

33.0 Solvent Cleaning and Drying.

Draft 12/13/2019

11/11/2004 xx/xx/xxxx**33.1 Applicability.**

33.1.1 ~~The applicable provisions of Section 33.0 of this regulation apply to any person who owns or operates a solvent cleaning machine that meets the criteria of 33.1.1.1 and 33.1.1.2 of this regulation.~~ contains any amount of volatile organic compound (VOC) material.

~~33.1.1.1~~ Contains more than one liter of solvent.

~~33.1.1.2~~ Uses any solvent containing volatile organic compounds in a total concentration greater than 5% by weight, as a cleaning or drying agent.

33.1.2 ~~Except as provided in 33.3.4 through 33.3.6 of this regulation, existing sources affected permitted by 33.0 of this regulation shall comply with the provisions of 33.0 of this regulation no later than November 11, 2001. New, modified, or reconstructed sources affected by Section 33.0 of this regulation shall comply with the provisions of Section 33.0 of this regulation upon start-up.~~

33.1.3 Any person subject to both ~~Section 33.0 of this regulation~~ and **7 DE Admin. Code 1130** shall submit to the Department a request to amend the existing Title V permit, consistent with the permitting requirements of **7 DE Admin. Code 1130**. Any person subject to subsection 33.3 of this regulation, but not subject to **7 DE Admin. Code 1130**, shall request to be covered under a source category permit, consistent with **7 DE Admin. Code 1102** within 90 days of the Department's establishment of a source category permit covering solvent cleaning and drying. Any person subject to subsections 33.4 through 33.7 of this regulation, but not subject to **7 DE Admin. Code 1130**, shall submit to the Department a request to amend the existing **7 DE Admin. Code 1102** permit, consistent with the permitting requirements of **7 DE Admin. Code 1102**.

33.1.4 Solvent cleaning machines using VOC that are hazardous air pollutants (HAPs), are subject to all the provisions of Section 33.0.

Solvent cleaning machines using HAPs that are not VOC are not covered by this Section 33.0 but may be covered by other regulations including Section 8.0 "Emission Standards for Halogenated HAP Solvent Cleaning" of 7 DE Admin. Code 1138.

Some solvent cleaning machines may use carbon containing compounds that EPA has determined are not VOC. Such compounds may be found in Section 2.0 "Definitions" of 7 DE Admin. Code 1101 under the definition for volatile organic compounds.

33.1.5 Section 33.0 regulates VOCs used in solvent cleaning machines, except as stated above, and does not separate VOCs into categories such as an LVP-VOC, a low-vapor pressure chemical compound or mixture, which is a term only used in the Consumer Products regulation (Section 2.2 "Definitions of 7 DE Admin. Code 1141). Thus, any special treatment of an LVP-VOC, such as stated in that regulation, does not apply to Section 33.0 of this regulation.

33.2 **Definitions.** As used in ~~Section 33.0 of this regulation~~, all terms not defined herein shall have the meaning given them in Section 2.0, in 7 DE Admin. Code 1101, in 7 Del. C. Chapter 60,

or in the November 15, 1990 Clean Air Act Amendments, ~~in 7 DE Admin. Code 1101, or in 2.0 of this regulation.~~

“Airless cleaning system” means a solvent cleaning machine that is automatically operated and seals at a differential pressure of 0.50 pounds per square inch gauge (psig) or less, prior to the introduction of solvent or solvent vapor into the cleaning chamber and maintains differential pressure under vacuum during all cleaning and drying cycles.

“Airtight cleaning system” means a solvent cleaning machine that is automatically operated and seals at a differential pressure of 0.50 pounds per square inch gauge (psig) or less, prior to the introduction of solvent or solvent vapor into the cleaning chamber and during all cleaning and drying cycles.

“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 or wet parts through the removal of the cleaned or dried parts. Automated parts handling systems include, but are not limited to, hoists and conveyors.

“Batch vapor cleaning machine” means a vapor solvent cleaning machine in which individual parts or a set of parts move through the entire cleaning or drying cycle before new parts are introduced into the cleaning machine. The term does not include machines that do not have a solvent/air interface, such as airless cleaning systems and airtight cleaning systems.

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

“Cold cleaning machine” means a solvent cleaning machine that contains or uses ~~unheated~~ a non-boiling liquid solvent into which parts are placed to remove soils from the surfaces of the parts or to dry the parts. Cold cleaning machines include, but are not limited to, batch cold cleaners and conveyorized in-line cold cleaners. Batch-loaded cold cleaners, immersion cold cleaning machines, remote reservoir cleaners (also known as sink-on-a-drum), and various types of spray booths, flush booths or wash stations are all various types of batch cold cleaners. Cold cleaning machine does not include machines that do not have a solvent/air interface, such as airless cleaning systems and airtight cleaning systems.

“Downtime mode” means the time period when a solvent cleaning machine is not cleaning or drying 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 a solvent cleaning machine. Dwell occurs after cleaning or drying to allow solvent to drain from the parts or parts baskets back into the solvent cleaning machine.

“Dwell time” means the period of time between when parts or a parts basket is placed in the vapor zone of a batch vapor or in-line vapor cleaning machine and when solvent dripping ceases.

“Freeboard height” means, for a batch cold cleaning machine, the distance from the liquid solvent level to the ~~top lip~~ top lip of the solvent cleaning machine. For a batch vapor cleaning machine, it is the distance from the solvent/air interface to the ~~top lip~~ top lip of the solvent cleaning machine, as measured during idling mode. 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 idling mode.

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

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

“In-line cold cleaning machine” means a cold cleaning machine that uses an automated parts handling system, typically a conveyor, to automatically provide a continuous supply of parts to be cleaned or dried. These units are fully enclosed except for the conveyor inlet and exit portals.

