COMPLIANCE ASSISTANCE PROGRAM

SPOKANE REGIONAL CLEAN AIR AGENCY

Info

Solvent Cleaning & Air Quality

Solvent cleaning (commonly called degreasing) is a process using non-aqueous solvents to clean and remove soils from various surfaces. Solvent cleaning is common in the electronics, surface coating and automotive sectors.

If you own/operate any size solvent dip tank, parts washer, vapor or in-line cleaning machines that use solvents containing halogenated compounds, you are required to comply with National Emission Standards for Hazardous Air Pollutants (NESHAPs) for halogenated organic solvents, as mandated by the 1990 Clean Air Act. This means you must install required controls on equipment and adopt specific work practices or stop using the chemicals regulated under the rule.

What solvents are regulated?

The U.S. Environmental Protection Agency (EPA) adopted regulations (40 CFR Part 63 Subpart T) to control toxic air emissions from solvent cleaning equipment (including dip tanks, parts washers, vapor and in-line cleaning machines) that use any of these halogenated solvents:

- 1,1,1-trichloroethane
- carbon tetrachloride
- chloroform
- methylene chloride
- perchloroethylene
- trichloroethylene

The rule is a pollution prevention regulation that reduces solvent usage by requiring the use of good housekeeping practices and efficient, well-controlled cleaning equipment.

Why are these solvents regulated?

The solvents are known or suspected carcinogens and are widely used. Emissions from using these solvents present a threat to human health and the environment. Vapors from these solvents also contribute to ground-level ozone, a harmful air pollutant.

The Washington State Administrative Code, WAC 173-400-040(3)(a), requires reasonable precautions be taken to prevent the release of air contaminants from operations which are a source of fugitive emissions. Spokane Regional Clean Air Agency considers federal, state and local air pollution control requirements when registering, permitting and inspecting businesses.

The owner/operator of any type of solvent cleaning machine is required to collect all solvent waste and store it in a tightly closed container with no perceptible leaks.

Is my facility affected?

Owners/operators of **any** size facility with solvent cleaning equipment that holds, or has a solvent capacity greater than two gallons, that uses any of the six above named solvents are affected by this regulation. (Ask your vendor or refer to your Material Safety Data Sheets [MSDSs] to determine whether you use these chemicals in your cleaning process.) How you are affected depends on the type of equipment you have and the compliance option you choose.

Solvent cleaning machines are divided into two categories; batch cold cleaning equipment and batch vapor, in-line cold, in-line vapor cleaning equipment.

Batch Cold Cleaning Machines

The charts below summarize the rules for the most common solvent cleaning equipment in Spokane County - **batch cold cleaning equipment**. The parts are immersed into the solvent and when clean, parts are removed to dry.

Batch Cold Cleaning Machines

Compliance Options	Required Controls	
	Option 1	**Option 2**
Dip Tank (Immersion Batch Cold Cleaning Equipment) *Must choose one of two options listed to the right.*	1. Install a sealed cover 2. Achieve 1" water layer or ¼" wax layer 3. No work practices required	1. Install a sealed cover 2. Maintain a freeboard ratio of 0.75 or greater 3. Work practices required (see chart below)
Parts Washer (Remote Reservoir Batch Cold Cleaning Equipment)	1. Install a sealed cover 2. Work practices required (see below) 3. Install tight fitting cover over solvent sump	

Batch Cold Cleaning Machines
Required Work Practices

1. Store solvent waste in closed containers.
2. Flush parts in freeboard area.
3. Reduce pooling of solvent on and in parts.
4. Do not fill cleaning equipment above fill line.
5. Clean up solvent spills immediately.
6. Store wipe rags in closed metal containers.
7. Do not agitate solvent to the point of splashing.
8. When cover is open, minimize room drafts.
9. Do not clean absorbent materials.
10. Keep cover closed and turn off fans when not in use.

