Toxic Use Reduction

Participant Guide

Acknowledgments

The Midwest Consortium developed this course for workers and community members who want to investigate the reduction of use of toxic materials in under cooperative agreement number U45 ES 06184 from the National Institute of Environmental Health Sciences. Member institutions of the Midwest Consortium who worked on the update of the initial program include Green Door Initiative, University of Minnesota and the University of Cincinnati. This program was developed for use by industrial workers and community residents who seek use reduction as one approach to reducing exposures.

See https://mwc.umn.edu for a listing of contacts at each member institution and additional information. We encourage you to comment on these materials. Please give your suggestions to those leading the program in which you are now enrolled.

Warning

The material was prepared for use by instructors experienced in the training of persons who are or who anticipate responding to emergencies. Authors of this material have prepared it for the training of this category of workers as of the date specified on the title page. Users are cautioned that the subject is constantly evolving. Therefore, the material may require additions, deletions, or modifications to incorporate the effects of that evolution occurring after the date of this material preparation.

All web links are active as of September 1, 2023; if you find an error, please inform the facilitator so that it can be updated.

Disclaimer

This program covers initial approaches to identify uses of toxic materials that may be reduced at a workplace, community or home. Web sites are provided throughout the program that may be useful as you continue activities to reduce use of toxic materials.

For further information about this matter, consult the training instructor, health and safety personnel at your workplace, the Local Emergency Planning Committee (LEPC) for your city or county or your local health department as appropriate.

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Approaches to Reduce the Use of Toxic Materials

The efforts to reduce exposures to hazardous chemicals may include consideration of Toxic Use Reduction (TUR) or similar programs. The overall goal is to involve stakeholders to identify a possible reduction and develop a strategy to accomplish the goal. This may be conducted during initial planning of a project or process or change to an existing process to reduce the use of a toxic material or control emissions, or by elimination/substitution of the chemical after identifying a less hazardous alternative.

This overview of approaches will enable you to better:

- Describe the overall objective of Toxic Use Reduction (TUR)
- Describe several specific approaches to TUR
- Link TUR with exposure reduction at work and in the community

> The internet is used extensively in this program. Information at trusted websites such as the US Environmental Protection Agency is often updated, and specific information shown may change.
>
> Always double check before specific information (such as cost, numbers of people exposed, emissions) is shared, to assure that the most recent data are known to you.

What are Approaches to Reduce Use of Toxic Materials?

Toxic use reduction (TUR) refers to any strategy to eliminate or minimize the use of toxic materials. This may involve decreasing the volume of a chemical used, even to elimination, or substituting a less toxic chemical. These actions may result in reduction of waste at the source where they are created or prevent the generation of chemicals that can be discharged as pollution. When these results are the goal, the program may be called Pollution Prevention (P2). In this training program, the term 'TUR' will be used to cover any action that reduces toxic material use, generation or discharge.

Some specific approaches to TUR include:

The Environmental Protection Agency (EPA) manages Safer Choices, a program that includes Design for Environment (DfE, https://www.epa.gov/saferchoice/history-safer-choice-and-design-environment). DfE is an approach to reduce the impact of a product, production process or service on human health and environment from first activity to disposal (the full life cycle of the activity).

> EPA recognizes the broad impact of DfE
>
> 'safer workplace practices, are designed to increase awareness of health and environmental concerns, minimize pollution, and protect workers, consumers, residents, bystanders, communities'.

Best practices for workplace DfE are:

- Use of safer alternative chemical products
- Use of cleaner, more efficient practices and technologies

EPA ratings of chemicals to assist in selecting alternative products are shown here: https://www.epa.gov/saferchoice/safer-ingredients#scil. The published rating of a chemical is coded to a symbol.

Green circle - The chemical has been verified to be of low concern based on experimental and modeled data.

Approaches

Green half-circle - The chemical is expected to be of low concern based on experimental and modeled data. Additional data would strengthen our confidence in the chemical's safer status.

Yellow triangle - The chemical has met Safer Choice Criteria for its functional ingredient-class but has some hazard profile issues. Specifically, a chemical with this code is not associated with a low level of hazard concern for all human health and environmental endpoints. (See Safer Choice Criteria). While it is a best-in-class chemical and among the safest available for a function, the function fulfilled by the chemical should be considered an area for safer chemistry innovation.

Grey square - This chemical will not be acceptable for use in products that are candidates for the Safer Choice label and currently labeled products that contain it must reformulate per Safer Choice Compliance Schedules.

Manufacturers that participate in the partnership with EPA are required to follow specific Safer Choice Criteria guidelines and timelines. Review these carefully prior to use.

