

Air Program Fact Sheet

Halogenated Solvent MACT

January 2017

In December 1994, the U.S. Environmental Protection Agency (EPA) issued the Maximum Achievable Control Technology (MACT) standard, aimed at reducing the amount of harmful pollutants emitted to the atmosphere when solvents evaporate from solvent cleaning machines (e.g., degreasers, parts cleaners). This standard also encourages pollution prevention by listing equipment options and housekeeping practices as compliance options.

Does this Federal Standard Affect My Business?

Businesses affected by this standard use cleaning or drying solvents containing one or more of the following halogenated compounds, in combined concentrations greater than 5% by weight, in a solvent cleaning machine. The term "halogenated" means the solvent contains a halogen (in this case, chlorine).

- Methylene Chloride
- Trichloroethylene (TCE)
- 1,1,1-Trichloroethane (methyl chloroform, TCA)
- Carbon Tetrachloride
- Perchloroethylene (perc, PCE)
- Chloroform

The following are **not** affected by this standard:

- mineral spirits and stoddard solvent (two commonly used solvents)
- fabric, wood, paper, sponge, and wipe cleaning operations
- buckets, pails, and beakers with capacities of 2 gallons or less

To determine if the solvent you use contains any affected compounds, refer to the material safety data sheet (MSDS) or ask your supplier.

How Does My Business Comply with this Standard?

Initial Notification Report

Each facility affected by this standard must file an Initial Notification Report. The deadline for existing sources to submit this report has passed. New sources must submit the report as soon as possible prior to starting construction.

An example Initial Notification form is available from USEPA, or you may submit your own report. The report must contain your business name and the following information for each solvent cleaning machine that is affected by this standard:

- address where machine is located
- description of machine [including type (open top, conveyORIZED), solvent/air interface area or cleaning capacity, and any existing air pollution controls associated with the machine]
- installation date
- anticipated compliance approach
- estimate of the yearly consumption of affected halogenated compound(s) used



Compliance With Standards

The federal standard offers several compliance options. Your business may choose to:

1. Switch to a non-chlorinated solvent, a water-based solvent, or a semi water-based solvent. This option may exempt your facility from the federal standard. Thus, it's in your business's best interest to investigate this option.
2. Comply with one of the machine standards (see pages 1-3 of Attachment 1).
3. Meet and maintain the appropriate idling emission limit (see Table 1 on page 4 of Attachment 1).
4. Meet an alternative emission limit (see page 5 of Attachment 1).

The compliance standards are organized by the following types of solvent cleaning machines:

- Open Top (Batch) Cold Cleaning Machines
- Open Top Vapor Machines (separated by small and large machines)
- ConveyORIZED Cleaning Machines (separated by existing and new)

Compliance Deadlines

Existing sources must be in compliance with this rule at all times, and new sources must comply with this rule upon startup of the equipment. If you miss a compliance deadline, contact your DNR Air Program inspector to determine how you should demonstrate compliance.

Initial Statement of Compliance

The deadline for existing sources has passed. New sources must submit their Statement of Compliance within 150 days after startup of the equipment.

A Statement of Compliance form is available, or you may submit your own. A Statement of Compliance must include the business name, address where the machine is located, and a statement that operation of the machine complies with the standard.

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Attachment 1

OPEN TOP (BATCH) COLD CLEANING MACHINE STANDARDS

(choose one option)

Option 1

- Equip the machine with a tight fitting cover.
- Close the cover at all times, except when parts enter and are removed from machine.
- Keep a water layer on the surface of the solvent within the cleaning machine. The layer must be at least 1.0 inch thick.

If you choose Option 2 or 3, you must also follow the Work and Operational Practices listed at the bottom of this page.

Option 2

- Equip the machine with a tight fitting cover.
- Close the cover at all times, except when parts enter and are removed from machine.
- Machine must have a freeboard ratio of at least 0.75.

Option 3 (remote-reservoir cold cleaning machines, only)

- Equip the machine with a tight fitting cover.
- Close the cover at all times, except when parts are being cleaned.

WORK AND OPERATIONAL PRACTICES FOR OPEN TOP COLD CLEANING MACHINES

- **Collect and store waste solvent** in closed containers. Closed containers may have pressure relief devices, so long as those devices do not allow liquid solvent to drain from containers.
- If a **flexible hose or flushing device** is used, flushing must be performed only within the freeboard area of the solvent cleaning machine.
- **Drain solvent-cleaned parts** for at least 15 seconds or until dripping stops, whichever is longer. Parts that have cavities or blind holes must be tipped or rotated while draining.
- **Solvent level** must not exceed the fill line.
- **Wipe up spills** immediately. Wipe rags must be stored in covered containers.
- **Air-agitated and pump-agitated solvent baths** must produce a rolling motion of solvent, but not "observable" splashing.
- **When the cover is open**, the machines must not be exposed to air drafts greater than 132 feet/minute. Drafts must be measured 3.3 - 6.6 feet upwind from tank lip, and at the same elevation as the tank lip.
- Do not use these machines to clean **fabric, wood, sponges, or paper products**.

