DEGREASING & SOLVENT CLEANING OPERATIONS

Date Initiated:

December 10, 1992

Dates Modified / Updated:

October 25, 1993

April 1, 1998

February 9, 2023

PROCESS DESCRIPTION:

Several volatile substances are released to the atmosphere from both stationary, and portable, solvent cleaning and degreasing operations. Emissions of volatile ingredients can be estimated with mass balance techniques based on purchase records, inventory records, and waste shipment receipts. Emissions from typical solvent and degreasing operations may include TOG, VOC, acetone, benzene, isopropanol, toluene, xylenes, methylene chloride, 1,1,1- trichloroethane, perchloroethylene, glycol ethers, chlorofluorocarbons, naphthalene, ethyl benzene, dichlorobenzene, and unspecified hydrocarbons.

Portable degreasers, such as those used by contractors, are commonly operated county-wide. Because of its ubiquity in the county, and because the actual solvent usage for each device at each site is often unrecorded or overreported, portable degreasers have their own calculation method described further in this document.

CALCULATION OF STATIONARY DEGREASING & SOLVENT CLEANING OPERATIONS EMISSIONS:

The standard estimation technique used by the District for emissions inventory purposes is a mass balance procedure based upon material usage and material composition:

Ea = (Ua - Wa) x D x Ci x (1 - e)

Eh = Ea / H

Where:

Ea = Annual emissions of each listed substance per device, (lbs/year)

Eh = Maximum hourly emissions of each listed substance per device, (lbs/hour)

Ua = Total usage of each material containing a listed substance, (gals/year)

Wa = Annual waste solvent shipped offsite, (gal/year)

D = Density, (lbs/gal)

Ci = Concentration of each listed substance in each material used, (lbs/lb)

H = Hours of operation with lid open, (hours/year)

e = Control device capture & removal efficiency, (%)

EMISSIONS INFORMATION FOR STATIONARY DEGREASING & SOLVENT CLEANING OPERATIONS:

Information regarding material composition can be obtained from SDS documentation. No control efficiency is assumed if all captured material (i.e., from covers, vapor degreaser cooling coils, etc.) is returned to the tank and accounted for in usage records. Emissions are adjusted for waste disposal by estimating the volume of degreasing solvent shipped offsite. On site stills should not be quantified as additional emission points since the solvent released should already be accounted for in the annual usage records. Usage estimates should be based on material purchases and changes in inventory.

Ua = (Inventory (initial) + Purchases) - Inventory (final)

The facility should estimate the volume of waste solvent shipped offsite using waste manifest records adjusted for the actual solvent content.

CALCULATION OF PORTABLE DEGREASING OPERATIONS EMISSIONS

District Rule Development Staff conducted a study of Safety Kleen portable degreasers in 1996. Safety Kleen is the most prevalent user of portable degreasers in the county. These enclosed degreasing units are distributed throughout the county and used by many facilities. Safety Kleen owns the equipment and provides a regular solvent disposal and recharge service to the user. The actual solvent usage for each device at each site is often unrecorded or overreported as the full capacity of the degreasing unit. Generally, these solvents are low-volatile hydrocarbon mixtures with trace quantities of benzene, toluene, and xylenes. Emissions are typically a very small percentage of the overall solvent throughput. The following average emission estimates by equipment type were developed by the District (L. Yannayon) and can be used in cases where solvent records are unavailable.

SAFETY KLEEN EMISSION FACTORS (by Model Type)

Model Number (1st two digits)	Unit Type	Surface Area (ft2)	Solvent Type	Emission Factor (lbs/day)
10, 11	Dip Tank	1.07	SK150 or SK699	0.12
14	Remote Reservoir	1.78	SK105	0.17
16, 17	Remote Reservoir	4.27	SK105	0.44
23	Remote Reservoir	3.42	SK105, SK140, or PC95	0.10
30	Remote Reservoir	6.50	SK105, SK140, or PC95	0.67
33	Remote Reservoir	6.50	SK105	0.67
34, 34.1	Remote Reservoir	5.50	SK105	1.34
44, 46	Dip Tank	4.60	SK105	2.00
60	Remote Reservoir	1.78	SK105	0.17
81	Dip Tank	8.44	SK105, SK140, SK150, or PC95	1.20

Because the actual solvent usage for each portable degreaser at each site is often unrecorded or overreported as the full capacity of the degreasing unit, emissions will be estimated with the following equations, which are based on the number of specific Safety Kleen devices being operated onsite.

