Tighe&Bond

Engineers | Environmental Specialists

MCTA - AIR COMPLIANCE AND PERMITTING CASE STUDIES

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Case Study Agenda

Case Study #1 – VOC Emissions from a Metal Finishing Operation

- **Rust Preventative Oil**
- **Loss-on-Drying**
- **Air Permit Applicability Determination**

Case Study #2 – Best Management Practices

- **Improper De-masking Methods**
- **Required Cold Degreasing Methods/Solvent Reduction (technology transfer)**

Case Study #3 – Like-for-Like

- **Equipment Replacement Scenarios**
- **Permit Exemptions**

Case Study #1 – VOC Emissions from a Metal Finishing Operation

Background Information

- A metal finishing company to install process equipment that applies a rust preventative to finished metal parts
- The rust preventative oil is 53% VOC by weight (3.77 lbs. VOC/gal) with very high lbs. VOC/gal solids
- The rust preventative application rate is 0.499 lbs./hr
- After the oil is applied to the parts, they are shipped off-site within 72-hours

Air Permitting Applicability Determination

- **Based on the VOC content of the rust preventative and the application rate, what would be the potential to emit?**
- **From internal discussions and with facility personnel, should we assume the conservative and assume the entire weight of the VOC in the rust preventative is emitted**
- **Review of recent DEP Air Permit Plan Approvals determined that other facilities had performed testing to establish a site specific emission factor**
- **DEP allowed testing be completed to determine the VOC emissions from the process using ASTM Method E1868-10 Standard Test Methods for Loss-on-Drying by Thermogravimetry**

Designation: E1868 – 10 (Reapproved 2015)

ASTM Standard Test Methods for Loss-On-Drying by Thermogravimetry

These test methods describe a procedure for determining the amount of volatile matter of any kind that is driven off from a test specimen under a specific set of temperature and time conditions. These test methods determine only the mass of material lost, not its identity.

Test Results:

- 10µl Rust Preventative Oil sample placed in a platinum pan for analysis by TGA. The analysis profile per ASTM E1868 (SCAQMD Rule 1144) was **to heat from room temperature to 81 degrees C** in a nitrogen atmosphere for 110 minutes. At the conclusion of the testing the sample was calculated to have emitted **21.24%** VOC by weight.

- Volatility of the sample in **ambient room temperature** conditions was evaluated. The metal part was soaked in the Rust Preventative Oil and then removed from the liquid and allowed to hang for 1 minute and the metal part was slightly shaken to remove excess liquid.

- The oil weight remaining on the metal part was determined at room temperature for 1 hour, 2 hour, 3 hour, and 72 hours.

- The oil was found to have 0.0% weight loss at 1, 2, and 3 hours however after 72 hours the sample was calculated to have emitted **1.5%** VOC by weight.

TABLE 1						
EMISSION CALCULATIONS						
SCENARIO: SAFETY DATA SHEET						
Product	Density (lbs./gal)	VOC %	VOC (lbs./gal)	Maximum Oil Process Rate(2) (lbs/hr)	Potential VOC Emissions (1) (lbs/yr)	Potential VOC Emissions(3) (tons/yr.)
Rust Preventative	**7.11**	**53.00%**	**3.77**	**0.4994**	**2,319**	**1.16**
(1) Potential emissions = Max process rate x 8760 hrs/year x VOC weight %						
(2) Maximum solvent process rate is 0.0702 gallons per machine hour						
(3) DEP air permitting threshold is 1 ton per year of VOCs.						

TABLE 2

EMISSION CALCULATIONS

SCENARIO: ASTM METHOD E-1868 (Heated to 81 deg. C)

Product	Density (lbs./gal)	VOC %	VOC (lbs./gal)	Maximum Oil Process Rate[2] (lbs/hr)	Potential VOC Emissions [1] (lbs/yr)	Potential VOC Emissions[3] (tons/yr.)
Rust Preventative	**7.11**	**21.24%**	**1.51**	**0.4994**	**929**	**0.46**

(1) Potential emissions = Max process rate x 8760 hrs/year x VOC weight %

(2) Maximum solvent process rate is 0.0702 gallons per machine hour

(3) DEP air permitting threshold is 1 ton per year of VOCs.

TABLE 3

EMISSION CALCULATIONS

SCENARIO: ASTM METHOD E-1868 (Maximum time after metal part was oiled = 72 HOURS) at Room Temperature

Product	Density (lbs./gal)	VOC %	VOC (lbs./gal)	Maximum Oil Process Rate[2] (lbs/hr)	Potential VOC Emissions [1] (lbs/yr)	Potential VOC Emissions[3] (tons/yr.)
Rust Preventative	**7.11**	**1.50%**	**0.11**	**0.4994**	**66**	**0.03**

(1) Potential emissions = Max process rate x 8760 hrs/year x VOC weight %

(2) Maximum solvent process rate is 0.0702 gallons per machine hour

(3) DEP air permitting threshold is 1 ton per year of VOCs.

