HAZARDOUS WASTE REDUCTION IN METAL PARTS CLEANING

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Virtually all fabricated metal objects require some form of cleaning prior to surface coating by painting, plating or vapor deposition. Cleaning is normally carried out by the use of: abrasives, solvents (halogenated and non halogenated), aqueous cleaners (acids or alkalies), and water (sometimes as steam). The use of solvents results in the production of vapors which can cause air pollution and of "dirty or used" solvents which comprise a hazardous waste. This paper discusses reduction in the amount and/or toxicity of these used solvents by examining: practices that result in a reduced cleaning load; good housekeeping practices; recycling solvents in or out of the facility; substitution of an abrasive, a less toxic solvent or an aqueous based cleaner. A full discussion of metal parts cleaning can be found in Chapter B-20 of Volume II, Waste Minimization Issues and Options, available from NTIS as PB87-114-367.

Reducing The Cleaning Load

Practices that have been used to reduce the cleaning load include the following:

(1) Increase the drainage time prior to cleaning.
(2) Centrifuge the objects to remove metal working fluids and particulates.
(3) Design the objects so they retain less fluid.
(4) Use a low viscosity metal working fluid so it flows readily from the object.
(5) Use a surface coating method relatively insensitive to the cleanliness of the surface. For example, use of cyanide zinc plating in place of nickel plating will reduce the cleanliness requirement.
(6) Inspect parts prior to cleaning to reduce unnecessary cleaning of faulty objects which would later be rejected.
(7) Practice good inventory control so as to minimize unnecessary cleaning or too early cleaning which in turn can lead to objects becoming rusty or dirty requiring a second cleaning.
(8) Practice good storage practices for uncleaned and cleaned parts to minimize soiling during storage.
(9) Pre clean by use of compressed air, brushes or buffing equipment to remove soil.

Good Operating or Housekeeping Practices

Good operating or housekeeping practices which can reduce the formation of waste solvents or still bottoms include:

(1) Waste stream segregation and identification of the waste as a recyclable stream rather than as a waste can improve recycling yield and keep water and foreign matter from the waste solvent container.
(2) Personnel training can stress operating practices which reduce the production of waste solvents.
(3) Purchasing practices can reduce or eliminate the generation of surplus or "off-spec" solvents.

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(4) Loss preventive practices such as spill prevention, preventive maintenance (particularly of pump and valve packing glands) can reduce leakage and spillage).
(5) Use of readily cleaned and purged filters can reduce dumping liquids from the filter container.
(6) Emergency preparedness can reduce the formation of wastes due to a leak or spill of solvent.

Reducing Waste Solvent Formation
Recycling Solvents

Solvents are used for various cleaning operations by a large segment of industry. Actions to reduce the amount of waste solvent produced include:

(1) Watch operating practices to avoid cross-contamination of solvents and water contamination. Remove sludge as it forms - zinc and aluminum fines catalyze the breakdown of chlorinated solvents forming acids.
(2) Analyze the solvent and add needed specific components rather than adding fresh solvent or replacing the bath.
(3) Locate cold cleaning tanks away from heat sources.
(4) Avoid spraying (cleaning) parts above the cooling jacket zone.
(5) Minimize solvent "drag out" by the design of the parts and their conveyor and by maximizing drip or drying time. Vapor drag out can occur, if the part is withdrawn too rapidly or exerts a piston effect.

Tens of thousands of vehicle repair facilities use solvent parts cleaners which comprise a sink placed atop a drum of solvent. Dirty solvent is filtered, returns to the drum, and is pumped to a spray cleaning nozzle in the sink. When the filter and/or solvent needs replacement a service firm such as Safety-Kleen replaces the solvent and filter and carries the dirty solvent to a recycling facility. The solvent can be halogenated or non halogenated and can be owned by the user or leased from the service company.

In production operations soak tanks and vapor degreasers are both commonly used. For both types of degreaser, the most important source reduction techniques are the minimization of solvent vapor loss and the maintenance of solvent quality. Solvents contain chemical stabilizers that help prevent acid formation and remove acid contaminants. Solvent vapor loss can preferentially lose stabilizers reducing solvent life before replacement. Techniques to reduce vapor loss include:

(1) Installation and use of tank covers -- slide covers horizontally, don't hinge; cut entry holes the shape of entering and leaving parts.
(2) Increase free board space.
(3) Install freeboard chillers in addition to cooling jackets.

Many operators of soak tanks and vapor degreasers have a solvent still directly connected to the degreaser. In other cases dirty solvent is piped or drummed to a centrally located in house still. Such stills are available with a capacity ranging from 1 gallon/hour to several hundred gallons/hour. Other operators send their dirty solvent to a recycler on a toll basis or for a fee determined by the value of the solvent when recycled compared to the recycling cost. Information on Still Suppliers and on Recyclers is contained in "Managing and Recycling Solvents" by Kohl et al which is available from the North Carolina

Pollution Prevention Program (Division of Environmental Management, NRCD, P.O. Box 27687, Raleigh, NC 27611 [919] 733-7015)

Waste or Toxicity Reduction by Media Substitution

Some parts cleaners have replaced the halogenated solvents (which result in "listed hazardous wastes) with non-halogenated solvents, such as Varsol or another petroleum solvent. While a change of this type reduces the problems of inhalation and vapor and skin contact toxicity it increases the fire hazard since the non halogenated solvents are readily flammable and their vapor can produce explosive mixtures.

Many former users of halogenated degreasing solvents have switched to alkaline or acid cleaners. The two other speakers in this session will explain why they made a switch of this nature and will describe their experiences with aqueous based degreasing media.