SMALL OPEN TOP (BATCH) VAPOR CLEANING MACHINE STANDARDS

(choose one option)

Option 1 Meet an alternative emission limit. See Table I on page 4.

If you choose one of Options 2-6, you must follow the Design Requirements and the Work and Operational Practices listed on page 5-6.

Option 2 Maintain the idling emission limit of 0.045 pounds per hour per square foot of solvent/air interface area.

Option 3 Use a freeboard refrigeration device and one of the following:

- A system that superheats the solvent vapor
- A working mode cover
- A carbon adsorption unit
- Dwell
- Reduce the room draft
- Freeboard ratio of 1.0

Option 4 Maintain a freeboard ratio of 1.0 and use a superheated vapor system and use one of the following:

- A working mode cover
- Reduce the room draft
- A carbon adsorption unit

Option 5 Maintain a freeboard ratio of 1.0 and reduce the room draft and dwell.

Option 6 Implement any other method equivalent to Options 2-5 that is approved by the DNR.

LARGE OPEN TOP VAPOR CLEANING MACHINE STANDARDS

(choose one option)

Option 1 Meet the alternative emission limit. See Table I on page 4.

If you choose one of Options 2-6, you must follow the Design Requirements and the Work and Operational Practices listed on page 5-6.

Option 2 Maintain the idling emission limit of 0.045 pounds per hour per square foot of solvent/air interface area.

Option 3 Use a freeboard refrigeration device and a superheated vapor system and do one of the following:

- Maintain a freeboard ratio of 1.0
- Use a carbon adsorption unit
- Reduce the room draft
- Use a working mode cover

Option 4 Use a freeboard refrigeration device and reduce the room draft and do one of the following:

- Dwell
- Maintain a freeboard ratio of 1.0

Option 5 Maintain a freeboard ratio of 1.0 and reduce the room draft and superheat the vapor system.

Option 6 Implement any other method equivalent to Options 2-5 that is approved by the DNR.

EXISTING CONVEYORIZED CLEANING MACHINE STANDARDS

(choose one option)

Option 1 Meet an alternative emission limit. See Table I on page 4.

If you choose one of Options 2-5, you must follow the Design Requirements and the Work and Operational Practices listed on page 5-6.

Option 2 Maintain the idling emission limit of 0.021 pounds per hour per square foot of solvent/air interface area.

Option 3 Dwell and use one of the following:

- A freeboard refrigeration device
- A carbon adsorption unit

Option 4 Maintain a freeboard ratio of 1.0 and use one of the following:

- A system that superheats the solvent vapor
- A freeboard refrigeration device

Option 5 Implement any other method equivalent to Options 2-4 that is approved by the DNR.

NEW CONVEYORIZED CLEANING MACHINE STANDARDS

(choose one option)

Option 1 Meet the alternative emission limit. See Table I on page 4.

If you choose one of Options 2-5, you must follow the Design Requirements and the Work and Operational Practices listed on page 5-6.

Option 2 Maintain the idling emission limit of 0.021 pounds per hour per square foot of solvent/air interface area.

Option 3 Use a freeboard refrigeration device and use of the following:

- A system that superheats the vapor system
- A carbon adsorption unit

Option 4 Use a superheated vapor system and a carbon adsorption unit.

Option 5 Implement any other method equivalent to Options 2-4 that is approved by the DNR.

TABLE I - IDLING AND ALTERNATIVE EMISSION LIMITS

Equipment	Idling Emission Limits ^{*1}	Alternative Emission Limits (EL) (3-month rolling average)
Small Open Top Vapor Machines	0.045 pounds/sq ft/hour	<ul style="list-style-type: none"> • If the machine has a solvent/air interface, then EL = 30.67 pounds/sq ft/month. • If the machine has no solvent/air interface, then: <ol style="list-style-type: none"> 1. If machine cleaning capacity is equal to or less than 2.95 cubic meters, refer to the federal standard [40 CFR 63.464(a)(2)(ii)]. 2. If machine cleaning capacity is greater than 2.95 cubic meters, then EL = 330 x (Volume)^{0.6} kilograms/month. <p>Volume is equal to the cleaning capacity, in cubic meters.</p>
Large Open Top Vapor Machines	0.045 pounds/sq ft/hour	30.67 pounds/sq ft/month
Existing ConveyORIZED Machines	0.021 pounds/sq ft/hour	31.28 pounds/sq ft/month
New ConveyORIZED Machines	0.021 pounds/sq ft/hour	20.24 pounds/sq ft/month
Batch Open Top Cold Cleaning Machines	N/A	N/A

^{*1} If you use any of the control techniques listed in the Machine Standard options to meet the Idling Emission Limits, you must adhere to that control technique's monitoring requirements (see page 7-8).

