

## **3.7.2 Manufacturing Common Operations: Metal Parts Cleaning**

*Tip Sheet #1*

**WASTE ORIGIN:** All Cleaning Methods

**WASTE TYPES:** Petroleum-based Solvents, Volatile Organic Compound (VOC) Air Emissions, and Aqueous Wastes

**WASTE REDUCTION AND RECYCLING METHODS:**

- ! **Avoid** the need to clean (e.g., shrink wrap metal parts prior to shipment).
  - ! Select the **least hazardous medium** for cleaning.
  - ! Maximize cleaning **efficiency** (e.g., remove oil contaminants prior to welding).
  - ! **Separate** cleaning wastes.
  - ! **Maximize** recycling and reuse of cleaners.
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**WASTE ORIGIN:** Abrasive Cleaning

**WASTE TYPES:** Abrasives and Soils

**WASTE REDUCTION AND RECYCLING METHODS:**

- ! Use greaseless or water-based **binders** for buffing or polishing.
  - ! Use liquid **spray compositions**.
  - ! Control **water level** in mass finishing equipment.
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**WASTE ORIGIN:** Cold Cleaning

**WASTE TYPES:** Petroleum-based Solvents, Volatile Organic Compound (VOC) Air Emissions, and Soils

**WASTE REDUCTION AND RECYCLING METHODS:**

- ! Reduce **drag-out**:
  - ! Use proper **racking** to minimize solvent trapped in parts or baskets;
  - ! Increase **drainage** (e.g., with rest shelf, drainage holes);
  - ! Install **drain boards**.
- ! **Cover** when not in use.

**Sources:**

*Guides to Pollution Prevention: The Fabricated Metal Products Industry*, U.S. EPA, Office of Research and Development, July 1990, EPA/625/7-90/006.

*Guides to Pollution Prevention: The Mechanical Equipment Repair Industry*, U.S. EPA, Office of Research and Development, September 1992, EPA/625/R-92/008.

*Industrial Cleaning Source Book*, Solid and Hazardous Waste Education Center, University of Wisconsin-Extension, September 1993.

Seminar Publication: *Meeting Hazardous Waste Requirements for Metal Finishers*, Center For Environmental Research Information, Office of Research and Development, September 1987, EPA/625/4-87/018.

*Waste Minimization in Metal Parts Cleaning*, U.S. EPA, Office of Solid Waste, August 1989, EPA/530-SW-89-049.

## **3.7.2 Manufacturing Common Operations: Metal Parts Cleaning**

*Tip Sheet #2*

**WASTE ORIGIN:** Aqueous Cleaning

**WASTE TYPES:** Aqueous Cleaning Solution and Rinse Water

### **WASTE REDUCTION AND RECYCLING METHODS:**

- ! Use **optional methods** like abrasives, water, or steam.
- ! Use **less hazardous** acid or alkaline compounds.
- ! Maintain **solution quality**:
  - ! **Inspect** parts before cleaning;
  - ! **Pre-rinse** parts (e.g., with last rinse stage of cleaning operation, using demineralized water);
  - ! **Avoid** unnecessary loading;
  - ! Provide continuous **heating**;
  - ! Properly make up **solution**;
  - ! **Remove** sludge and soils promptly;
  - ! Routinely **monitor** cleaning solution strength and temperature;
  - ! **Maintain** equipment (e.g., racks free from cracks, rust);
  - ! Reduce **drag-out**.
- ! Increase degree of **rinsing efficiency** while reducing water use:
  - ! Use **de-mineralized water**;
  - ! Use **counterflow rinsing**;
  - ! Use **spray rinsing**;
  - ! Install **fog nozzles**.
- ! **Dry parts** properly (e.g., automated drying ovens).

### **Sources:**

*Guides to Pollution Prevention: The Fabricated Metal Products Industry*, U.S. EPA, Office of Research and Development, July 1990, EPA/625/7-90/006.

*Guides to Pollution Prevention: The Mechanical Equipment Repair Industry*, U.S. EPA, Office of Research and Development, September 1992, EPA/625/R-92/008.

*Industrial Cleaning Source Book*, Solid and Hazardous Waste Education Center, University of Wisconsin-Extension, September 1993.

Seminar Publication: *Meeting Hazardous Waste Requirements for Metal Finishers*, Center For Environmental Research Information, Office of Research and Development, September 1987, EPA/625/4-87/018.

*Vehicle Maintenance Pollution Prevention*, Iowa Waste Reduction Center, Small Business Pollution Center, University of Northern Iowa, 1995.

*Waste Minimization in Metal Parts Cleaning*, U.S. EPA, Office of Solid Waste, August 1989, EPA/530-SW-89-049.