Batch Vapor, In-Line Cold and In-Line Vapor Cleaning Machines

Three different types of cleaning machines are included in this section: **batch vapor, in-line vapor** and **in-line cold**. Vapor-type cleaning machines heat the solvent above its boiling point. The parts are cleaned by the condensation of hot solvent vapor on colder parts. With this process, the parts to be cleaned go into and come out of the machine dry. In-line cold machines operate much like batch cold cleaning machines. The charts on page two and three summarize the rules for batch vapor and in-line cleaning machines.

Vapor & In-Line Cleaning Machines
(Choose from one of three options listed below.)

Compliance Options	Required Controls
Option 1 Control Combinations & Design & Work Practices	1. Use control devices/methods. Choose two or three of the control devices/methods in combination (see chart to the right). 2. Follow established design and work practices (see chart below).
Option 2 Idling Emission Limit & Design & Work Practices	1. Set limits on solvent emissions during idle mode. Idle mode is when machine is turned on but is not actually cleaning parts. Initial measurements are required to determine that the machine meets the idling emission limits and monitoring parameters to measure compliance. Monitoring specifications and test results from the equipment manufacturer may be used in place of actual tests. Test methods for determining idling emissions can be found in the rule. Batch Vapor 0.22 kg/m2 hour (0.045 lb/ft2 hour) In-Line 0.10 kg/m2 hour (0.021 lb/ft2 hour) **The amount of solvent in kilograms (pounds) emitted per square meter (foot) of solvent surface area per month. 2. Follow established design and work practices (see chart below).
Option 3 Overall Emission Limit Alternative Standard	1. Sets an emission limit for solvent cleaning machines. The emissions from each machine must not exceed a three-month rolling average. The amount of solvent emitted each month must be calculated based on how much solvent is added and removed from each machine. *Machine Type* — *Avg. Monthly Emission Limit ** in kg/m2 (lb/ft2)* Batch Vapor 150 kg/m2 (30.7 lb/ft2) Existing* In-Line 153 kg/m2 (31.4 lb/ft2) New* In-Line 99 kg/m2 (20 lb/ft2) *Existing = machines in operation on or before 11/29/93, New = start up after 11/23/93 **The amount of solvent in kilograms (pounds) emitted per square meter (foot) of solvent surface area per month.

Vapor & In-Line Cleaning Machines
Design & Work Practices

Design Requirements

1. Cover the machine or reduce room draft.
2. Have a 0.75 or greater freeboard ratio.
3. Set hoist maximum speed of 3.4 meters (11 ft) per minute.
4. Have liquid and vapor level indicators that shut off sump heat.
5. Primary condenser (required on vapor cleaning machines).

Work Practices

1. Minimize air disturbances in the cleaning machine and in the room.
2. Minimize solvent loss due to spraying operations.
3. Reduce the pooling of solvent on and in parts.
4. Remove parts only after solvent dripping stops.
5. During startup, turn primary condenser on before sump heater.
6. During shutdown, turn sump heater off before the primary condenser.
7. Maintain equipment as recommended by the manufacturer.
8. Store solvent waste in closed containers.
9. Do not clean absorbent materials.
10. Take and pass an operator test, if requested.
11. Transfer solvent using leakproof couplings and minimize emissions.
12. Parts or parts basket in a open-top batch vapor machine shall not occupy more than 50% of the solvent/air interface area unless the parts are introduce as a speed of 0.9 meters/minute (3 feet/minute).

Vapor & In-Line Cleaning Machines
Control / Methods Combinations

Choose two - three of the control devices or methods in combination (see below approved combination charts for more information). Options differ for batch vapor and in-line machines. For batch vapor, there are two sets of control combinations options, based on the solvent surface area within the machine. Smaller machines have more options than larger machines.