DESIGN REQUIREMENTS FOR OPEN TOP VAPOR AND CONVEYORIZED CLEANING MACHINES

- **Manual and bi-parting covers** must be easy to use, large enough to cover the solvent tank, and be free of cracks, holes, and other defects.

Or, when cover is open, the **freeboard area** must not be exposed to air drafts greater than 50 feet per minute.
- Maintain a **freeboard ratio** of at least 0.75.
- Equip machine with an **automated parts handling system** that moves parts or parts baskets no faster than 11 feet per minute (from initial loading of parts to removal of clean parts).
- Equip **vapor cleaning machine** with a device that shuts off the sump heat if the sump liquid level drops to the sump heating coils.
- Equip **vapor cleaning machine** with a **primary condenser**.
- Equip **vapor cleaning machine** with a device that shuts off the sump heat if the vapor level rises above the top of the primary condenser.
- **Each machine that uses a lip exhaust** shall be designed and operated so that all collected solvent vapors are routed through a carbon adsorption unit that is properly operated and maintained.

WORK AND OPERATIONAL PRACTICES FOR OPEN TOP VAPOR AND CONVEYORIZED CLEANING MACHINES

- Close **machine cover** during idling and downtime modes, except when solvent has been removed from the machine, or maintenance or monitoring requires the cover to be open.

Or, when cover is open, the freeboard area must not be exposed to air drafts greater than 50 feet per minute.
- **Parts or parts baskets** being cleaned must not occupy more than 50% of the solvent/air interface area, unless parts or parts baskets are being introduced at a speed of 3 feet per minute or less.
- Perform all **spraying operations** within the vapor zone or within a section of the machine that is not directly exposed to the surrounding air.
- Do not remove **parts or parts baskets** from solvent cleaning machine until dripping has stopped.
- Orient parts so that solvent drains from them freely. **Tip or rotate parts** that have cavities or blind holes before removing them from the machine.
- When **starting-up a vapor cleaning machine**, turn on the primary condenser before turning on the sump heater.
- When **shutting-down a vapor cleaning machine**, turn off the sump heater and allow the vapor layer to collapse before turning off the primary condenser.
- When **adding, draining, or transferring solvent**, use leakproof pipes and couplings. Also, keep end of the pipe beneath the liquid solvent level.
- Maintain and operate equipment as recommended by the manufacturer.

- Make sure that equipment operators are trained to use the equipment properly. Operators may be asked to **complete and pass a test of operating procedures** during routine inspections by the DNR. Copies of this test are available from your local DNR district air staff.
- **Collect and store** waste solvent in closed containers. Closed containers may have pressure relief devices so long as they do not allow liquid solvent to drain from container.
- Do not use these machines to clean of **fabric, wood, sponges, or paper products**.

MONITORING AND RECORDKEEPING REQUIREMENTS

Businesses that have open top vapor and conveyorized solvent cleaning machines must perform periodic monitoring and recordkeeping to determine whether solvent cleaning machines comply with the federal standard. The chart below lists the monitoring and recordkeeping requirements for each equipment standard/emission limit.

NOTE: There are no monitoring or recordkeeping requirements for open top cold cleaning machines.

Equipment Standard/ Emission Limit	Requirement	Recordkeeping Frequency
Carbon Adsorber	<ul style="list-style-type: none"> • The halogenated solvent concentration in the carbon adsorber exhaust cannot exceed 100 ppm. If 100 ppm is exceeded, adjust the desorption schedule or replace the adsorption canister. • Locate lip exhaust so that cover closes below the lip exhaust level. • The adsorber must not be bypassed during desorption. • Measure and record the concentration of halogenated air pollutants in the exhaust of the carbon adsorber. 	weekly
Cover	Visually inspect for cracks and to ensure proper operation.	monthly
Dwell	<p>Determine proper dwell time for each part type/parts basket as follows:</p> <ol style="list-style-type: none"> 1. Use parts or parts baskets that are at room temperature. 2. Clean parts in machine using standard operating procedures. 3. Determine the time it takes for part(s) or parts basket to cease dripping once placed in the freeboard region. 4. Proper dwell time is no less than 35% of the time determined in Step #3. <p>Measure and record period of time that parts are held within the freeboard area of the machine after cleaning (dwell time).</p>	monthly
Alternative Emission Limit	<ul style="list-style-type: none"> • Record solvent additions and deletions. • Return solvent level to solvent fill line. • Determine and record emission rate (3-month rolling average). 	monthly monthly
Freeboard Refrigeration Device (also called a chiller)	<ul style="list-style-type: none"> • Chilled air blanket temperature, measured at the center of the air blanket must be 30% or less of the solvent's boiling point. • Measure and record that temperature while the machine is idling. 	weekly
Automated Parts Handling System (Hoist Speed)	<ul style="list-style-type: none"> • Calculate hoist speed by measuring the time it takes for hoist to travel a measured distance. • Measure and record hoist speed, periodically. 	monthly/quarterly ^{*2}