Cleaner, more efficient practices and technologies can be developed using one of several DfE guidance documents. In the ideal circumstance, DfE begins with product or process development; when this opportunity has passed, a systematic approach can be implemented to explore alternatives. The steps in one structured approach provided by the Environmental Protection Agency is shown below:

- STEP 1. Determine the feasibility of an alternatives assessment
- STEP 2. Collect Information on chemical alternatives
- STEP 3. Convene stakeholders
- STEP 4. Identify viable alternatives
- STEP 5. Conduct the hazard assessment
- STEP 6. Apply economic and life cycle context
- STEP 7. Apply the results in decision making for safer chemical substitutes

See https://www.epa.gov/saferchoice/design-environment-alternatives-assessments.

DfE life-cycle assessments allow businesses to improve products by using less toxic material in environmentally sound designs and processes.

To help consumers identify safer, more environmentally friendly chemicals for cleaning, a Safer Choice label is used on more than 2,000 products currently available for homes at retail stores and for use in facilities like schools, hotels, offices, and sports venues.

(used with permission to MWC)

In addition to the basic Safer Choice label above (used with permission of EPA), modified labels are available for use on products designated for businesses, office buildings, sports venues, and schools and to indicate that a product is fragrance-free to help consumers who prefer products without fragrance; see https://www.epa.gov/sites/production/files/2015-02/documents/fragrance-free_criteria.pdf.

A DfE label is used for antimicrobial and biopesticides.

Toxic Substance Control Act (TSCA)

The TSCA (1976; updated 2016 as the Frank R. Lautenberg Chemical Safety for the 21st Century Act) requires evaluation of chemicals before they are sold. This act requires EPA to create a list of reviewed harmful substances that need precautions and safe work practices by the community as well as industry. This act gives the manufacturers, importers, and distributers of these goods the responsibility to report on and keep records related to those substances. Some substances have additional restrictions, while others are excluded from the requirement due to the nature of their use.

TSCA also charges EPA to review 40 chemicals. The Agency divided the list into two groups: high and low priority. See the listing here: https://www.epa.gov/assessing-and-managing-chemicals-under-tsca/chemical-substances-undergoing-prioritization

Exercise – Identifying a Hazardous Material to Reduce

To get started generating ideas, access this site https://www.epa.gov/saferchoice/find-safer-choices-use-your-community#community_div. Click on a location of interest and then 'see more' for alternatives.

Work in small groups to list one or more chemicals that the group is interested in reducing use or exposure. This could be a chemical used at work, emitted from a workplace, emitted from mobile sources (cars, busses, rail, air) or used at home.

Product:

How/where is this used?

List information you would like to know about this chemical.

_____

_____

_____

Can you identify a resource(s) to find this information?

Several TUR-related programs use the word ‘Green’ to help designate the overall goal. These include:

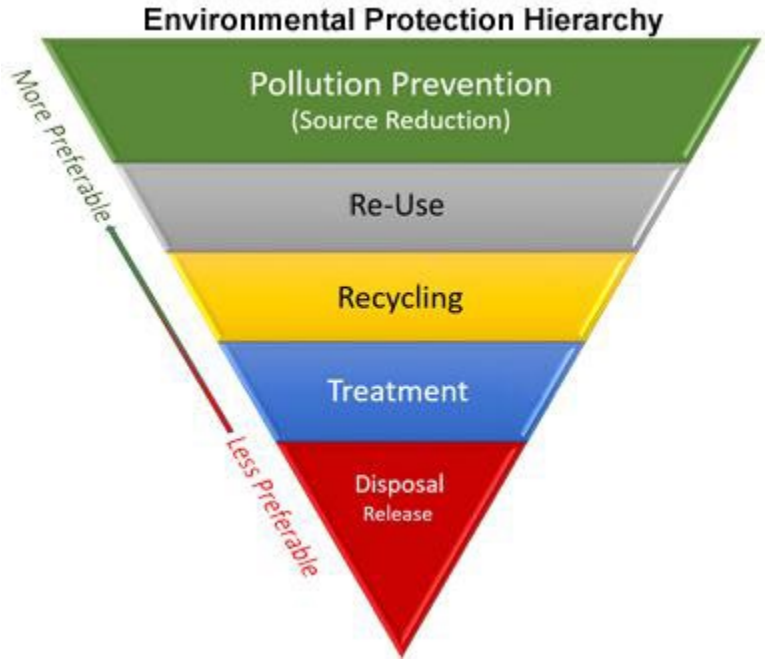
Green Engineering. Resources are available for designers. https://www.epa.gov/green-engineering/green-engineering-environmentally-conscious-design-chemical-processes-text-book

Green Chemistry is the design of chemical products and processes that reduce or eliminate the generation of hazardous substances. Guidance is found in many resources, including https://www.epa.gov/greenchemistry. Training needs in the green economy have been discussed by NIEHS Worker Training awardees (https://www.niehs.nih.gov/news/events/pastmtg/hazmat/2008/fall_meeting/index.cfm).