Batch Vapor

1. **Install a working-mode cover.** It completely covers the machine openings to minimize the influence of outside air disturbances while parts are being cleaned. Cover is opened only during parts entry and removal.
2. **Reduce room draft.** By decreasing the flow of air (from fans) across the top of the solvent cleaning machine to 50 ft per minute.
3. **Have a freeboard ratio of 1.0 or greater.** This effectively reduces solvent emissions. For example, if the height of the freeboard is 2 meters (6.6 ft) and the interior dimensions of the freeboard are 2 meters (6.6 ft) by 4 meters (13.2 ft), the freeboard ratio would be 2 meters/2 meters (6.6 ft/6.6 ft = 1.0).
4. **Use a superheated vapor system.** It heats the solvent within the vapor zone to at least 10°F above solvent's boiling point. Parts must be held within the superheated vapor zone to allow the solvent to evaporate from the part.
5. **Install a freeboard refrigeration device.** It is a set of coils mounted in the freeboard are that carries a refrigerant to provide a chilled air blanket above the vapor zone, which causes the solvent vapors t condense and return to the tank. The temperature measured from the center of the air blanket must not exceed 30% of the solvent's boiling point.
6. **Install a carbon adsorber in conjunction with a lip exhaust** to further remove solvent emissions. Exhaust from the carbon adsorber must not exceed 100 ppm.
7. **Use appropriate dwell time per type of part.** Dwell time is the amount of time cleaned parts are held above the vapor zone but within the freeboard area, allowing solvent to drain from the parts or parts basket back into the machine. This reduces solvent emissions and drag out. Dwell time must be at least 35% of the time required for a part or basket to stop dripping.

In-Line

1. **Have a freeboard ratio of 1.0 or greater.** This effectively reduces solvent emissions. For example, if the height of the freeboard is 2 meters (6.6 ft) and the interior dimensions of the freeboard are 2 meters (6.6 ft) by 4 meters (13.2 ft), the freeboard ratio would be 2 meters/2 meters (6.6 ft/6.6 ft = 1.0).
2. **Use a superheated vapor system.** It heats the solvent within the vapor zone to at least 10°F above solvent's boiling point. Parts must be held within the superheated vapor zone to allow the solvent to evaporate from the part.
3. **Install a freeboard refrigeration device.** It is a set of coils mounted in the freeboard are that carries a refrigerant to provide a chilled air blanket above the vapor zone, which causes the solvent vapors t condense and return to the tank. The temperature measured from the center of the air blanket must not exceed 30% of the solvent's boiling point.
4. **Install a carbon adsorber in conjunction with a lip exhaust** to further remove solvent emissions. Exhaust from the carbon adsorber must not exceed 100 ppm.
5. **Use appropriate dwell time per type of part.** Dwell time is the amount of time cleaned parts are held above the vapor zone but within the freeboard area, allowing solvent to drain from the parts or parts basket back into the machine. This reduces solvent emissions and drag out. Dwell time must be at least 35% of the time required for a part or basket to stop dripping.

Approved Batch Vapor Control Combinations

Cleaning Machine Type	Option	Working Mode Cover	1.0 Freeboard Ratio	Super Heated Vapor	Freeboard Refrigeration Device	Reduce Room Draft	Carbon Adsorber	Dwell
Batch Vapor Cleaning Machine ≤1.21 m^2 (≤13 ft^2)	1	■	■	■				
	2			■	■			
	3	■			■			
	4		■	■		■		
	5				■	■		
	6		■		■			
	7				■			■
	8		■			■		■
	9				■		■	
	10		■	■			■	
Batch Vapor Cleaning Machine ≥1.21 m^2 (≥13 ft^2)	1		■	■	■			
	2				■	■		■
	3	■		■	■			
	4		■	■		■		
	5			■	■	■		
	6		■	■	■	■		
	7			■	■		■	

Shaded boxes indicate the control devices or methods that can be used in combination for each option.