Equipment Standard/ Emission Limit	Requirement	Recordkeeping Frequency
Reduced Room Draft	<p>Air movement or flow across the freeboard area (windspeed) or within an enclosure must not exceed 50 feet/minute.</p> <p><u>If machine is not enclosed</u> - Measure and record windspeed across top of freeboard area. Monitor room parameters that were used in initial compliance test to achieve the reduced room draft.</p> <p><u>If machine is enclosed</u> - Measure and record windspeed within enclosure. Visually inspect enclosure for cracks, holes, and other defects.</p>	<p>windspeed – quarterly</p> <p>room parameters - weekly</p> <p>wind speed – monthly</p> <p>enclosure - monthly</p>
Superheated Vapor System	<ul style="list-style-type: none"> • Temperature at center of superheated vapor zone must be at least 10° F above the solvent's boiling point. • Measure and record temperature at center of air blanket during idling mode. • Parts must remain in the superheated vapor zone for at least the proper dwell time. 	weekly

*2 Quarterly monitoring is allowed if your hoist speed cannot exceed 11 ft/min or if your hoist speed does not exceed this for one year.

DEFINITIONS

Air blanket means the layer of air inside the solvent cleaning machine freeboard located above the solvent-air interface. The center of the air blanket is equidistant between the sides of the cleaning machine.

An **area source** is a business that does not meet the major source definition.

Automated parts handling system means a mechanical device that carries all parts and parts baskets at a controlled speed from the initial loading of soiled parts through the removal of the cleaned parts. These systems include, but are not limited to, hoists and conveyors.

Carbon adsorber means a bed of activated carbon into which an air-solvent gas-vapor stream is routed and that adsorbs the solvent on the carbon.

Clean liquid solvent means fresh unused solvent, recycled solvent, or used solvent that has been cleaned of soils (e.g., skimmed of oils, strained of metal chips).

Cleaning capacity. For a cleaning machine without a solvent/air interface, this is the maximum volume of parts that can be cleaned at one time. In most cases, the cleaning capacity is equal to the volume (length times width times height) of the cleaning chamber.

Cold cleaning machines are those that use solvents in a cold, liquid phase, below the normal boiling point of the solvent.

Construction means the on-site fabrication, erection, or installation of an affected source.

Conveyorized cleaning machines are those that use an automated system, usually a conveyor, that continuously feeds parts into the machine. These machines are fully enclosed, except for the conveyor inlet and exit openings.

Cover means a lid, top, or portal cover that shields the solvent cleaning machine openings from air disturbances when it is in place and is designed to be easily opened and closed without disturbing the vapor zone. Air disturbances include, but are not limited to, lip exhausts, ventilation fans, and general room drafts. Types of covers include, but are not limited to, sliding, biparting, and roll-top covers.

Downtime mode means the time period when a solvent cleaning machine is not cleaning parts and the sump heating coils, if present, are turned off.

Dwell means the technique of holding parts within the freeboard area but above the vapor zone of the solvent cleaning machine. Dwell occurs after cleaning to allow solvent to drain from the parts or parts baskets back into the solvent cleaning machine.

Dwell time means the required minimum time period that a part must dwell.

Existing solvent cleaning machine means a cleaning machine constructed or reconstructed before or on November 29, 1993.

Freeboard area. For a batch cleaning machine, this is the area within the solvent cleaning machine that extends from the solvent/air interface to the top of the solvent cleaning machine. For an in-line cleaning machine, this is the area within the solvent cleaning machine that extends from the solvent/air interface to the bottom of the entrance or exit opening, whichever is lower.

Freeboard height. For a batch vapor cleaning machine, this is the distance from the solvent-air interface, as measured during the idling mode, to the top of the cleaning machine. For an in-line cleaning machine, it is the distance from the solvent-air interface to the bottom of the entrance or exit opening, whichever is lower as measured during the idling mode.