Other relevant programs

Environmentally Preferable Purchasing (EPP) is a federal program to promote development and government purchase of ‘green products’. The EPP program started in 1993 to comply with an EPA task in the Pollution Prevention Act (PPA), specifically to “identify opportunities to use federal procurement to encourage source reduction" as shown at https://www.epa.gov/greenerproducts/about-environmentally-preferable-purchasing-program. Information for suppliers is shown here: https://www.epa.gov/greenerproducts/selling-greener-products-and-services-federal-government

Pollution Prevention (P2) activities are shown in the schematic below:



Source reduction is an initial step to reduce or eliminate the source of pollution. This can be accomplished by industry through careful initial production process development or later as changes are made in a process (including change in a raw material). See Green Engineering resources.

The Solvent Alternative Guide (SAGE) is a PP resource. This comprehensive guide to provide pollution prevention information on solvent and process alternatives for parts cleaning and degreasing. SAGE does not recommend any ozone depleting chemicals. Descriptions of alternatives, case studies, economic and environmental information are in the download here: https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=NRMRL&dirEntryId=20220.

Clean (sometimes referred to as cleaner) Production is another approach to reducing waste and emissions. GreenScreen is a tool available globally to systematically evaluate production, identify safer alternatives, track progress and keep stakeholders informed. See https://www.cleanproduction.org/programs/greenscreen.

Disposal may involve release to the air, surface, waterways or sewers. Disposal to the sewer system can result in system damage, including clogging (https://undark.org/2019/12/23/flushable-wipes/) or the accumulation of grease ball (https://www.youtube.com/watch?v=9rt1ihd3dOA&feature=youtu.be) that impede flow.

How Toxic Use Reduction Can Protect Worker Health, Community Health and the Environment

Historically worker health and safety and environmental protection have been viewed as separate issues. They are regulated by two separate agencies:

- The Occupational Safety & Health Administration (OSHA) was established to regulate health and safety in the workplace. OSHA established limits for chemical exposure levels in the workplace.
- The Environmental Protection Agency (EPA) was established to regulate pollution in the environment to protect both the health of residents and the environment.

Much of the hazardous waste produced comes from industry. See https://www.epa.gov/hw. Emissions of reportable quantities are available through the Toxic Release Inventory (TRI), https://www.epa.gov/toxics-release-inventory-tri-program. This site includes 'Learn about TRI in your community'.

Daily in 2017, each person in the US produced 4.51 pounds of municipal solid waste (not hazardous waste) https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling.

At times there has appeared to be conflict between protecting workers' jobs and protecting the environment. Arguments have been made that there is a trade-off between well-paying jobs and a cleaner environment, with some people claiming that the technology required to control pollution can be so costly it will lead to lay-offs and plant closings. This argument may create divisions between workers and members of the community.

Toxic use reduction recognizes that the issues are connected and can *unite* workers and community members. The chemicals that expose workers to hazards inside the plant become pollution when emitted out into the environment, and people who work in the plant also live out in the community. The best outcome for everyone is to reduce the use of toxic chemicals. Decreased exposure to chemicals benefits everyone: TUR activities are a pathway to achieve this goal.

A permanent approach to reducing hazardous materials releases in the workplace and in the community is to reduce use.

Summary - Approaches

Toxic use reduction (TUR) refers to any strategy to eliminate or minimize the use of toxic materials.

The EPA Safer Choices program includes ratings and labels to assist in:

- selecting safer alternatives
- identifying more efficient practices and technologies
- conducting life-cycle evaluations
- identifying best practices to reduce use of toxic materials

EPA also oversees evaluations of chemicals under TSCA.

The Environmental Protection Hierarchy shows preventing pollution at the source as the preferred approach, followed by reuse, recycle, treatment and disposal (the least preferred alternative).

TUR in the workplace benefits workers and the community; TUR in the community benefits everyone.

Health and Safety

Options to control exposures to hazardous materials range from elimination of the material to protective gear to prevent contact with the body through inhalation, skin contact or ingestion. The types of options are reviewed and the advantages and disadvantages of each are discussed.

After this discussion, you will be better able to:

- Identify how you would be alerted to a chemical release
- Compare approaches to reduction of use or exposure control
- Identify an approach to reduce the use of a toxic material

Emergency Response

In the 1980s laws were passed that require employers to prepare an emergency response plan and train workers to respond to emergencies at sites where hazardous chemicals are located. If you work at a place where toxic chemicals are used, you may have had emergency response training.

