	10,000 lbs. (**enter Field 3**)
2009 lbs. byproduct:	3,800 (from your Form S)
2011 estimate, lbs. byproduct:	3,200
Two Year Projected Byproduct:	-600 lbs. (**enter Field 4)**

PLEASE NOTE:

- IF you expect **USE** or **BYPRODUCT** to **decline** in the future, the number of pounds entered in the Two Year Projection should be **NEGATIVE**. (Please use a minus sign to indicate negative numbers. Do not use parentheses.)

- IF you expect **USE** or **BYPRODUCT** to **increase** in the future the number of pounds entered in the Two Year Projection should be **POSITIVE**.

Mistakes to Avoid:

- Do not leave the fields blank. Fields 3 and 4 must be filled in, and filled in with a number expressed in pounds. If you do not expect any change, enter zero. "N.A." is not an appropriate entry.

- Do not enter totals for expected use and/or byproduct for 2011. Enter the expected **change** in use and byproduct between 2009 and 2011.

Section B. Options Considered and Selected to Implement

In this section, you should list the TUR options which you have considered and those selected to implement.

Section C. Additional Information

This section allows you to provide additional information about your facility's TUR Plan and/or progress. Some facilities may choose to describe accomplishments, quantify savings, or provide additional information about improvements to workplace safety as a result of their TUR activities. This space can be used to explain why 2009 projections in chemical use and byproduct generation were not met. It is intended that facilities will use this opportunity to communicate their progress to MassDEP and the public.

Massachusetts Department of Environmental Protection
Bureau of Waste Prevention

Plan Summary

A separate form for each covered toxic is required

Planning Year

Facility Name

MassDEP Facility ID Number

A. Facility-Wide Data

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.

1. Chemical Name

2. CAS #

Two Year Projected Changes (Total lbs.):

Use

3. Use

Byproduct

4. Byproduct

5. Is this chemical used only in wastewater treatment? ☐ Yes – skip to Section C.
☐ No – go to Section B.

B. Options Considered & Selected to Implement

1. Options Considered _____

2. Options Selected to Implement _____

C. Additional Information

Section C is optional.

You may use the following section to provide more information about your TUR Plans and/or progress.

_____

_____

_____

APPENDIX B

OPTIONAL TABLES 1-6

Table 1
OPTIONAL
Total Quantities and Quantities/Unit of Product
In Production Unit # _____

	Manufactured	Processed	Otherwise Used	Byproduct	Releases and Transfers Off-site
Chemical 1 –Total Quantity					
Chemical 1 – Quantity/Unit of Product					
Chemical 2 –Total Quantity					
Chemical 2 – Quantity/Unit of Product					
Chemical 3 –Total Quantity					
Chemical 3 – Quantity/Unit of Product					

Table 2
OPTIONAL
Byproducts and Emissions in Production Unit # _____

Byproducts: **Emissions:**

	Treated On-site	Treated Off-site	Recycled On-site	Recycled Off-site	Disposed On-site	Disposed Off-site	Released to the Environment
Chemical 1							
Chemical 2							
Chemical 3							

Table 3
OPTIONAL
OPTIONS IDENTIFICATION AND EVALUATION SUMMARY FORM

Production Unit # _____ Chemical _____

OPTION		Appropriate?	Implementing?	Reason Why Inappropriate Or Not Implementing
#	Description			

(Append any technical and economic analyses and calculations)

Table 4
OPTIONAL
OPTIONS IDENTIFICATION AND EVALUATION SUMMARY FORM
APPROPRIATE OPTIONS THAT WILL NOT BE IMPLEMENTED

Production Unit # _____ Chemical _____

Option # Option Description			
Reason Why Not Implementing			
Expected Changes (lbs.)	Use	Per Unit of Product:	Annual:
	Byproduct	Per Unit of Product:	Annual:
Annual Costs			
Annual Savings			
Other Regulations			

(Append any technical and economic analyses and calculations)

Table 5
OPTIONAL
OPTIONS IDENTIFICATION AND EVALUATION SUMMARY FORM
APPROPRIATE OPTIONS THAT ARE BEING IMPLEMENTED

Production Unit # _____ Chemical _____

Option # Option Description			
Implementation Schedule			
Expected Changes (lbs.) (in planning year)	Use	Per Unit of Product:	Annual:
	Byproduct	Per Unit of Product:	Annual:
Projected Changes (lbs.) (from the year on which the plan is based)	Use in 2 years	Per Unit of Product:	Annual:
	Byproduct in 2 years	Per Unit of Product:	Annual:
Annual Costs			
Annual Savings			
Relationship to Other Regulations			

(Append any technical and economic analyses and calculations)

Table 6
OPTIONAL
OPTIONS IDENTIFICATION AND EVALUATION SUMMARY FORM
OPTIONS REQUIRING FURTHER STUDY

Production Unit # _____ Chemical _____

Option # Option Description	
Reason Why Evaluation Cannot Be Completed By Plan Deadline	
Steps and Schedule For Completing Evaluation	

(Append any technical and economic analyses and calculations completed to date)

APPENDIX C

PLAN UPDATE WORKSHEET

PLAN UPDATE WORKSHEET

2010 TUR TEAM MEMBERS			
Name	Title	Name	Title

FACILITY-WIDE COMPONENTS OF THE PLAN

A. MANAGEMENT POLICY

Action Item	**Date Reviewed**	**Date Revised**
Management Policy has been reviewed and revised as needed.		
Management Policy is located at:		

Narrative Section (You may use this section to comment on such questions as: How has the Management Policy been refined over the past two years? How has the Management Policy been communicated to employees? Has the Policy resulted in greater employee awareness or increased implementation of TUR? If so, how?)