“In-line vapor cleaning machine” means a vapor solvent cleaning machine that uses an automated parts handling system, typically a conveyor, to automatically provide a continuous supply of parts to be cleaned or dried. These units are fully enclosed except for the conveyor inlet and exit portals.

“Lip exhaust” means a system which collects solvent vapors escaping from the top of a solvent cleaning machine and directs them away from operating personnel.

“Primary condenser” means a series of circumferential cooling coils on a vapor cleaning machine through which a chilled substance is circulated or recirculated to provide continuous condensation of rising solvent vapors and, thereby, creating a concentrated solvent vapor zone.

“Reduced room draft” means decreasing the flow or movement of air across the top of the freeboard area of a solvent cleaning machine to less than 15.2 meters per minute (50 feet per minute) by methods including, but not limited to, redirecting fans or air vents to not blow across the cleaning machine, moving the cleaning machine to a corner where there is less room draft, and constructing a partial or complete enclosure around the cleaning machine.

“Remote reservoir cold cleaning machine” means a solvent cleaning machine in which liquid solvent is pumped to a sink-like work area that immediately drains solvent back into an enclosed container while parts are being cleaned or dried, allowing no solvent to pool in the work area. A remote reservoir cold cleaning machine is also termed a sink-on-a-drum. A remote reservoir cold cleaning machine that uses an enclosed container for dipping or soaking parts is considered to be a batch-loaded, or immersion cold cleaning machine.

“Soils” means contaminants that are removed from the parts, products, tools and machinery being cleaned. Soils include, but are not limited to, grease, oils, waxes, metal chips, carbon deposits, fluxes, and tars.

“Solvent” means any liquid containing volatile organic compounds (VOC) which is used to perform solvent cleaning or drying.

“Solvent/air interface” means, for a vapor cleaning machine, the location of contact between the concentrated solvent vapor layer and the air. This location of contact is defined as the mid-line 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 cleaning machine” means any device or piece of equipment that uses volatile organic compounds, liquid or vapor, to remove soils from parts or to dry parts. Types of solvent

cleaning machines include, but are not limited to, batch vapor, in-line vapor, in-line cold, immersion cold, and remote reservoir cold cleaning machines, as well as, airless cleaning systems and airtight cleaning systems.

“Superheated vapor system” means a system that heats the solvent vapor, either passively or actively, to a temperature 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 the parts. Hot vapor recycle is an example of a superheated vapor system.

“Vapor cleaning machine” means a batch or in-line solvent cleaning machine that heats liquid solvent that is used as part of the cleaning or drying cycle. The heated solvent may or may not be boiling. The term does not include machines that do not have a solvent/air interface, such as airless cleaning systems and airtight cleaning systems.

“Vapor up control switch” means a thermostatically controlled switch that shuts off or prevents solvent from being sprayed when there is no vapor. On in-line vapor cleaning machines the switch also prevents the conveyor from operating when there is no vapor.

“Working mode” means the time period when the solvent cleaning machine is actively cleaning or drying 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 being cleaned or dried in the cleaning machine. A cover that is used during the working mode is opened only during parts entry and removal.

33.3 **Standards for batch cold cleaning machines.** The provisions of subsection 33.3 of this regulation apply to all batch cold cleaning machines. The provisions of subsection 33.3 of this regulation shall not apply if the owner or operator of the cold cleaning machine demonstrates and the Department approves in writing that compliance with subsection 33.3 of this regulation will result in unsafe operating conditions.

33.3.1 Immersion cold cleaning machines shall have a freeboard ratio of 0.75 or greater unless the machines are equipped with working mode covers that shall be closed except when parts are being placed into or being removed from the machine. Covers shall be free of cracks, holes, and other defects, and easily opened or closed.

33.3.2 Immersion cold cleaning machines and remote reservoir cold cleaning machines shall:

33.3.2.1 Have a permanent, conspicuous label summarizing the operating requirements in subsection 33.3.3 of this regulation.

33.3.2.2 Be equipped with a downtime mode cover that shall be closed at all times except during cleaning or drying of parts or the addition or removal of solvent. Cover shall be free of cracks, holes, and other defects, and readily opened or closed.

33.3.3 Batch Cold cold cleaning machines shall be operated in accordance with the following procedures:

33.3.3.1 Waste solvent, still bottoms, and sump bottoms shall be collected and stored in closed containers and identified as waste solvent. The closed containers may