Emergency response training provides some very valuable information for workers to protect themselves if there is an accident involving hazardous materials at the workplace. Depending on the level of training, workers learn how to use personal protective equipment and how to contain or clean up the spill. It is important to know these skills, but it is also important to understand that emergency response gives workers only a small measure of protection. The activities are conducted according to an Emergency Response Plan developed in advance, practiced and revised as needed as outlined in the Occupational Safety and Health Administration standard, Hazardous Waste Operations and Emergency Response (HAZWOPER, 29 CFR 1920.120).

- Emergency response is just that—a response to an accident or spill that has already occurred. Emergency response does nothing to prevent an accident from happening.
- Emergency response cannot always be performed fast or well enough to stop harmful emissions into the workplace or environment.
- Emergency response is a reaction to a single, accidental release of hazardous substances at high levels known to be toxic. It does not stop or prevent the daily exposure to low levels of hazardous materials that could be toxic over a long period of time.
- Emergency response depends on the behavior of individuals to implement response activities, ranging from evacuation to full response in protective gear.

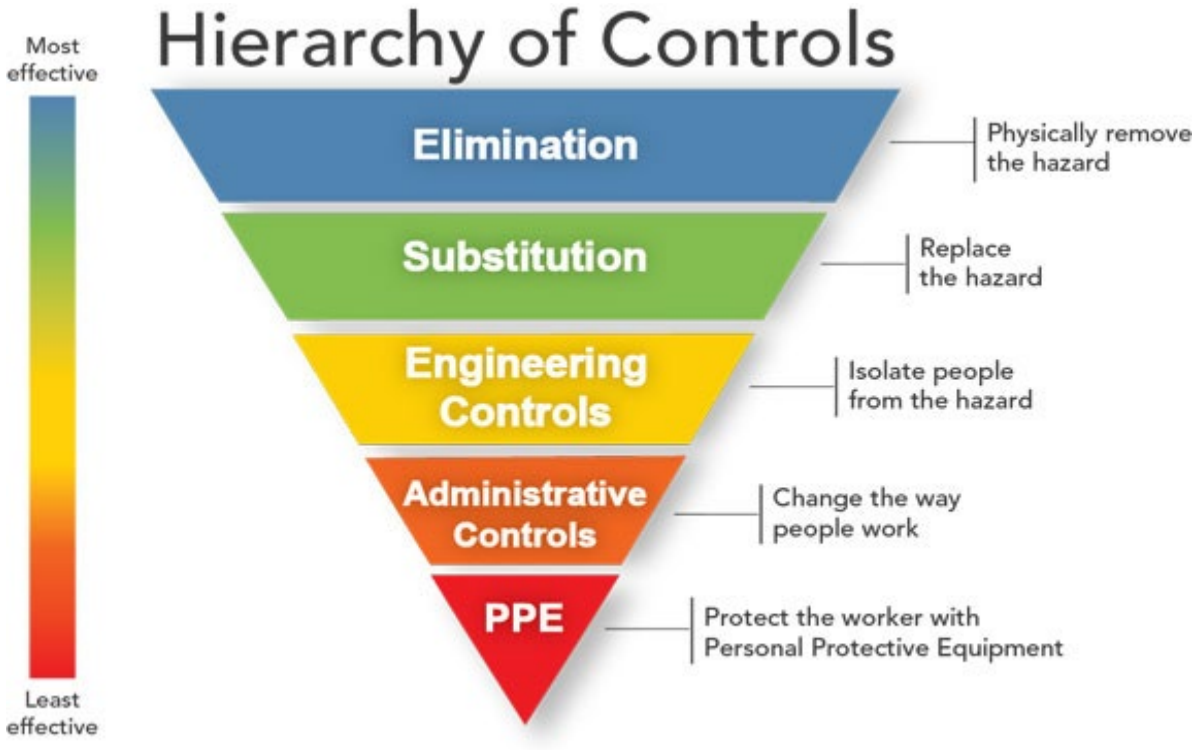
At the community level, the Local Emergency Planning Committee, fire department(s) and other officials work with industries to identify hazards in advance to assure prompt and effective response. Residents may be alerted to shelter in place or evacuate.

Do you know how alerts are made in your community?

Hazard Control

A hazard control is any device, procedure, piece of equipment, or tool that keeps dangerous exposures from occurring.

In 1950 the National Safety Council began describing a Hierarchy of Controls. This hierarchy is recognized and accepted by most health and safety professionals and is included in most safety manuals. The Hierarchy of Controls describes an order of preference in selecting hazard control. The figure below from the National Institute for Occupational Safety and Health (NIOSH) shows the categories of controls, from the most effective to the least effective.



This scheme illustrates that the two best and surest approaches to control hazards is to eliminate the exposure or substitute a less toxic material or hazardous process.

