THE VIRGINIA WASTE MINIMIZATION PROGRAM

WASTE REDUCTION FACT SHEET

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SOURCE REDUCTION IN METAL MANUFACTURING

Source reduction means reducing or stopping the production of hazardous waste its the source rather than using recycling or recovery systems after the waste has been created. Source reduction is usually the least expensive approach to minimizing waste because many source reduction strategies involve housekeeping changes or minor in-plant process modifications. The number of different facets of metal manufacturing provide many opportunities for source reduction of hazardous waste. You may benefit from these opportunities if you are in one of these businesses:

Business	**Common Hazardous Wastes**
Primary metal production	Spent solvents, quenching and cutting oils, waste coolants
Metal casting or extrusion	Metal scrap, used oils, foundry sands, coolants
Metal product fabrication	Spent solvents, caustic solutions, paint wastes

This fact sheet identifies areas for reducing waste generation and suggests techniques availaable to metal manufacturers for waste reduction. For more specific information *on waste reduction technologies available, contact the Virginia Waste Minimization Program.*

RAW MATERIAL HANDLING AND STORAGE

- Inspect materials before you accept them and return damaged or unacceptable materials to the supplier to avoid disposal of unusable material later.
- Store chemicals at appropriate temperature and humidity levels.
- Restrict traffic through storage areas to decrease chances of chemical contamination and spillage.
- Employ a “first-in, first-out” policy for raw materials to keep them from becoming too old for use. Assign the responsibility for maintaining and distributing raw materials to one person.
- Purchase raw materials according to actual need, thereby avoiding partly used containers of material from becoming unusable while in storage. Ordering materials in returnable bins reduces or eliminates the need for cleaning.
- Test expired materials for usefulness. Many chemicals are usable well beyond their expiration dates.

EXTENDING METALWORKING FLUID LIFE

- Regularly replace seals and wipers to avoid contamination of metalworking fluids by tramp oil.

Cover sumps with screens or solid covers to reduce the contamination of fluids by cigarette butts, food, food wrappers and other litter.

Establish a concentrated program for maintaining sumps. Regular cleaning of the sumps will result in extended and more efficient performance, and thus significant monetary savings.

Use high quality, stable cutting and grinding fluids.

Use demineralized water for mixing purposes to avoid emulsion deterioration, corrosion, and microbial growth.

Regularly clean metalworking fluid through filtering or centrifugation. Periodic addition of specialized biocides can also extend fluid life by combating microbe growth.

Consider using synthetic metalworking fluids. While the lubricity of synthetic fluids is lower than many non-synthetic ones, tramp oils are not able to contaminate synthetic fluids as easily. Many synthetic fluids offer greater thermal stability at high temperatures.

Consider using air rather than, or as a complement to, fluid coolants. Air cooling avoids workpiece and tool contamination.

Select fluids with an overall, plant-wide perspective to find the most versatile products, thus minimizing the number of different fluids in use. It is sometimes possible to use just one kind of high quality fluid in an entire plant, although different applications may require different proportions of water and concentrate.

Regularly test fluids to detect deteriorating fluid qualities prior to failure.

SOURCE REDUCTION IN PARTS CLEANING

Solvents and Vapor Degreasing

Install lids on soak tanks so they can be covered during periods of non-use, reducing vapor degreaser solvent loss by up to 50 percent. Special lids, called “silhouette entries,” allow the bath to be used while covered by providing openings that match the shapes of the parts being degreased.

Increase the distance between the top of the vapor zone and the top of the soak tank, called “freeboard space.” EPA recommends freeboard space of 75 percent of the tank width. For shops where air turbulence is present, freeboard space of 100 percent of tank width can provide additional reductions in solvent usage.

Avoid cross-contamination of solvents.

Avoid water contamination by: cleaning the water separator and checking it frequently for proper drainage; preventing parts from entering the degreaser wet; maintaining the temperature of the water exiting the condenser coils at 90 to 100 degrees Fahrenheit.

Promptly remove any sludge that collects in the bottom of the soak tank to prevent contamination.

Locate cold cleaning tanks away from heat sources.

Avoid spraying parts above the vapor zone or cooling jacket.

Avoid solvent vapor drag-out that occurs when a workpiece is inserted or withdrawn from a tank too quickly.

For *soak* tanks of 500 gallons or more, use appropriate makeup solutions for the solvent bath rather than simply adding fresh solvent to boost the level of stabilizers in the tank.

For facilities using a large number of cold cleaning tanks, standardizing the solvent used will increase the potential for recycling and minimize the chances of cross-contamination

from other solvents. Consideration should also be given to consolidating cold cleaning operations into a centralized vapor degreasing operation.

