Methylene Chloride
An Alternative Solvent to 1,1,1-Trichloroethane in Vapor Degreasing

Methylene chloride is uniquely suited for use as a vapor degreasing solvent in applications where low vapor temperatures and superior solvency are desirable. It is also widely used where short cycle times are needed.

The low boiling point of methylene chloride (104°F) make it the solvent of choice on temperature-sensitive parts such as thermal switches or thermometers. The shortened processing cycle allows for more rapid processing and handling, particularly large, heavy parts. This feature also permits partial removal of sealing compounds from porous castings. The more aggressive nature of methylene chloride is also useful when degreasing parts soiled with resins, paints or other contaminants that are difficult to remove.

Advantages

Stability: Methylene chloride is generally more stable than 1,1,1-Trichloroethane, particularly in its stability in the presence of aluminum. It is also less sensitive to water contamination.

Solvency: Methylene chloride is the most aggressive cleaning solvent on the market today. It readily dissolves many resins and polymers that are unaffected by other solvents. While this is normally a desirable characteristic, it may cause methylene chloride to be unsuitable for cleaning certain parts made from incompatible materials.

Recoverability: Contaminated methylene chloride can be recovered by conventional distillation equipment either on site, or by a licensed solvent recycler.

Ozone Depletion: Methylene chloride is not regulated as an Ozone-Depleting Substance, and has no assigned ODP value.

Compatibility: As a chlorinated solvent, methylene chloride can often be used in the same process as 1,1,1-Trichloroethane. With some modification, it may permit the use of existing equipment.

Volatile Organic Compound: Methylene chloride is exempt from regulation as a volatile organic compound (VOC) in most states.

Low Heat requirements: Methylene chloride degreasers can be operated on very low levels of heat input, including hot water and heat pump technology.

Limitations/Concerns

Carcinogenicity: Methylene chloride has been categorized as a 2B animal carcinogen by IARC, and appears on the NTP Carcinogen list. It also appears on some state lists, including the California Proposition 65 list

Air Toxic: As a designated Hazardous Air Pollutant, the use of methylene chloride is subject to National Emission Standards (NESHAP) based on Maximum Achievable Control Technology (MACT). These regulations became effective in 1995, and affect cleaning operations using chlorinated hydrocarbons.

Worker Safety: Occupational exposure to methylene chloride is regulated by OSHA (29 CFR 1910.1052). The OSHA PEL for methylene chloride is 25 ppm. In addition, OSHA has assigned an action limit of 12.5 ppm (8-hour TWA), which if met or exceeded triggers the requirement for additional compliance activities including routine vapor monitoring and medical surveillance.

Operating Temperature: Because of its low boiling point and low vapor density, higher freeboards and low temperature condensing capability are required. Additional cooling may be necessary during summer months.

Conversion of a Vapor Degreaser to Methylene Chloride

Vapor degreasers using methylene chloride may require more careful operating practices to ensure that personnel are not exposed to solvent vapors in excess of the recommended OSHA PEL of 25 ppm. In addition, solvent emissions must be minimized in order to comply with federal, state, and local regulations. This may require the addition of emission control equipment.

Conversion of a vapor degreaser from 1,1,1-trichloroethane to methylene chloride requires a complete cleanout, followed by adjustment of several operating controls. The following steps should be followed as an initial part of the conversion.

1. Drain and Clean the degreaser.

A. Shut off heat supply and allow solvent and equipment to cool.

B. Drain all solvent from the degreaser, including the water separator and all piping.

C. Turn off cooling water.

D. Thoroughly clean the equipment. Vapor degreasers are considered to be Permit-Required Confined Spaces by OSHA. Entry into, and work within these spaces must be done in accordance with the provisions of 29 CFR 1910.146.

E. Remove all insoluble residue from the bottom of all sections of the degreaser, i.e., sump, clean solvent reservoir, and water separator. Also wipe or brush residues off the walls of the equipment. Clean heating coils down to bare metal and test steam coils for any leaks.

F. If the previous operation has any history of acidity problems, a thorough neutralization by flushing with sodium carbonate solution should be accomplished. This solution can be mixed by adding ½-1 pound of sodium carbonate (Soda ash) per gallon of water. After neutralization, the sodium carbonate solution must be completely flushed out of the unit and the unit completely dried.

2. Set the safety control thermostat (located just above the cooling coils) to 95°F. This control is designed to cut off the heat input if the solvent vapors rise above the cooling coils.

3. Adjust the boiling sump safety thermostat to cut off at 108°F. This will shut off the heat input when the solvent becomes contaminated, or in the case of electrically heated degreasers, if the coil is exposed to air.

4. The heat supply will need to be adjusted to maintain the solvent vapor level at the midpoint of the condensing coils. For steam operated equipment, a steam pressure of 1-2 psig should be adequate. For electrically heated equipment, it may be necessary to disconnect some of the heating elements. It is important that the heat input does not overpower the cooling coils.

5. Cooling coils and water jackets should be checked to ensure circulation of cooling water. Cooling water flow must be sufficient to maintain solvent vapors at the midpoint of the cooling coils under idling conditions. The temperature of the water exiting the coils should be in the range of 75-85°F. A low temperature condenser may be needed in order to sufficiently contain solvent vapors.

Further Information

More detailed information is available upon request through the OxyChem Technical Services Department. Call or write to:

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