The strategies to isolate the person from exposure include modifying the process (use a robot to explore a possible hazard), containing the hazard (build a box) and removing through ventilation. Administrative controls, including Standard Operating Procedures (SOPs) are written procedures and programs that describe how the work is done; these procedures must be adhered to diligently (day after day by everyone involved), often require training and must be kept current. For example, an administrative control for

emergency response is an Emergency Response Plan that details the various procedures needed from initial assessment to response to termination.

The use of personal protective equipment (PPE) is the least preferred approach as it may not be 100% effective even when used diligently; PPE requires proper selection, training, cleaning, maintenance and resupply. To use many types of respiratory protection, medical clearance is required. Additional medical surveillance requirements may be in place based on job activities and potential exposure.

Training and personal protective equipment are at the bottom of the list. Training often requires periodic updates of skills and knowledge. PPE costs are substantial, both in terms of personnel and purchasing and rely on diligent use according to the written administrative program. Higher-level controls are more effective because they rely less on human behavior. Here is one example.

> Prior to the 1970s the poisoning of children from prescription drugs, paints, and cleaning products was a major problem. Parents were told to watch their children and to keep hazardous products in safe places where children couldn't reach them. Television commercials, radio ads, newspapers, and magazines issued warnings. Warning labels were placed on these products. None of these measures was effective, and children continued to die. In the early 1970s manufacturers were required to put child-proof lids on selected containers. By 1980 childhood poisonings declined by 65%.

A fire hazard is present when too many electrical devices are plugged into the same circuit. Which is the most effective control?

- An instruction manual
- A warning sticker
- A circuit breaker

These examples illustrate how much more effective engineering controls are than warning labels and training.

Engineering controls can fail, too. But one of the biggest problems with engineering controls is poor design; if they make a tool or machine more complicated to operate or to not operate as well, people bypass or disable them. A common example is the removal of a guard for cleaning or maintenance and then putting it back in place.

- The most effective control is to eliminate the hazard
- The best way to control an accident is prevention

Exercise - Evaluating Hazard Controls

1. A dry-cleaning shop in the neighborhood uses a solvent that has at times overcome workers and the odor is often noted by residents and passersby on the street. Even picking up cleaning bothers some patrons. Workers and residents are concerned and have organized a meeting to discuss options. Please indicate what type of control each measure is (refer to figure above) and the level of confidence (high, medium, low) you have that each of the approaches below will control the hazard.

Limit the hours of operation

Improve the ventilation to get the chemical out of the shop

Worker training to evacuate when odors are 'strong'

Close the shop

Implement pickup/delivery service for all cleaning

Investigate using new chemical/process

Employee weight loss program

Put fan by pickup station blowing air to back of shop

Other suggestion:

2. Which approach would you select as a first step to reduce use?

Summary - Health and Safety

The Hierarchy of Controls includes elimination and substitution, both part of TUR. When these cannot be accomplished, engineering controls to isolate the person from the toxic material is preferred. Administrative controls that describe how a person is to perform a task are important, but it may be difficult to achieve compliance. Use of PPE is considered the least effective control approach due to compliance cost and other factors.

For any toxic material, there may be many possible actions to reduce use. Identifying and listing some initial options is the beginning of a process.

TUR Benefits, Examples, Costs

The business case for reducing use of toxic materials is illustrated in this section.

From examples, you will be better able to:

- Describe benefits of TUR
- Review a TUR ‘success’
- Identify some costs for an example of TUR

Benefits of Toxic Use Reduction

- **Cost savings**—By reducing the use of toxic material, a company often reduces the cost of waste treatment and disposal and saves money through increased efficiency.

  Example: A metal stamping plant switches to a non-volatile lubricant and applies it with a low volume misting unit, saving thousands of dollars annually on hazardous waste disposal and permitting costs.

- **Reduced liability**—By reducing the use and handling of toxic materials, there is less chance a company will be sued for polluting the environment or for injury to workers.

  Example: A clothing manufacturer replaces solvent-based adhesive with a solvent-free, hot-melt adhesive that is non-flammable and emits no volatile organic compounds (VOCs) or air pollutants.

- **Regulatory compliance**—Less toxic use often means fewer or less stringent permitting, record-keeping, and other government requirements.

  Example: A metal and jewelry finishing operation eliminates the use of ammonia in its annealing ovens, freeing the company from reporting requirements.

- **Cleaner environment**—Reducing the use of toxic substances in the workplace means fewer toxic emissions are discharged into the public air and water.

  Example: A hospital implements a program to reduce the amount of mercury being discharged into the waste stream where it can damage wildlife.

- **Improved health and safety**—Reducing the use of toxic materials in the workplace means that worker exposure to harmful substances decreases.

  Example: A company eliminates its use of TSP, which is toxic to workers, and replaces it with sodium carbonate, which is less dangerous.