Freeboard ratio means the freeboard height divided by the smaller interior dimension (length, width, or diameter) of the solvent cleaning machine.

Freeboard refrigeration device (also called a chiller) means a set of secondary coils mounted in the freeboard area that carries a refrigerant or other chilled substance to provide a chilled air blanket above the solvent vapor.

Hoist means a mechanical device that carries the parts and parts baskets from the loading area into the solvent cleaning machine and to the unloading area at a controlled speed. A hoist may be operated by controls or may be programmed to cycle parts through the cleaning cycle automatically.

Idling mode means the time period when a solvent cleaning machine is turned on but is not actively cleaning parts.

Idling-mode cover means any cover or solvent cleaning machine design that allows the cover to shield the cleaning machine openings during the idling mode. A cover that meets this definition can also be used as a working-mode cover if that definition is also met.

Large open top vapor cleaning machines have a solvent/air interface greater than 13.0 ft² (1.21 m²).

Lip exhaust means a device installed at the top of the opening of a solvent cleaning machine that draws in air and solvent vapor emissions from the freeboard area and ducts the air and vapor away from the solvent cleaning area.

Major source means any stationary source or group of stationary sources located within a contiguous area and under common control that emits or has the potential to emit:

- 10 tons per year or more of any hazardous air pollutant; or
- 25 tons per year or more of any combination of hazardous air pollutants; or
- 100 tons per year or more of any air contaminant

Potential to emit is a measurement of your business' worst-case air pollution emissions at maximum production capacity, 24 hours per day and 365 days per year. The major source determination is based on all emission points inside the facility, not just the solvent cleaning machines.

New solvent cleaning machine means a solvent cleaning machine the construction or reconstruction of which is commenced after November 29, 1993.

Open top (batch) cleaning machines are those in which individual parts move through the **entire** solvent cleaning process before new parts are introduced to the machine (typically carburetor cleaners).

Primary condenser means a series of circumferential cooling coils on a vapor cleaning machine through which chilled liquid or gas is circulated or recirculated to provide continuous condensation of rising solvent vapors and, thereby, create a controlled vapor zone.

Reduced room draft means decreasing the flow or movement of air across the top of the freeboard area of the solvent cleaning machine to less than or equal to 50 feet per minute. Methods of achieving a reduced room draft include, but are not limited to, redirecting fans and/or air vents away from the cleaning machine, moving the cleaning machine to a less drafty location, and constructing a partial or complete enclosure around the cleaning machine.

Remote-reservoir cold cleaning machine means any device in which liquid solvent is pumped to a sink-like work area that drains solvent back into an enclosed container while parts are being cleaned, allowing no solvent to pool in the work area.

Room parameters are items such as fans, windows, and doors that can be adjusted to reduce room draft.

Small open top vapor cleaning machines have a solvent/air interface of less than 13.0 ft² (1.21 m²).

Solvent fill line means the line, typically on the interior of a solvent cleaning machine sump, that indicates the level to which the cleaning machine should be filled with solvent.

Solvent-air interface. For a vapor cleaning machine, this is the location of contact between the concentrated solvent vapor layer and the air. This location of contact is defined as the midline height of the primary condenser coils. For a cold cleaning machine, it is the location of contact between the liquid solvent and the air.

Solvent-air interface area for a vapor cleaning machine, means the surface area of the solvent vapor zone that is exposed to the air. For an in-line cleaning machine, it is the total surface area of all the sumps. For a cold cleaning machine, it is the surface area of the liquid solvent that is exposed to the air.

Solvent vapor zone is the area that extends from the liquid solvent surface to the level at which the solvent vapor is condensed in a vapor cleaning machine. This level is defined as the midline height of the primary condenser coils.

Sump means the part of a solvent cleaning machine where the liquid solvent is located.

Superheated vapor system means a system that heats the solvent vapor, either passively or actively, to at least 10° F above the solvent's boiling point. Parts are held in the superheated vapor before exiting the machine to evaporate the liquid solvent on them. Hot vapor recycle is an example of a superheated vapor system.

Vapor cleaning machines are those that boil the solvent, creating a vapor that is used as part of the cleaning cycle.

Working-mode means the time period when the solvent cleaning machine is actively cleaning parts.

Working-mode cover means any cover or solvent cleaning machine design that allows the cover to shield the cleaning machine openings from outside air disturbances while parts are inside the machine and during idling and downtime modes. A working-mode cover is opened only during parts entry and removal. A cover that meets this definition can also be used as an idling-mode cover if that definition is also met.