Approved In-Line Control Combinations

Cleaning Machine Type	Option	1.0 Freeboard Ratio	Super Heated Vapor	Freeboard Refrigeration Device	Carbon Adsorber	Dwell
Existing In-Line[a]	1	■	■			
	2	■		■		
	3			■		■
	4				■	■
New In-Line[b]	1		■	■		
	2			■	■	
	3		■		■	

[a] Existing = machines in operation on or before 11/29/93
[b] New = start up after 11/29/93

Notice of Construction

Exisiting and new sources of air contaminants throughout Spokane County must obtain an approved Notice of Construction (NOC) prior to the construction or installation of the air pollution control equipment.

Annual Registration & Fees

Operations with NOCs must also register with Spokane Clean Air and are subject to annual resigtation fee, annual reporting of air emissions data and regular compliance inspections. The annual registration program enables Spokane Clean Air to maintain an inventory of air contaminants. Information is also used to evaluate air pollution control strategies to attain and maintain National Ambient Air Quality Standards.

On-site Inspections

Regular inspections of registered sources are conducted to verify compliance with air pollution regulations. Inspectors also respond to citizen complaints regarding air pollution concerns. Complaint response typically results in an on-site inspection.

Are there benefits to using solvent alternatives ?

Yes. Eliminating or minimizing the use of toxic substances can help your business:

- meet federal regulations and cut your paperwork burden;
- reduce costs by using fewer raw materials;
- cut waste transportation and disposal costs; and
- reduce long-term liability and insurance costs.

Before looking at alternative cleaning options, it is important to understand your situation. Consider the following questions:

- What is being cleaned?
- What are the contaminants?
- How "dirty" are the parts prior to cleaning?
- How are the parts getting dirty in the first place?
- What are the minimum requirements for cleanliness that must be met for this process?
- Is a specific type of cleaning required by internal or external specifications?
- Is continuous or batch processing required?

How do I determine if an alternative method will work for me?

Alternative cleaning methods or materials include eliminating the cleaning process; using water-based or semi-water-based cleaning systems and/or materials; using citrus based or biological solvents, or using a specialty cleaning process, such as supercritical carbon dioxide or vacuum de-oiling. **The following three steps will help you analyze your cleaning process and possible alternatives.**

Step 1: Evaluate cleaning

- Check your minimum cleanliness requirements. You may be "overcleaning." If you can't eliminate cleaning, you may be able to reduce the amount of cleaning (see Step 2 & 3.)
- Investigate controlling the contamination of parts. You may find that you can meet minimum cleanliness requirements without cleaning. If not, you may be able to reduce the load on the cleaning system (see Step 2 & 3.)
- Investigate process changes that make cleaning unnecessary. If you are cleaning because of residue put on a part by a current process, see if there is an alternative process that meets your needs without leaving any residue (or that leaves residue that can be left on).
- Work to change internal specifications that require cleaning, if you can prove it is not technically necessary. If external specifications require cleaning with a regulated substance, inquire with the customer if a change would be acceptable. If not, refer to the required equipment controls and work practices (see charts on page 1, 2 and 3) and Step 3.

Step 2: If cleaning is still required, consider an alternative cleaning process

- Determine which alternatives are compatible with your parts and will remove contaminants, based on information from vendors, peers or others. Try to identify water-based alternatives.
- Identify which of the compatible alternatives is most economical and convenient.
- Have enough representative parts "test cleaned" to verify that the alternative will work, and to identify any modifications you'll need to make to use the new process.
- Work to change internal specifications that require a specific cleaning process if you can prove a viable alternative exists. If external specifications require cleaning with a regulated substance, inquire with the customer if a change is acceptable.

Step 3: If alternatives are not feasible, optimize current cleaning process

Implement the design and work practices listed in the information sheet:

- batch cold cleaning machines (see page 1)
- vapor and in-line cleaning machines (see page 2 and 3)

Resources:

- Pacific NW Pollution Prevention Resource Center, www.pprc.org
- EPA & Design for the Environment, www.epa.gov/dfe/
- Ecology, www.ecy.wa.gov