Toxic Use Reduction in Practice

The Toxic Use Reduction Institute (TURI, https://www.turi.org/) at the University of Massachusetts at Lowell is a highly-respected, publicly-supported research group that develops and evaluates alternatives to use of toxic materials in the workplace and community. Below are three selected examples of work by the TURI group, one each from small business, large industry and the community.

Example: small business

Perchloroethylene is a dry-cleaning agent designated as a potential occupational carcinogen by NIOSH and the International Agency for Research on Cancer (IARC). TURI evaluated professional wet cleaning, liquid carbon dioxide, high flash hydrocarbons, acetal, propylene glycol ethers, cyclic volatile methyl siloxane, and N-propyl bromide. Based on these results, professional wet cleaning was identified as an alternative technology. The level of cleaning was found to match or exceed the use of perc and cost of the change was recovered in an average of 2.5 years. The complete technology assessment is shown at https://www.turi.org/TURI_Publications/TURI_Technical_Reports/Chemical_Alternatives_Assessment_Cleaning_Solutions_Formulations._2015).

Example: large business

Quality control is essential in the food processing industry. TURI assisted a company using phenolphthalein (an irritant; probable human carcinogen as evaluated by IARC) and sodium hydroxide (highly corrosive) in the lab to assess the free fatty acid content of cooking oil. A new testing method eliminated both chemicals. Using isopropyl alcohol (not classified as a carcinogen) and a coloring agent with a new testing device, the new lab procedure was estimated to pay for the initial costs of about $5,000 in three years, not accounting for an estimated 24.8 labor hours that were redirected to other tasks. Annual costs of chemical purchase, handling and disposal of more than $14,700 were eliminated with the new procedure. See https://www.turi.org/TURI_Publications/Case_Studies/Food_and_Beverage/Cape_Cod_Potato_Chips_-_Food_Manufacturer_Shrinks_Chemical_Use.2018.

Example: community

Playgrounds are an important part of any town or city. The surface on these spaces generally includes grass and some other material in play areas especially around/under play equipment like slides and swings. Material and maintenance costs and accessibility to those with disabilities are considerations in the selection of material(s) for these highly used areas. Based on a review of a range of materials including various wood products (including those tested for absence of chromated copper arsenate, designated a human carcinogen by IARC), sand (may contain crystalline silica unless absence documented by testing), artificial grass, rubber tiles/pour-in-place rubber, and loose-fill rubber. Engineered wood fiber, wood chips or bark much received a high rating for absence of chemical of concern and health and safety concerns.

A summary table shows that binders may be a hazard in bonded engineered wood fiber products; binders and phthalates may be chemicals of concern in artificial grass. Artificial grass, and a range of rubber products may pose a hazard of exposure to polycyclic aromatic hydrocarbons, volatile organic compounds and heavy metals (each established health hazards). Non-bonded engineered wood products, silica-free sand and pea gravel are not associated with chemical exposure or environmental concerns; wood products provide the highest fall protection. These findings extend the results of work by the Consumer Product Safety Commission (CPSC) about surfaces filled with recycled tire materials. The CPSC recommended steps parents can take to limit exposure if this surface is in place. See https://www.cpsc.gov/Safety-Education/Safety-Education-Centers/Crumb-Rubber-Safety-Information-Center for CPSC reports and recommendations.

Cost data in the TURI report shows that the initial cost for wood materials with no health or environmental hazards are higher than non-silica sand or pea gravel; the latter two products provide low fall protection, however.

Exercise - Discussing Costs

Change is a balance of costs and benefits. Discuss the types of costs that might be anticipated for an example of interest to the group (entire group or each small group). These factors may include:

Who will pay the initial costs?

What longer term costs must be considered?

List any 'hidden' or difficult to assess costs (examples: change in traffic or delivery patterns, need for parking due to added use of a public space).

Work as one group, or in small groups and prepare a report back.

Summary - TUR Benefits, Examples, Costs

Successful TUR programs result in a range of benefits to workers and the community.

Detailed 'success stories' are available through several sources, including the Toxic Use Reduction Institute (TURI). Universities are another resource through groups that serve industrial clients. The US EPA TRI program shows reduction approaches that have resulted in reduced emissions.

Costs for TUR include initial and longer-term expenditures. Some costs related to impact of a change may be difficult to assess; early anticipation will add to a more complete listing of the types of costs that could occur.

Putting a TUR Process into Effect

You have discussed approaches to toxic use reduction, reviewed hazard controls, and reviewed case studies that benefit workers and the community. In this section, you will discuss how you can put these methods into effect to reduce the use of toxic materials.

When you finish this chapter, you will be better able to:

- Describe why stakeholder input is so valuable in reducing toxics
- Discuss considerations in developing a TUR process
- Describe how to present ideas to others

Why It Is Important to Involve All Stakeholders in Toxic Use Reduction

The most successful toxic use reduction strategies include input from workers. There are several important reasons why workers should be involved in any toxic use reduction effort at the workplace. First, worker's health is directly affected using toxic chemicals on the job.