## 3.7.2 Manufacturing Common Operations: Metal Parts Cleaning

Tip Sheet #3

**WASTE ORIGIN:** Solvent Cleaning

**WASTE TYPES:** Spent Petroleum-based Solvents, Volatile Organic Compound (VOC) Air Emissions, and Soils

### WASTE REDUCTION AND RECYCLING METHODS:

- ! Create cleaning standards.
- ! Replace solvent with **aqueous cleaning** medium.
- ! Use **emulsion** cleaners.
- ! Use **mechanical or thermal** methods.
- ! Use a **less toxic** solvent.
- ! **Standardize** solvent use (minimize different types of solvents used).
- ! **Consolidate** cleaning operations into one centralized degreasing operation.
- ! Maintain **solvent quality**:
  - ! Avoid **contamination** (e.g., with moisture);
  - ! **Don't mix** solvents;
  - ! **Maintain** equipment (e.g., maintain racks and barrels so that corrosion products like rust into solvent are not introduced);
  - ! **Monitor** solvent (e.g., test and add only specific components required);
  - ! Properly add to solvent (e.g., don't **cross-contaminate**);
  - ! Promptly **remove sludge**; use continuous filtering.
- ! Increase **cleaning efficiency**:
  - ! Employ **manual** brushing;
  - ! Increase **agitation** in bath (by use of mechanical agitators; ultrasonic devices, liquid sprays, and liquid jet pump-around arrangements).
- ! Control **evaporative losses**:
  - ! Select **proper location** for cleaning operations (e.g., free of drafts);
  - ! Use **lids** on tanks (roll-type covers on vapor degreasers);
  - ! Monitor **temperature**;
  - ! Avoid using **porous items** (ropes/bags) for handling parts;
  - ! Use **two-stage cleaning** (use dirty solvent for first stage and fresh solvent for second stage);
  - ! Stage solvent usage depending on **level of cleanliness** needed (reuse dirty solvent for parts which do not need to get as clean).
- ! **Recycle** solvents on-site (e.g., with gravity separation, filtration, batch distillation, fractional distillation, or evaporation).

**Sources:**

*Guides to Pollution Prevention: The Fabricated Metal Products Industry*, U.S. EPA, Office of Research and Development, July 1990, EPA/625/7-90/006.

*Guides to Pollution Prevention: The Mechanical Equipment Repair Industry*, U.S. EPA, Office of Research and Development, September 1992, EPA/625/R-92/008.

*Industrial Cleaning Source Book*, Solid and Hazardous Waste Education Center, University of Wisconsin-Extension, September 1993.

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*Vehicle Maintenance Pollution Prevention*, Iowa Waste Reduction Center, Small Business Pollution Center, University of Northern Iowa, 1995.

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## 3.7.2 Manufacturing Common Operations: Metal Parts Cleaning

Tip Sheet #4

**WASTE ORIGIN:** Solvent Parts Cleaning Operations

**WASTE TYPES:** Petroleum-based Solvents, Volatile Organic Compound (VOC) Air Emissions, and Soils

### WASTE REDUCTION AND RECYCLING METHODS:

- ! Install **lids or silhouettes** on tanks, and cover tanks when not in use.
- ! Use **less toxic** solvents (e.g., dibasic acid esters, terpenes, amines, alcohols).
- ! Substitute less hazardous solvent **degreasers** (e.g., petroleum solvents instead of chlorinated solvents).
- ! Replace solvents with **aqueous cleaners**.
- ! Replace solvents with **mechanical or thermal alternatives** (e.g., air blast systems, dry stripping, and cleaning with blasting media).
- ! **Standardize** type of solvent used in all operations.
- ! Consolidate cold cleaning operations into **centralized vapor degreasing** operation.
- ! Locate cold cleaning tanks away from **heat sources**.
- ! Minimize **vapor diffusion**:
  - ! Check parts for excessive **water contamination**;
  - ! **Cover** water separator;
  - ! Check **water jacket** for proper water flow and temperature on outside of degreaser;
  - ! Extend **freeboard**;
  - ! Use **cold traps** above freeboard chillers;
  - ! Locate **degreasers** away from drafts, windows, fans, or use baffles (air flow over tank should not exceed 131 feet per minute).
- ! Maintain proper **solvent level** in sump.
- ! Control the amount of heat supplied to **vapor degreasers**.
- ! Install safety **limit switches** (condenser flow switch and shut-off device for sump heat and a spray safety switch).
- ! Avoid spraying parts above the **vapor zone or cooling jacket**.
- ! Avoid solvent vapor drag-out by controlling **speed of withdrawal** (less than 11 feet per minute).
- ! Allow sufficient **time** in the degreaser.
- ! **Limit workload size** (use baskets with an area less than 50 percent of degreaser opening).
- ! Avoid **cross-contamination** of solvents (e.g., 1,1,1-Trichloroethane and trichloroethylene).
- ! Use appropriate **makeup solutions** for solvent bath.
- ! Remove **sludge** from solvent tanks frequently.
- ! Extend **solvent life** by pre-cleaning parts by wiping, using air blowers, or pre-dipping in cold mineral spirits dip.
- ! **Reclaim or recover** solvent on- or off-site (gravity separation, filtration, distillation, fuel use).

- ! Distribute parts on **rack** to allow good cleaning and minimize solvent hold-up.
- ! Slow speed of **parts removal** from vapor zone.
- ! **Rotate** parts to allow condensed solvent drop-off.

**Sources:**

*Guides to Pollution Prevention: The Fabricated Metal Products Industry*, U.S. EPA, Office of Research and Development, July 1990, EPA/625/7-90/006.

*Guides to Pollution Prevention: The Mechanical Equipment Repair Industry*, U.S. EPA, Office of Research and Development, September 1992, EPA/625/R-92/008.

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*Waste Minimization in Metal Parts Cleaning*, U.S. EPA, Office of Solid Waste, August 1989, EPA/530-SW-89-049.