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- contain a device that allows pressure relief, but does not allow liquid solvent to drain from the container.
- 33.3.3.2 Cleaned parts shall be drained at least 15 seconds or until dripping ceases, whichever is longer. Parts having cavities or blind holes shall be tipped or rotated while the part is draining. During the draining, tipping or rotating, the parts shall be positioned so that solvent drains directly back to the cleaning machine.
 - 33.3.3.3 Flushing of parts using a flexible hose or other flushing device shall be performed only within the freeboard area of the cold cleaning machine. The solvent flushing shall be a solid fluid stream, not an atomized or shower spray, at a pressure that does not exceed 10 pounds per square inch gauge (psig).
 - 33.3.3.4 Work area fans shall be located and positioned so that they do not blow across the opening of the cold cleaning machine.
 - 33.3.3.5 Sponges, fabric, wood, leather, paper products, and other absorbent materials shall not be cleaned or dried in the cold cleaning machine.
 - 33.3.3.6 Any solvent bath agitator shall be operated to produce a rolling motion of the solvent with no observable splashing of the solvent against the tank walls or the parts being cleaned. Air agitated solvent baths may not be used.
 - 33.3.3.7 Spills during solvent transfer and use of the cold cleaning machine shall be cleaned up immediately, and the wipe rags or other absorbent material shall be immediately stored in covered containers for disposal or recycling.
 - 33.3.3.8 The owner or operator shall ensure that the solvent level does not exceed the fill line.
 - 33.3.3.9 If heated, the cold cleaning machine shall have a temperature control device that will avoid overheating, prevent boiling of the cleaning solution and provide a continuous temperature record.
 - 33.3.3.10 Cold cleaning machine container or containers shall be free of all liquid leaks. Auxiliary equipment such as pumps, water separators, steam traps, or distillation units, shall not have any liquid leaks, visible tears, or cracks. In addition, any liquid leak, visible tear, or crack detected shall be repaired within 48 hours, or the cleaner shall be drained of all solvent and shutdown until replaced or repaired.
 - 33.3.3.11 Draining or filling of solvent containers or the cold cleaning machine shall be performed beneath the solvent surface.
- 33.3.4 On and after November 11, 2002, and before xx/xx/2021, ~~No~~ no person shall use, sell, or offer for sale for use in a cold cleaning machine any solvent with a vapor pressure of 1.0 millimeters of mercury (mm Hg) or greater, measured at 20°C (68°F) that contains volatile organic compounds.
- 33.3.5 On and after November 11, 2002, and before xx/xx/2021, a person who sells or offers for sale any solvent containing volatile organic compounds for use in a cold cleaning machine shall provide, to the purchaser, the following written information:

- 33.3.5.1 The name and address of the solvent supplier.
 - 33.3.5.2 The type of solvent including the product or vendor identification number.
 - 33.3.5.3 The vapor pressure of the solvent measured in mm Hg at 20°C (68°F).
- 33.3.6 The owner or operator of a cold cleaning machine shall maintain for not less than five years, and shall provide to the Department, on request, the information specified in 33.3.5 of this regulation. An invoice, bill of sale, certificate that corresponds to a number of sales, Material Safety Data Sheet (MSDS), or other appropriate documentation acceptable to the Department may be used to comply with 33.0 of this regulation.

33.3.7 VOC requirements for cold cleaning machines.

33.3.7.1 On and after (insert compliance date) no person shall use, sell or offer for sale for use in a cold cleaning machine any solvent containing more than 25 grams of VOC per liter in a cold cleaning machine, except as noted in subsections 33.3.7.2 or 33.3.7.3. See subsection 33.10.3 for more details.

33.3.7.2 Solvent to clean post-solder printed circuit boards as well as critical adjunct processes, including the cleaning of raw solder paste and adhesives from hard surfaces, such as stencils and misprinted boards during the printing process, and baked on fluxes (polymerized fluxes) from reflow and wave solder oven components, such as conveyor fingers and condensation traps, may contain no more than 150 grams VOC per liter of solution and all other applicable provisions of Section 33.0 must be followed.

33.3.7.3 A cold cleaning machine may use greater than the VOC content for cold cleaning machines as specified above (25 g/l or 150 g/l) by using a DNREC approved VOC capture and control device (see subsection 33.11.5).

- 33.4 **Standards for batch vapor cleaning machines.** The provisions of subsection 33.4 of this regulation apply to batch vapor cleaning machines.

33.4.1 Batch vapor cleaning machines shall be equipped with:

- 33.4.1.1 Either a fully enclosed design or idling and downtime mode covers that completely covers the cleaning machine openings when in place. Covers shall be free of cracks, holes, and other defects, and readily opened or closed without disturbing the vapor zone. If the solvent cleaning machine opening is greater than 10 square feet, the covers must be powered. If a lip exhaust is used, the closed covers shall be below the level of the lip exhaust.
- 33.4.1.2 A freeboard ratio of 0.75 or greater.
- 33.4.1.3 A primary condenser.
- 33.4.1.4 A vapor up control switch.
- 33.4.1.5 A device that shuts off the sump heat if the sump liquid solvent level drops to the sump heater coils.

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- 33.4.1.6 A vapor level control device that shuts off the sump heat if the vapor level in the vapor cleaning machine rises above the height of the primary condenser.
 - 33.4.1.7 An automated parts handling system that moves parts or parts baskets at a speed of 3.4 meters per minute (11 feet per minute) or less when the parts are entering or exiting the vapor zone. If the parts or parts basket being cleaned or dried occupy more than 50% of the solvent/air interface area, the automated parts handling system shall move parts or parts baskets at a speed of 0.93 meters per minute (three feet per minute) or less.
 - 33.4.1.8 Each vapor cleaning machine that uses a lip exhaust shall be designed and operated to route all collected solvent vapors through a properly operated and maintained carbon adsorber. The concentration of organic solvent in the exhaust shall not exceed 25 parts per million, averaged over one complete adsorption cycle or 24 hours, whichever is less.
 - 33.4.1.9 A permanent, conspicuous label summarizing the operating requirements in subsection 33.4.4 of this regulation.
- 33.4.2 In addition to the requirements of subsection 33.4.1 of this regulation, the owner or operator of a batch vapor cleaning machine with a solvent/air interface area of 13 square feet or less shall implement one of the following control options:
- 33.4.2.1 A working mode cover, a freeboard ratio of 1.0, and superheated vapor.
 - 33.4.2.2 Superheated vapor and a freeboard refrigeration device operated to ensure that the chilled air blanket temperature is no greater than 30% of the solvent's boiling point.
 - 33.4.2.3 A working mode cover and a freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point.
 - 33.4.2.4 Reduced room draft, a freeboard ratio of 1.0, and superheated vapor.
 - 33.4.2.5 Reduced room draft and a freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point.
 - 33.4.2.6 A freeboard ratio of 1.0 and a freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point.
 - 33.4.2.7 Dwell and a freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point. Dwell shall be not less than 35% of the dwell time determined for the part or parts basket.
 - 33.4.2.8 Reduced room draft, a freeboard ratio of 1.0, and dwell. Dwell shall be not less than 35% of the dwell time determined for the part or parts basket.