Aqueous Cleaners

* Utilizing separator units that remove sludge and particulate matter continuously from alkaline or acid baths can reduce replacement chemical costs up to 20 percent.
* Use sand or bead blasting cleaning and stripping methods. The dry wastes produced are minimal and cheaper to dispose of than sludge.

Abrasives (used with binders and applied to polishing wheels)

* Use greaseless or water-based binders for polishing or buffing to leave buffing wheel clean without burning.
* Use liquid spray compositions rather than compositions in bar form because sprays allow for less fluctuation in quantity application.
* Use synthetic abrasives. Replace abrasives like beach sand with aluminum oxide grit and river rock with ceramic debut-ring materials; they are more resistant to grinding down.

Rinsewater

* Design rack systems so that parts are racked with their surfaces nearly vertical and their longest dimensions horizontal to reduce solution drag-out. The bottom edges of the racks should be tilted from the horizontal to allow run-off at only one corner.
* Keep racks well maintained to avoid solution loss in gaps and fissures.
* For barrel systems, maximum rinsing efficiency occurs when the barrel is only immersed partially, approximately 38 percent of its diameter:
* For installations with single rinse tanks and limited space, rinsing efficiency can be increased by installing a water spray system. Sprays should be designed to provide uniform coverage and to reduce undue splashing. Spray rinsing is also beneficial on multi-tank, counterflow systems where each spray unit is fed water from the succeeding rinse tank.
* Use deionized water for rinsing to reduce impurities.
* Investigate counter-current rinsing systems, which use less than one one-hundredth of the water used in single rinse tank operations.

Media Substitution

* Replace solvents with less toxic solvents. For instance, percloroethylene (PCE) and trichloroethylene (TCE) can be replaced by l,l,l-trichloroethane while benzene can often be replaced by aliphatic solvents such as Stoddard napthas.
* Investigate the use of terpenes, oils isolated from plants, as substitutes for solvents as well as aqueous cleaners.
* Replace solvents with aqueous cleaners. Aqueous-based systems often clean more effectively and produce less waste.
* Replace solvents with mechanical and thermal alternatives. Where solvents are used to dry parts following a water rinse operation, use a high velocity air jet.
* Use a plastic or sand blast media for dry stripping and cleaning.

* Replace aqueous cleaners and strippers with abrasive media.

PAINT **WASTES**

* Segregate all hazardous wastes, including paint wastes, from non-hazardous wastes.
* When possible, buy paint in returnable containers. To reduce paint waste, purchase quantities appropriate to paint usage.
* Use paint application equipment with low overspray characteristics. The most efficient spray methods, in order of greatest efficiency, are: electrostatic centrifugally-atomized, electrostatic air-atomized, conventional pressure-atomized, and conventional air-atomized.
* For manual spray systems, consider implementing an operator training program focusing on overspray reduction. **A** program that videotapes operators and has them analyze their own techniques can save a mid-sized manufacturer more than $50,000 a year in overspray costs.
* Fully inspect parts before they are painted to avoid painting of potential rejects.
* Use water-based coatings rather than solvent-based. Water-based coatings often substitute up to 80% of volatile solvents with water thus reducing air emissions. Furthermore, major equipment changes are not necessary and overspray can be easily collected, concentrated, and reused again as paint.
* Investigate radiation-curable or powder coatings which reduce waste and decrease energy and maintenance requirements.

FOR MORE INFORMATION:

The source reduction methods outlined above can significantly reduce the amount of waste you produce. Although recycling is not technically considered source reduction, significant savings can be achieved by recycling leftover materials or participating in a waste exchange. Both efforts can reduce hauling and disposal costs. Information on waste exchanges is provided in Volume 1, Issue l3 of the Virginia Waste Minimization Program Fact Sheet series.

Recycling of waste metals produced and resource recovery will be specifically addressed in the Virginia Waste Minimization Fact Sheet entitled, “Recycling and Resource Recovery in Metal Manufacturing,” available in 1992.

For information on waste reduction in metal finishing, refer to Virginia Waste Minimization Program Fact Sheet, “Waste Reduction for Metal Finishers.”

Much of the information outlined in this Fact Sheet comes from the “EPA Guide to Pollution Prevention: The Fabricated Metal Products Industry” which is available through the Virginia Waste Minimization Program.

This Waste Reduction Fact Sheet is provided as a service of the Virginia Waste Minimization Program, a technical assistance program of the Virginia Department of Waste Management. For more information on opportunities to reduce waste contact:

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