PLAN UPDATE WORKSHEET

B. SCOPE OF PLAN

Action Item (Review the following items to determine if they are accurate and up-to-date. Revise as needed.)	**Date Reviewed**	**Date Revised**
Production Unit Descriptions (Include the identifying #, the processes, chemicals and products involved with the units.)		
Summary of Process used to identify TUR Options.		
TUR Options Rejected (Include a description of those options and an explanation of why they were not chosen.)		
TUR Options Chosen (Include a description of the option, anticipated costs and savings, expected reductions, and an implementation schedule.)		
2 Year Projections for total use and byproduct for each chemical (projected to 2011).		
The Scope of Plan is located at:		

Narrative Section (You may use this section to discuss any changes in your Scope of Plan.)

PLAN UPDATE WORKSHEET

C. EMPLOYEE NOTIFICATION

Action Item	Date Completed	Location of Documentation
Employee notification has been completed.		

Narrative Section (You may use this section to discuss whether or not the employee notification generated interest, participation, and TUR options.)

PLAN UPDATE WORKSHEET

D. PROCESS CHARACTERIZATION

Action Item (Review the following items to determine if they are accurate and up-to-date. Revise as needed.)	**Date Reviewed**	**Date Revised**
Production Unit Descriptions (Include the identifying #'s and the unit of product.)		
Purpose of Chemicals (Include a statement of the purpose each chemical serves in the production units.)		
Process Flow Diagram for each production unit or combination of production units.		
Materials Accounting (For each production unit, identify and quantify 2009 total inputs and outputs of each chemical, including chemical use, byproducts and emissions.)		
2 Year Projections of total use and byproduct for each chemical in each production unit (projected to 2011).		
The Process Characterization Section is located at:		

PLAN UPDATE WORKSHEET

E.1 OPTIONS IDENTIFICATION

Action Item	Date Completed	Location of Documentation
A review to identify any new TUR options has been conducted.		

Narrative Section (What new TUR options, if any, were identified?)

E.2 and E.3 OPTIONS EVALUATION AND ECONOMIC EVALUATION

Action Item (Document the results of your options identification process)	Date Completed	Location of Documentation
No New TUR Options were identified (If no new options were found, identify any changes in the cost of using the toxic chemicals that may have occurred since the last plan review.)		
New TUR Options were identified (Evaluate the technical and economic feasibility of any newly-identified TUR options.)		
Previously Rejected TUR Options were re-evaluated (Re-evaluate the technical and economic feasibility of options rejected during the last planning cycle.)		

PLAN UPDATE WORKSHEET

E.2 and E.3 OPTIONS EVALUATION AND ECONOMIC EVALUATION (continued)

Narrative Section (Were any TUR options identified as clearly technically or economically infeasible? If so, describe them. Have all direct and indirect costs listed on pages 25-27 been considered for inclusion in your financial analysis of TUR options?)

E.4 OPTIONS IMPLEMENTATION

Action Item	Date Completed	Location of Documentation
New Implementation Schedule was developed (If any new TUR options have been identified, develop an implementation schedule for those options.)		
Prior Implementation Schedule was revised (If facility developed an implementation schedule as part of the last Plan or Plan Update cycle, review the schedule to determine if the schedule was met and options implemented. Include an explanation for any lack of success.)		

PLAN UPDATE WORKSHEET

E.4 OPTIONS IMPLEMENTATION (continued)

Narrative Section: (Explain success or lack of success in implementing TUR options and meeting stated implementation schedule.)

F. CERTIFICATION STATEMENT

Action Item	Date Completed	Location of Documentation
Certification Statement signed by a TUR Planner and Senior Management Official. (Original must be included in the Plan Summary and mailed to MassDEP.)		

G. PLAN SUMMARY FORM

Action Item	Date Completed	Location of Documentation
Plan Summary Forms for each chemical have been changed. (Forms must be included in the Plan Summary and mailed to MassDEP.)		

Narrative Section: (Has the optional section of the Plan Summary been used to communicate your facility's TUR and environmental efforts/successes?)

Useful Phone Numbers:

MassDEP -	TURA Program (General Information)	(617) 292-5711
	TUR Planner Certification Information	(617)556-1011
	TURA Electronic Reporting	(617)292-5982
OTA -	Industry Specific Assistance, Information and Training	(617) 626-1060
TURI -	Training/TUR Planner Courses/Research	(978) 934-3275

The Following are the MassDEP, TURI and OTA Web Sites:

Toxics Use Reduction Program, MassDEP
http://www.mass.gov/dep/toxics/toxicsus.htm

Toxics Use Reduction Institute (TURI)
http://www.turi.org

Office of Technical Assistance and Technology (OTA)
http://www.mass.gov/ota

Commonwealth of Massachusetts
Deval L. Patrick, Governor

Executive Office of Energy and Environmental Affairs
Ian A. Bowles, Secretary

Department of Environmental Protection
Laurie Burt, Commissioner