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- 33.4.2.9 A freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point and a carbon adsorber that reduces solvent emissions in the exhaust to a level not to exceed 25 parts per million, averaged over one complete adsorption cycle or 24 hours, whichever is less.
- 33.4.2.10 A freeboard ratio of 1.0, superheated vapor, and a carbon adsorber that reduces solvent emissions in the exhaust to a level not to exceed 25 parts per million, averaged over one complete adsorption cycle or 24 hours, whichever is less.
- 33.4.3 In addition to the requirements of subsection 33.4.1 of this regulation, the owner or operator of a batch vapor cleaning machine with a solvent/air interface area of greater than 13 square feet shall implement one of the following control options:
 - 33.4.3.1 A freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point, a freeboard ratio of 1.0, and superheated vapor.
 - 33.4.3.2 Dwell, a freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point, and reduced room draft. Dwell shall be not less than 35% of the dwell time determined for the part or parts basket.
 - 33.4.3.3 A working mode cover, a freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point, and superheated vapor.
 - 33.4.3.4 Reduced room draft, freeboard ratio of 1.0, and superheated vapor.
 - 33.4.3.5 A freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point, reduced room draft, and superheated vapor.
 - 33.4.3.6 A freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point, a freeboard ratio of 1.0, and reduced room draft.
 - 33.4.3.7 A freeboard refrigeration device operated to ensure that the chilled air blanket temperature is no greater than 30% of the solvent's boiling point, superheated vapor, and a carbon adsorber that reduces solvent emissions in the exhaust to a level not to exceed 25 parts per million, averaged over one complete adsorption cycle or 24 hours, whichever is less.
- 33.4.4 Batch vapor cleaning machines shall be operated in accordance with the following procedures:
 - 33.4.4.1 Waste solvent, still bottoms, and sump bottoms shall be collected and stored in closed containers and identified as waste solvent. The closed containers may contain a device that allows pressure relief, but does not allow liquid solvent to drain from the container.

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- 33.4.4.2 Cleaned parts shall be drained at least 15 seconds or until dripping ceases, whichever is longer. Parts having cavities or blind holes shall be tipped or rotated while the part is draining. During the draining, tipping or rotating, the parts shall be positioned so that solvent drains directly back to the batch vapor cleaning machine. A superheated vapor system shall be an acceptable alternate technology.
- 33.4.4.3 Parts or parts baskets shall not be removed from the batch vapor cleaning machine until dripping has ceased.
- 33.4.4.4 Flushing of parts using a flexible hose or other flushing device shall be performed within the vapor zone of the batch vapor cleaning machine or within a section of the machine that is not exposed to the ambient air. The solvent flushing shall be a solid fluid stream, not an atomized or shower spray.
- 33.4.4.5 When the cover is open, the batch vapor cleaning machine shall not be exposed to drafts greater than 40 meters per minute (132 feet per minute), as measured between one and two meters (3.3 and 6.6 feet) upwind and at the same elevation as the tank lip.
- 33.4.4.6 Sponges, fabric, wood, leather, paper products, and other absorbent materials shall not be cleaned or dried in the batch vapor cleaning machine.
- 33.4.4.7 Spills during solvent transfer and use of the batch vapor cleaning machine shall be cleaned up immediately, and the wipe rags or other absorbent material shall be immediately stored in covered containers for disposal or recycling.
- 33.4.4.8 Work area fans shall be located and positioned so that they do not blow across the opening of the batch vapor cleaning machine.
- 33.4.4.9 During startup of each batch vapor cleaning machine, the primary condenser shall be turned on before the sump heater.
- 33.4.4.10 During shutdown of each batch vapor cleaning machine, the sump heater shall be turned off and the solvent vapor layer allowed to collapse before the primary condenser is turned off.
- 33.4.4.11 When solvent is added to or drained from the batch vapor cleaning machine, the solvent shall be transferred using threaded or other leak-proof couplings, and the discharge end of the pipe shall be located beneath the liquid solvent surface.
- 33.4.4.12 The idling and downtime mode covers shall be closed at all times during idling and downtimes except during maintenance of the machine when the solvent has been removed and during addition of solvent to the machine.
- 33.4.4.13 If a lip exhaust is used on the ~~open top~~ batch vapor cleaning machine, the ventilation rate shall not exceed $20 \text{ m}^3/\text{min}/\text{m}^2$ ($65 \text{ ft}^3/\text{min}/\text{ft}^2$) of batch vapor cleaning machine open area, unless a higher rate is necessary to meet OSHA requirements.

33.4.5 VOC requirements for batch vapor cleaning machines.

This regulation contains no VOC content restrictions for the cleaning solvent used in batch vapor cleaning machines.

33.5 **Standards for in-line cleaning machines.** The provisions of subsection 33.5 of this regulation apply to in-line cold and in-line vapor cleaning machines.