- Workers often have the closest contact with chemicals used in industry. Exposures occur through fume inhalation, skin contact from handling materials, and hand-to-mouth contact. Exposures to toxic chemicals may occur daily.
- The chemicals workers are exposed to on the job are generally at higher concentrations than those in the environment.
- Our knowledge about industrial chemicals is not complete. The Environmental Protection Agency estimates that about 1,000 new chemicals are introduced commercially each year, many with minimal testing. Adequate data about hazards to human health and the environment is available on about 10% of them.
- Many workers die from disease caused by exposures to chemicals at work. Estimates are that as many as 250,000 Americans die each year from long-term chemical exposures on the job.
- Workers may also carry some toxic substances home on shoes and clothing and expose family members. Some of the most hazardous materials carried home by workers are dusts including lead, asbestos, cadmium and pesticides.

Another good reason to involve workers is that they know about production.

- Workers who have been trained in emergency response are in a unique position to evaluate where hazards exist and where accidents are most likely to happen.
- Workers have the most knowledge of workplace processes and how they really occur.

Many others may be stake holders - individuals or groups. The more who contribute to a plan, and resolve to participate or support implementation, the higher the likelihood of success.

It is important to remember that although toxic use reduction can reduce worker and community exposures, that is not always the outcome.

Example: Electroplating facility management decides to conserve plating solution by reducing "drag out." To do this, operators on the plating line hold racks of parts they are removing from tanks up in the air for a few seconds to allow excess plating solution to

drip back before moving the racks into rinse tanks. This process reduces the use of toxic plating chemicals but increases workers' exposures to them.

Exercise - Does this Management-based Reduction Strategy Benefit Workers or the Community?

A manufacturer decides to reduce use of a degreasing solvent to meet an industrial association environmental emission guideline. Management is proposing repairing and replacing all gaskets on pumps and valves. In addition, management is considering reducing the speed of the conveyor belt to keep parts in the vapor zone longer. They anticipate reducing use of this solvent by 30% with these methods.

Why would management consider each of these changes?

In small groups discuss the benefit and hazards of these changes to workers.

In small groups discuss the benefit and hazards of these changes to the community.

How to Develop Ideas for Toxic Use Reduction

You have identified several advantages to toxic use reduction for stakeholders. You have also discussed how toxic use reduction can protect workers and the community because it eliminates hazardous exposures. Before you try to introduce toxic use reduction in any setting, you need a plan and information.

You can develop ideas on your own as a start, but it is generally better to involve the other stakeholders early. How would you feel to be brought in 'at the end' and asked to approve something? Collectively, the group may have additional ideas to contribute add information available to you. There will be greater acceptance at the ground level for any strategy to reduce toxic chemicals with broader involvement. If there is a union or health and safety committee in your workplace, talk with these representatives. Communities have local committees that represent stakeholders that might be involved. Meet and talk informally with anyone who may be concerned about the hazard.

Hazard Assessment

The first step in planning is to find out where and how workers are being exposed to toxic materials, and to what. There are several questions to consider.

How are workers being exposed?

Walk around your plant and observe. Talk to other workers. Questions to ask yourself and others to determine exposure and potential for hazards include:

- What chemicals are used or created in the production process?
- Do odors indicate that chemicals are getting into the air?
- Does heating or drying make them more volatile?
- Are there leaks, spills, or emissions from equipment, vents, or containers?
- Is there visible dust or particles in the air?
- Is ductwork clogged or punctured?
- Are vents/hoods located too far from the source, or are they missing or broken?
- Are people working between emission sources and the ventilation?
- How much time do workers spend manually handling the material?
- Is there skin contact with the material?
- Does the work process increase exposure (i.e., do workers have to carry parts dripping across the floor)?
- Are work surfaces contaminated?
- Are workers experiencing skin rashes or breathing problems?

How are others being exposed?

- What chemicals are emitted?
- Do odors indicate that chemicals are getting into the air?
- Does heating or drying make them more volatile?
- Are there leaks, spills, or emissions from equipment, vents, or containers?
- Is there visible dust or particles in the air?
- Are people living near the emission points?
- Are surfaces contaminated?
- Are there reports of any health effects (examples: rashes asthma)

What are the exposures?

If you are interested in a source from a specific company, what chemicals are listed on the company's TRI report?

If not from an industrial source, what is the source (examples: buses/truck exhaust, water)?

What are the hazards of these chemicals?

Once the chemicals have been identified, the internet can be used to obtain more information on the hazards. Several resources are shown below:

Consult a Safety Data Sheet (SDS) to learn:

- Is this chemical a fire or explosion hazard?
- Is this chemical a health hazard? What are the effects? What are the symptoms?
- How should this chemical be handled?
- Are there conditions that should be avoided?
- Are there environmental hazards?