Conclusions:

- **Based on the testing results, the VOCs in the Rust Preventative Oil has very low volatility at ambient room temperatures.**

- **The facility was not required to obtain an air permit for the installation of the one process unit.**

- **DEP did not recognize the room temperature testing but agreed on the results from the ASTM Method using the 81 degree C.**

- **Rust preventatives have varying "Loss-on-Drying" results.**

- **MassDEP determined that the application of a rust preventative as a protective oil for metal is not a surface coating for the purposes of applying the requirements of 310 CMR 7.18(11) for Surface Coating of Miscellaneous Metal Parts and Products. MassDEP based its decision on EPA's definition of coating contained in the National Emission Standards for Hazardous Air Pollutants for Surface Coating of Miscellaneous Metal Parts and Products - 40 CFR Part 63 Subpart MMMM since MassDEP's coating definition does not specifically address the use of protective oils for metals.**

Case Study #2 – Best Management Practices

Background Information

- A metal finishing company servicing an aerospace customer is required by their military specification to use MEK to remove the maskant off the metal parts. The maskant is brushed onto the parts prior to an anodizing process that produces a protective coating.

- The parts are placed in open small buckets/tubs/pans containing MEK and the maskant is scrubbed off with a brush. These containers are located adjacent to exhaust fans and are ventilated outside the building.

- In addition to the use of MEK, the facility needed to apply for air permit coverage for their paint spray operations and a chrome scrubber. For the purposes of this Case Study we will focus on the emissions from the MEK during the de-masking process.

Air Permitting Applicability Determination

- **Based on facility records, the Company used 11,009 pounds of MEK in the cleaning/stripping area the year prior.**
- **The facility was required to discontinue the use of the open buckets/pans of MEK.**
- **DEP required the facility to perform a BACT analysis which resulted in using units that complied with the requirements for Cold Degreasing units in accordance with 310 CMR 7.18(8)(a)**
- **The use of the closed top Cold Degreasing compliant units located away from actively ventilated areas had a large effect on their use of MEK.**

Cold Degreasing Units (310 CMR 7.18(8)(a)) (continued)

The following requirements shall apply unless the cold cleaning degreaser is a sink-like work area with a remote solvent reservoir with an open drain area < 100 square centimeters:

1. Each cold cleaning degreaser is **equipped with a cover** that is designed to be easily operated with one hand;

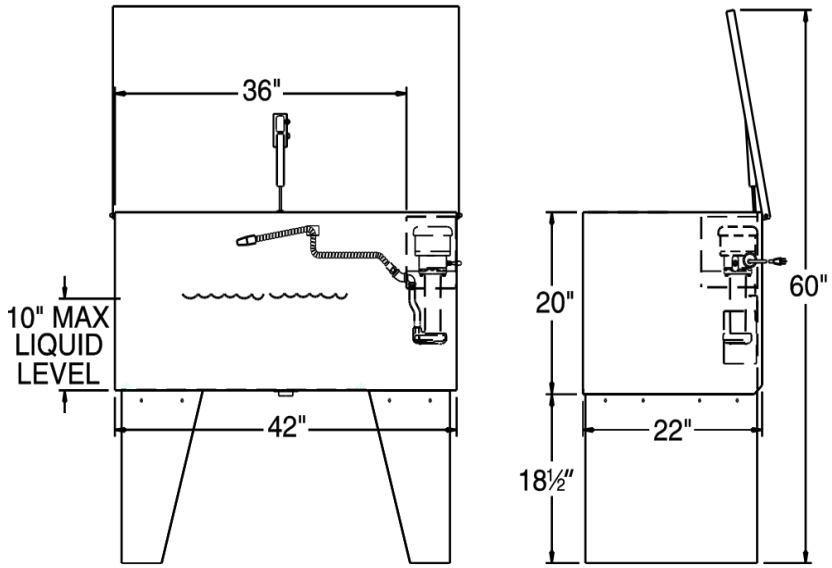
2. Each cold cleaning degreaser is **equipped to drain** clean parts so that, while draining, the cleaned parts are enclosed for 15 seconds or until dripping ceases, whichever is longer;

3. Each cold cleaning degreaser is designed with:
   - a **freeboard ratio > 0.75**; or
   - a water blanket (only if the solvent used is insoluble in and heavier than water);
   - an equivalent system of air pollution control which has been approved by the Department and EPA;

Cold Degreasing Units (310 CMR 7.18 (8)(a)) (continued)

4. The **covers** of each cold cleaning degreaser are **closed** whenever parts are not being handled in the degreaser, or when the degreaser is not in use; and

5. The **drafts** across the top of each cold cleaning degreaser **are minimized** such that when the cover is open the degreaser is not exposed to drafts greater than 40 meters per minute (1.5 miles per hour), as measured between one and two meters upwind at the same elevation as the tank lip.



Conclusions:

- **Prior to the installation of the cold degreasing units the facility was using open top buckets/pans with MEK for their parts cleaning of the maskant material.**

- **The facility used 11,009 pounds of MEK per year. The following year after the installation of the cold degreasing units, the usage was reduced to 3,196 pounds!**

- **In fact production was also up 15% that year !**

- **The implementation of compliant cold degreasing containers saved the company in their annual solvent purchases and reduced emissions of MEK approximately 4-tons/year.**

Case Study #3 – Like for Like

- What is considered “replacement in-kind”?

  Answer: Nothing (with a few exceptions specifically listed in 7.02, e.g. pm control replacement)

- What is exempted from a plan approval when I replace process equipment?

  Answer: Need to include everything included as part of the project and not segmented.

- What performance level does my new pollution control device need to meet when I replace my old 1981 unit?

  Answer: Equipment needs to go through an appropriate top-down BACT review. Raw material used and pollution control devices need to be included in this review

Thank you !!!