33.5.1 In-line cleaning machines shall be equipped with:

- 33.5.1.1 Either a fully enclosed design or idling and downtime mode covers that completely covers the in-line cleaning machine openings when in place. Covers shall be free of cracks, holes, and other defects, and readily opened or closed without disturbing the vapor zone.
- 33.5.1.2 A freeboard ratio of 0.75 or greater.
- 33.5.1.3 A primary condenser.
- 33.5.1.4 A vapor up control switch.
- 33.5.1.5 A device that shuts off the sump heat if the sump liquid solvent level drops to the sump heater coils.
- 33.5.1.6 A vapor level control device that shuts off the sump heat if the vapor level in the in-line cleaning machine rises above the height of the primary condenser.
- 33.5.1.7 An automated parts handling system that moves parts or parts baskets at a speed of 3.4 meters per minute (11 feet per minute) or less when the parts are entering or exiting the vapor zone. If the parts or parts basket being cleaned or dried occupy more than 50% of the solvent/air interface area, the automated parts handling system shall move parts or parts baskets at a speed of 0.93 meters per minute (three feet per minute) or less.
- 33.5.1.8 Each in-line machine that uses a lip exhaust shall be designed and operated to route all collected solvent vapors through a properly operated and maintained carbon adsorber. The concentration of organic solvent in the exhaust shall not exceed 25 parts per million, averaged over one complete adsorption cycle or 24 hours, whichever is less.
- 33.5.1.9 A permanent, conspicuous label summarizing the operating requirements in subsection 33.5.3 of this regulation.

33.5.2 In addition to the requirements of subsection 33.5.1 of this regulation, the owner or operator of an in-line cleaning machine shall implement one of the following control options:

- 33.5.2.1 A freeboard ratio of 1.0 and superheated vapor.
- 33.5.2.2 A freeboard ratio of 1.0 and a freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point.

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- 33.5.2.3 Dwell and a freeboard refrigeration device operated to ensure that the chilled air blanket temperature, in °F, is no greater than 30% of the solvent's boiling point. Dwell shall be not less than 35% of the dwell time determined for the part or parts basket.
- 33.5.2.4 Dwell and a carbon adsorber that reduces solvent emissions in the exhaust to a level not to exceed 25 parts per million, averaged over one complete adsorption cycle or 24 hours, whichever is less. Dwell shall be not less than 35% of the dwell time determined for the part or parts basket.
- 33.5.3 In-line cleaning machines shall be operated in accordance with the following procedures:
- 33.5.3.1 Waste solvent, still bottoms, and sump bottoms shall be collected and stored in closed containers and identified as waste solvent. The closed containers may contain a device that allows pressure relief, but does not allow liquid solvent to drain from the container.
- 33.5.3.2 Parts shall be oriented so that the solvent drains freely from the parts. Cleaned parts shall be drained at least 15 seconds or until dripping ceases, whichever is longer. Parts having cavities or blind holes shall be tipped or rotated while the part is draining. During the draining, tipping or rotating, the parts shall be positioned so that solvent drains directly within the in-line cleaning machine.
- 33.5.3.3 Parts or parts baskets shall not be removed from the in-line cleaning machine until dripping has ceased.
- 33.5.3.4 Flushing of parts using a flexible hose or other flushing device shall be performed within the vapor zone of the in-line cleaning machine or within a section of the machine that is not exposed to the ambient air. The solvent flushing shall be a solid fluid stream, not an atomized or shower spray.
- 33.5.3.5 When the in-line cleaning machine is operating, the entrance and exit portals shall not be exposed to drafts greater than 40 meters per minute (132 feet per minute), as measured between one and two meters (3.3 and 6.6 feet) upwind and at the same elevation as the portals.
- 33.5.3.6 Sponges, fabric, wood, leather, paper products, and other absorbent materials shall not be cleaned or dried in the in-line cleaning machine.
- 33.5.3.7 Spills during solvent transfer and use of the in-line cleaning machine shall be cleaned up immediately, and the wipe rags or other absorbent material shall be immediately stored in covered containers for disposal or recycling.
- 33.5.3.8 Work area fans shall be located and positioned so that they do not blow across the openings of the in-line cleaning machine.
- 33.5.3.9 During startup of each in-line cleaning machine, the primary condenser shall be turned on before the sump heater.
- 33.5.3.10 During shutdown of each in-line cleaning machine, the sump heater shall be turned off and the solvent vapor layer allowed to collapse before the primary condenser is turned off.

- 33.5.3.11 When solvent is added to or drained from the in-line cleaning machine, the solvent shall be transferred using threaded or other leak-proof couplings and the discharge end of the pipe shall be located beneath the liquid solvent surface.
- 33.5.3.12 The idling and downtime mode covers shall be closed at all times during idling and downtimes except during maintenance of the machine when the solvent has been removed and during addition of solvent to the machine.
- 33.5.3.13 If a lip exhaust is used on the on-line cleaning machine, the ventilation rate shall not exceed 20 m³/min/m² (65 ft³/min/ft²) of on-line cleaning machine open area, unless a higher rate is necessary to meet OSHA requirements.
- 33.5.3.14 Minimize openings during operation so that entrances and exits silhouette workloads with an average clearance between the parts and the edge of the portal opening of less than 10 centimeters (four inches) or less than 10% of the width of the opening.

33.5.4 VOC requirements for in-line cleaning machines.

33.5.4.1 For all cold in-line cleaning machines, this regulation does contain VOC content restrictions for cleaning solution; no more than 25 grams of VOC per liter for cleaning standard parts and no more than 150 grams VOC for printed circuit boards. See subsections 33.3.7 and 33.10.3.

33.5.4.2 This regulation contains no VOC content restrictions for the cleaning solvent used in vapor in-line cleaning machines.

33.6 Standards for cleaning machines not having a solvent/air interface. The provisions of subsection 33.6 of this regulation apply to cleaning machines that do not have a solvent/air interface. These cleaning machines include, but are not limited to, airless cleaning systems and airtight cleaning systems.