Exercise - Map the Exposure Zone

What are the ingredients? Who manufacturers the chemical?

Divide into small groups. In each group, each person should provide input as a map or diagram of the workplace or a community location is drawn. This is the first step in a hazard assessment. Identify on the map who (individual or group) who may be affected.

Can you identify the chemical(s) in each of the areas where a reduction might be possible?

Assessing Toxic Use Reduction Techniques

Once you have some idea of *what* you want to reduce or eliminate, you need to explore ideas for *how* to reach the goal. There are several different ways to reduce the use of toxic materials, including:

- Substitute non-toxic or less-toxic chemicals
- Replace hazardous chemicals with those that are less harmful in the design of a product or its packaging
- Change the process to reduce the toxic chemicals
- Upgrade and/or replace outdated equipment
- Improve operation and maintenance of equipment
- Re-use or extend the use of a toxic chemical

Exercise - Brainstorming About How to Reduce Toxics

Now that you have thought about and mapped the toxic chemicals at your workplace or community, write a list of ways to reduce use. This is a brainstorming session. Come up with as many ideas as possible. Don't worry about cost or feasibility for now.

Evaluating Options

In deciding on what option(s) to consider, you need to consider several factors. Some strategies may work better than others in a specific situation. All methods have advantages and disadvantages. The first question to ask is:

Will this action reduce use?

- Toxic use reduction eliminates or minimizes toxic chemicals at the source before they're produced. It is not waste reduction.
- Toxic use reduction lessens or eliminates the use of harmful chemicals. It does not redirect chemical pollution to the environment.

The next question to ask is:

What are the benefits?

There are many benefits to toxic use reduction, including the following:

- Cost savings
- Reduced liability
- Regulatory compliance
- Cleaner environment
- Improved health and safety

Exercise - Narrowing the List of Options

Review the list of options you came up with in the previous exercise. Which options meet the definition of toxic use reduction? What are the main benefits of each option? Which options reduce exposures? Choose one or two options with the most advantages.

Considering All Stakeholder Perspectives

The ideas developed during the exercise may be very good, but you still need to gain acceptance for them. Change is always difficult. When introducing toxic use reduction various stakeholders will have different concerns that need to be addressed, such as the following:

Worker Issues

- Increased difficulty in job
- Safety
- Workforce reduction
- Additional training required
- Violation of any contracts or understandings (i.e., change in job classification)

Employer Issues

- Product quality
- Ease in implementing
- Up-front costs
- Expense to operate

- Life of any capital investment
- Change required in personnel, training or shifts
- Reduced liability
- Reduced regulatory reporting
- Downtime in production
- Local supplier available for new products
- Consumer acceptance of product

Community Issues

- Costs
- Long lead-time working with town/city management
- Need for community involvement (volunteer commitment)

The concerns will vary widely, depending on individual conditions. For example, a small company may not have the money available to spend on expensive solutions. If a facility's equipment is old and in need of expensive repair, management may be more open to buying new, more efficient equipment. Some corporate cultures may be more willing to try new technology and ideas. Community support will vary.

Exercise - Presenting Your Ideas to Others

Knowing what you do about the situation described, what groups need to be brought into the discussion for input, review and refinement? Note: others may offer a new and better approach!

What stakeholders must be onboard?

How would you present the ideas to others?

Summary - Putting a TUR Process into Effect

Implementing change requires research and involvement of stakeholders.

The development of a TUR process may include:

- Hazard assessment
- Mapping

- Assessing approaches
- Brainstorming
- Evaluating and narrowing options
- Stakeholder perspectives

These steps contribute to developing a clear, fact-based approach that can be communicated to others for additional input.

Closing and Program Evaluation

Thank you for participating in this program. Are you better able to do the following?

- Describe the overall objective of Toxic Use Reduction (TUR)
- Describe several specific approaches to TUR
- Link TUR with exposure reduction at work and in the community
- Identify how you would be alerted to a chemical release
- Compare approaches to reduction of use or exposure control
- Identify an approach to reduce the use of a toxic material
- Describe benefits of TUR
- Review a TUR 'success'
- Identify some costs for an example of TUR
- Describe why stakeholder input is so valuable in reducing toxics
- Discuss considerations in developing a TUR process
- Describe how to present ideas to others

This is an opportunity to ask any questions you may have, or to discuss how the knowledge and skills learned can be used at work. Were all your initial questions answered?

Please take the next 10 minutes to complete the program evaluation forms. These are important for improving the program. The Midwest Consortium does take your

comments seriously and has made changes in content and the skill exercises based on feedback. Your comments are anonymous.

We hope to see you at another Midwest Consortium program in the future.