The below estimation procedures should only be used for facilities with incomplete or unrepresentative usage solvent records. If valid information does exist, use the mass balance procedure, posted above, to estimate emissions.

Ea = #Units x EF x Ci x 365

Eh = #Units x EF x Ci / 24

Where:

Ea = Annual emissions of each contaminant, (lbs/year)

Eh = Maximum hourly emissions of each contaminant, (lbs/hour)

#Units = Number of each type of Safety Kleen Unit used on site, (dimensionless)

EF = Daily emission factor per unit type, (lbs TOG/day)

Ci = Weight percent of each listed substance in the TOG emissions (lbs/lb)

EMISSIONS INFORMATION FOR PORTABLE DEGREASING OPERATIONS:

Safety Kleen solvents are repeatedly recycled and redistributed to the end users. Trace organics are common and actual compositions vary. Based on SDS information, the District will assume the following default composition of TOG emissions from the various solvents used.

SAFETY KLEEN SOLVENT EMISSIONS (DEFAULT COMPOSITION)

Trace Organic Compound	Weight Fraction (lbs/lb TOG emissions)
Dichlorobenzenes (mixed isomers)	0.0020
Ethyl benzene	0.0050
Glycol Ethers, unspecified	0.0100
Methylene Chloride	0.0015
Naphthalene	0.0300
Perchloroethylene	0.0025
Toluene	0.0025
1,1,1-Trichloroethane	0.0025
Xylenes	0.0100

ASSUMPTIONS / LIMITATIONS:

- Emission calculations assume no reaction, conversion, or breakdown of the degreasing solvent during use. It is also assumed that the solvent does not become part of the final product. Additionally, no other source of solvent usage (e.g., plating tank carry over, etc.) is assumed present other than materials charged to the degreaser.

- To avoid double counting, emissions from on-site stills are included with degreaser estimates. These stills should not be treated as additional sources and recovered material should not be added to purchase records when estimating usage. Likewise, material sent to on-site stills is not considered waste.

- Control efficiencies for degreasers are usually reflected in the material usage records. Additional control efficiencies are not assigned to covers, lids, condensing coils, or other devices which return captured solvent for reuse. Additional control efficiencies are applied to control devices that capture and destroy fugitive solvent emissions (i.e., carbon adsorption beds transported offsite for regeneration, flares, catalytic oxidizers, etc.).

- Waste removed from degreasers and cleaning processes usually consists of solvent, solids, water, pigments, oils, rags, and/or sludge. Waste material composition should not be considered equivalent to virgin material (i.e., 100% solvent). The total volume of hazardous material shipped offsite for disposal must be adjusted for solvent content to correctly estimate the volume of waste 'solvent' shipped offsite. The solvent content may vary significantly between sites dependent upon differences in processes and standard operating procedures. Waste solvents evaporated on site for 'minimization' purposes are considered emissions.

- Most degreaser operations are vented to the work area and released to the atmosphere through the building HVAC system. Facilities should use the specifications of the nearest building exhaust point for AB2588 health risk assessment and modeling purposes. In some cases, emissions may best be treated as area or fugitive sources.

- Many degreasing solvents composed primarily of 1,1,1-trichloroethane also include small quantities of 1,4-dioxane. The 1,4-dioxane emissions are often inadvertently omitted when reporting. District staff should carefully review reported usage of 1,1,1-trichloroethane (listed as a non-carcinogen) for the presence of 1,4-dioxane (listed as a carcinogen) since these emissions often have significant impacts on overall risk estimates.

- For stationary degreasing and solvent cleaning operations, both TOG and VOC weight percentages will be "Implicit" based on the calculation method.

- For portable degreasers, the average daily emission rates developed by the District should be used only when representative solvent throughput records are unavailable. These average emission rates may not be representative of all industrial sites.

- All similar portable degreasing units using the same solvent should be reported as a single material unless emissions are being calculated according to mass balance procedures.

- An alternative Safety Kleen estimation technique based on mass balance (same as degreasing) can be used to calculate emissions if the model-based factors are unrepresentative. The mass balance procedure assumes total annual usage is already correctly adjusted for annual waste disposal. However, many sites do not have the accurate annual usage and waste information necessary to do this type of calculation. Also, when calculating hourly emissions, this alternative procedure assumes 8760 hours/year (365 days/year x 24 hours/day) of operation with the lid open.

REPORTING:

In general, a separate entry should be completed for EACH material used in EACH degreasing unit and solvent cleaning operation. Usage records for individual solvents may be grouped together for reporting purposes where deemed appropriate by District staff.