33.6.1 The owner or operator of each machine shall maintain a log of solvent additions and deletions for each machine including the weight of solvent contained in activated carbon or other adsorbent material used to control emissions from the cleaning machine.

33.6.2 The owner or operator of each machine shall demonstrate that the emissions from each machine, on a three-month rolling average, are equal to or less than the allowable emission limit determined using Equation 33-1 ~~of this regulation.~~

$$EL = 330(\text{Vol})^{0.6} \quad (33-1)$$

where:

EL = the three-month rolling average monthly emission limit (kilograms/month).

Vol = the cleaning capacity of machine (cubic meters).

33.6.3 The owner or operator of each machine shall operate the machine in conformance with the manufacturer's instructions and good air pollution control practices.

33.6.4 The owner or operator of each machine equipped with a carbon adsorber shall maintain and operate the carbon adsorber system to reduce solvent emissions in the exhaust to a

level not to exceed 25 parts per million, averaged over one complete adsorption cycle or 24 hours, whichever is less.

- 33.6.5 A permanent, conspicuous label summarizing the operating requirements in subsection 33.6.7 of this regulation.
- 33.6.6 The owner or operator of a solvent cleaning machine complying with subsection 33.6 of ~~this regulation~~ shall demonstrate compliance with the applicable three-month rolling average monthly emission limit on a monthly basis. If the applicable three-month rolling average monthly emission limit is not met, an exceedance has occurred. All exceedances shall be reported to the Department within 30 days of the determination of the exceedance.
- 33.6.7 Cleaning machines not having a solvent/air interface shall be operated in accordance with the following procedures:
- 33.6.7.1 Waste solvent, still bottoms, and sump bottoms shall be collected and stored in closed containers and identified as waste solvent. The closed containers may contain a device that allows pressure relief, but does not allow liquid solvent to drain from the container.
 - 33.6.7.2 Cleaned parts shall be drained at least 15 seconds or until dripping ceases, whichever is longer. Parts having cavities or blind holes shall be tipped or rotated while the part is draining. During the draining, tipping or rotating, the parts shall be positioned so that solvent drains directly into the cleaning machine.
 - 33.6.7.3 Parts or parts baskets shall not be removed from the cleaning machine until dripping has ceased.
 - 33.6.7.4 Sponges, fabric, wood, leather, paper products, and other absorbent materials shall not be cleaned or dried in the cleaning machines.
 - 33.6.7.5 Spills during solvent transfer and use of the cleaning machines shall be cleaned up immediately, and the wipe rags or other absorbent material shall be immediately stored in covered containers for disposal or recycling.
 - 33.6.7.6 Work area fans shall be located and positioned so that they do not blow across the opening of the cleaning machine.
 - 33.6.7.7 When solvent is added to or drained from the cleaning machine, the solvent shall be transferred using threaded or other leak-proof couplings and the discharge end of the pipe shall be located beneath the liquid solvent surface.
- 33.6.8 The owner or operator of a solvent cleaning machine complying with subsection 33.6 of this regulation shall maintain records and determine compliance with the applicable provisions in accordance with the following:
- 33.6.8.1 On the first operating day of every month ensure that the solvent cleaning machine system contains only clean liquid solvent. This includes, but is not limited to, fresh unused solvent, recycled solvent, and used solvent that have been cleaned of soils. A fill line must be indicated during the first month the measurements are made. The solvent level within the machine must be returned to the same fill-line each month, immediately prior to calculating monthly emissions. The solvent

cleaning machine does not have to be emptied and filled with fresh unused solvent prior to the calculations.

- 33.6.8.2 Using the records of all solvent additions and deletions for the previous monthly reporting period, determine total solvent emissions, E, using Equation 33-2 ~~of this regulation~~:

$$E = SA - LSR - SSR \quad (33-2)$$

where:

E = the total VOC solvent emissions from the solvent cleaning machine during the most recent monthly reporting period (kilograms of solvent per month).

SA = the total amount of VOC liquid solvent added to the solvent cleaning machine during the most recent monthly reporting period (kilograms of solvent per month).

LSR = the total amount of VOC liquid solvent removed from the solvent cleaning machine during the most recent monthly reporting period (kilograms of solvent per month).

SSR = the total amount of VOC solvent removed from the solvent cleaning machine in solid waste during the most recent monthly reporting period (kilograms of solvent per month), as determined from tests conducted using Method 25D in **Appendix A** of 40 CFR part 60 or by engineering calculations included in the compliance report.

- 33.6.8.3 Determine the monthly rolling average solvent emission, EA, using Equation 33-3 ~~of this regulation~~:

$$EA = \frac{(E_{j=1} + E_{j=2} + E_{j=3})}{3} \quad (33-3)$$

where:

EA = the average VOC solvent emissions over the preceding three monthly reporting periods (kilograms of solvent per month).

E = the total VOC solvent emissions for each month (j) for the most recent three monthly reporting periods (kilograms of solvent per month).

j = 1 = the most recent monthly reporting period.

j = 2 = the monthly reporting period immediately prior to j = 1.

j = 3 = the monthly reporting period immediately prior to j = 2.

33.6.9 VOC requirements for cleaning machines not having a solvent/air interface.

This regulation contains no VOC content restrictions for the cleaning solution used in cleaning machines not having a solvent/air interface.

33.7 **Alternative standard.** As an alternative to meeting the requirements of subsection 33.4 or subsection 33.5 of this regulation, the owner or operator of a batch vapor or vapor in-line cleaning machine can elect to comply with the requirements of subsection 33.7.1 through subsection 33.7.4 of this regulation. The owner or operator shall maintain records sufficient to demonstrate compliance. The records shall include, at a minimum, the quantity of solvent added to and removed from the solvent cleaning machine, the dates of the addition and removal, and the calculations of the monthly rolling three-month average emission limit.

33.7.1 The owner or operator shall:

33.7.1.1 Maintain a log of solvent additions and deletions for each solvent cleaning machine.

33.7.1.2 Ensure that emissions from each solvent cleaning machine are equal to or less than the allowable emission limit presented in Table 33-1 of this regulation.

Table 33-1 - Emission Limits for Batch Vapor and In-line Cleaning Machines

Solvent cleaning machine	Three-Month rolling average monthly emission limit (kilograms/square meters/month)
Batch vapor cleaning machines	150
Existing in-line cleaning machines	153
New in-line cleaning machines	99

33.7.2 In addition to the requirements of subsection 33.7.1 of this regulation, the owner or operator of a cleaning machine shall comply with the following:

33.7.2.1 The subsections 33.4.1.9 and 33.4.4 of this regulation for batch vapor cleaning machines.

33.7.2.2 The subsections 33.5.1.9 and 33.5.3 of this regulation for in-line vapor cleaning machines.

33.7.3 The owner or operator of a solvent cleaning machine complying with subsection 33.7 of this regulation shall demonstrate compliance with the applicable three-month rolling average monthly emission limit on a monthly basis. If the applicable three-month rolling average monthly emission limit is not met, an exceedance has occurred. All exceedances shall be reported to the Department within 30 days of the determination of the exceedance.

33.7.4 The owner or operator of a solvent cleaning machine complying with subsection 33.7 of this regulation shall maintain records and determine compliance with the applicable provisions in accordance with the following:

33.7.4.1 On the first operating day of every month ensure that the solvent cleaning machine system contains only clean liquid solvent. This includes, but is not limited to, fresh unused solvent, recycled solvent, and used solvent that have been cleaned of soils. A fill line must be indicated during the first month the measurements are

made. The solvent level within the machine must be returned to the same fill-line each month, immediately prior to calculating monthly emissions. The solvent cleaning machine does not have to be emptied and filled with fresh unused solvent prior to the calculations.

- 33.7.4.2 Using the records of all solvent additions and deletions for the previous monthly reporting period, determine total solvent emissions, E, using Equation 33-4 ~~of this regulation~~:

$$E = \frac{(SA - LSR - SSR)}{AREA} \quad (33-4)$$

where:

E = the total VOC solvent emissions from the solvent cleaning machine during the most recent monthly reporting period (kilograms of solvent per square meter of solvent/air interface area per month).

SA = the total amount of VOC liquid solvent added to the solvent cleaning machine during the most recent monthly reporting period (kilograms of solvent per month).

LSR = the total amount of VOC liquid solvent removed from the solvent cleaning machine during the most recent monthly reporting period (kilograms of solvent per month).

SSR = the total amount of VOC solvent removed from the solvent cleaning machine in solid waste during the most recent monthly reporting period (kilograms of solvent per month), as determined from tests conducted using Method 25D in **Appendix A** of 40 CFR part 60 or by engineering calculations included in the compliance report.

AREA = the solvent/air interface area of the solvent cleaning machine (square meters).

- 33.7.4.3 Determine the monthly rolling average solvent emission, EA, using Equation 33-5 ~~of this regulation~~:

$$EA = \frac{(E_{j=1} + E_{j=2} + E_{j=3})}{3} \quad (33-5)$$

where:

EA = the average VOC solvent emissions over the preceding three monthly reporting periods (kilograms of solvent per square meter of solvent/air interface area per month).

E = the total VOC solvent emissions for each month (j) for the most recent three monthly reporting periods (kilograms of solvent per square meter of solvent/air interface area per month).

j = 1 = the most recent monthly reporting period.

j = 2 = the monthly reporting period immediately prior to j = 1.

j = 3 = the monthly reporting period immediately prior to j = 2.

33.7.5 VOC requirements for alternative standard.

This regulation contains no VOC content restrictions for the cleaning solvent used for batch vapor or vapor in-line cleaning machines under the alternative standard.

33.8 **Monitoring.** The owner or operator of a solvent cleaning machine subject to the provisions of subsections 33-4 33.3 through 33.7 of this regulation shall conduct monitoring as follows:

33.8.1 If a freeboard refrigeration device is used to comply with Section 33.0 of this regulation, the owner or operator shall use a thermometer or thermocouple to measure the temperature at the center of the air blanket during the idling mode. Measurements and recordings shall be made weekly.

33.8.2 If a superheated vapor system is used to comply with Section 33.0 of this regulation, the owner or operator shall use a thermometer or thermocouple to measure the temperature at the center of the superheated solvent vapor zone while the solvent cleaning machine is in the idling mode. Measurements and recordings shall be made weekly.

33.8.3 If a cover (working mode, downtime mode, or idling mode cover) is used to comply with Section 33.0 of this regulation, the owner or operator shall conduct a visual inspection to determine if the cover is opening and closing properly, completely covers the cleaning machine openings when closed, and is free of cracks, holes, and other defects. Observations and recordings shall be made monthly.

33.8.4 If dwell is used to comply with Section 33.0 of this regulation, the owner or operator shall determine the actual dwell time by measuring the period of time that parts are held within the freeboard area of the solvent cleaning machine after cleaning or drying. Measurements and recordings shall be made monthly.

33.8.5 The owner or operator shall determine the automated parts handling system speed by measuring the time it takes to travel a measured distance. The speed is equal to the distance in meters or feet divided by the time in minutes (meters or feet per minute). Measurements and recordings shall be made monthly.

33.8.6 If reduced room draft is used to comply with Section 33.0 of this regulation, the owner or operator shall determine the average wind speed and controlling room parameters (i.e., redirecting fans, closing doors and windows, etc.) as follows.

33.8.6.1 Initially measure the wind speed within six inches above the top of the freeboard area of the solvent cleaning machine in accordance with the following:

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- 33.8.6.1.1 Determine the direction of the wind current by slowly rotating a velometer or similar device until the maximum speed is located.
- 33.8.6.1.2 Orient a velometer in the direction of the wind current at the four corners of the machine.
- 33.8.6.1.3 Record the reading for each corner.
- 33.8.6.1.4 Average the values obtained at each corner and record the average wind speed.
- 33.8.6.2 Record the room parameters established during the initial compliance test to achieve the reduced room draft.
- 33.8.6.3 Quarterly monitor of the wind speed in accordance with subsection 33.8.6.4 of this regulation.
- 33.8.6.4 Weekly monitoring of the room parameters as specified in subsection 33.8.6 of this regulation.
- 33.8.7 If an enclosure (full or partial) is used to achieve reduced room draft, the owner or operator shall conduct an initial monitoring test of the wind speed within the enclosure by slowly rotating a velometer inside the entrance to the enclosure until the maximum speed is located and recorded. Measurements and recordings shall be made monthly. The owner or operator shall also conduct a monthly visual inspection of the enclosure to determine if it is free of cracks, holes, and other defects.
- 33.8.8 The owner or operator of a solvent cleaning machine using a carbon adsorber to comply with Section 33.0 of this regulation shall measure and record the concentration of VOC solvent in the exhaust of the carbon adsorber whenever the solvent cleaning machine is in the working mode or is venting to the carbon adsorber. The concentration shall be determined through a sampling port within the exhaust outlet that is easily accessible, located downstream from no other inlet, and located at least eight stack or duct diameters downstream and two stack or duct diameters upstream from any flow disturbance such as a bend, expansion, contraction, or outlet.
- 33.8.9 The owner or operator of a heated cold cleaning machine described in subsection 33.3.3.9 shall use a continuous temperature recorder, or equivalent, to indicate machine operating temperature during processing.
- 33.9 **Recordkeeping.** The owner or operator of a solvent cleaning machine subject to Section 33.0 of this regulation shall maintain the following records in a readily accessible location for at least five years and shall make these records available to the Department, upon verbal or written request:
 - 33.9.1 The log of operating times for the carbon adsorber, if applicable.
 - 33.9.2 The maintenance record for the carbon adsorber, such as replacement of the activated carbon bed, if applicable.
 - 33.9.3 The maintenance record for each control option used, such as replacement of a heater in the superheated vapor recycle system, if applicable.

- 33.9.4 The logs and calculations demonstrating compliance with the allowable emission limits in subsections 33.6 and 33.7 of this regulation.
- 33.9.5 The results of all monitoring conducted in accordance with the requirements in subsection 33.8 of this regulation.
- 33.9.6 The owner or operator of a cold cleaning machine shall provide to the Department on request, the information specified in subsection 33.10.3. An invoice, bill of sale, certificate that corresponds to a number of sales, Material Safety Data Sheet (MSDS) or other appropriate documentation acceptable to the Department may be used for compliance.
- 33.10 **Reporting.** The owner of operator of a solvent cleaning machine subject to Section 33.0 of this regulation shall:
- 33.10.1 Comply with the initial compliance certification requirements of subsection 5.1. of this regulation. of 7 DE Admin. Code 1124.
- 33.10.2 Comply with the requirements of subsection 5.2 of this regulation of 7 DE Admin. Code 1124 regarding reports of excess emissions, as well as complying with other State of Delaware exceedance reporting requirements.
- 33.10.3 Obtain from any person from whom they purchase or obtain any solvent containing VOC for use in a cold cleaning machine, a signed document specifying the following accurate information specific to all purchased or obtained product:
- 33.10.3.1 The name and address of the solvent supplier.
- 33.10.3.2 The type of solvent including the product or vendor identification number.
- 33.10.3.3 The VOC content of the solvent as determined by a test method in subsection 33.11.1.
- 33.11 **Test Methods**
- 33.11.1 The VOC content of materials subject to the provisions of Section 33.0 shall be determined by the EPA Reference Method 24 (Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coatings, Code of Federal Regulations Title 40, Part 60, Appendix A-7), dated May 1, 2019, and incorporated herein by reference, or by SCAQMD Method 304 (1996) [Determination of Volatile Organic Compounds (VOCs) in Various Materials] contained in the SCAQMD “Laboratory Methods of Analysis for Enforcement Samples” manual and incorporated herein by reference. The VOC content of materials containing 50 g/l of VOC or less shall be determined by SCAQMD Method 313 (1991) (Determination of Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry) and incorporated herein by reference or any other alternative test methods approved by the Department and by EPA.
- 33.11.2 When more than one test method or set of methods are specified for any testing, a violation of any requirement established by any one of the specified test methods or set of test methods shall constitute a violation of this regulation.

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33.11.3 Maximum hoist speed shall be measured with use of a stop clock and distance traveled by the hoist.

33.11.4 Temperatures in the vapor zone shall be measured with the use of a temperature probe.

33.11.5 If a VOC emissions capture and control system is required or used as an alternative compliance method to comply with subsection 33.3.7.3, the procedures shown in Appendix D "Emission Capture and Destruction or Removal Efficiency and Monitoring Requirements" of 7 DE Admin. Code 1124 and Appendix E "Determining the Destruction or Removal Efficiency of a Control Device" of 7 DE Admin. Code 1124 shall be followed.

33.12 Test Method Availability

SCAQMD methods described in subsection 33.11.1 can be purchased from South Coast Air Quality Management District, located in California.