Report of Methylene Chloride Spot Monitoring:
ABC Company, 12345 6th St., Denver, Co 80123
Attn: Joe Smith
December 29, 2004, 9:00 am to 10:30 am

Methylene chloride, also called dichloromethane, is a volatile, colorless liquid with a chloroform-like odor. Methylene chloride is used in various industrial processes in many different industries including paint stripping, pharmaceutical manufacturing, paint remover manufacturing, metal cleaning and degreasing, and so forth. The most common means of exposure to methylene chloride is inhalation and skin exposure. OSHA considers methylene chloride to be a potential occupational carcinogen. The following questions link to resources that provide safety and health information relevant to methylene chloride in the workplace.

Synonyms: CH2 CL2, dichloromethane, Aerothene MM, CAS 75-09-2
Appearance/odor: colorless, volatile liquid with a chloroform-like odor.˚ Odor threshold 160 to 230 ppm.
Acute exposure: causes confusion, headaches and nausea; prolonged exposure may cause unconsciousness and eventually death. Some of this toxicity is a result of methylene chloride being metabolized into carbon monoxide within the body.
Chronic exposure:˚ Carcinogen

OSHA Permissible Exposure Limits: Methylene Chloride

- No employee may be exposed to airborne concentrations in excess of **25 ppm** as an 8-hour time weighted average (TWA).
- Short-term exposure limit (STEL) is established at **125 ppm during a 15-minute** sampling period.
- At **12.5 ppm** TWA, the employer must establish regulated use areas, exposure monitoring procedures, and medical surveillance protocols.

OSHA Methylene Chloride Standard Requirements

- **Exposure monitoring** must be conducted for representative individuals performing tasks most likely to result in exposure.
- If an exposure is identified, monitoring must be continued until the exposure is engineered out.˚ (**Personal protective equipment** will be used to protect the employees until air-monitoring results show no exposure above the permissible exposure limits.)
- **Regulated areas** must be established wherever an employee's exposure to airborne concentrations of MC exceeds or can reasonably be expected to exceed either the 8-hour TWA PEL or the STEL. The employer shall limit access to regulated areas to authorized persons.
- **Medical surveillance** is required for all individuals who are
    - Required to wear respirators (Respirator physical)
    - Exposed above the action level for 30 days or more each year or
    - Exposed at or above the 8 hour TWA for 10 or more days per year.

- See the **full text** of the standard at http://www.osha-slc.gov/OshStd_data/1910_1052.html.

Air-Monitoring Results: 12/29/04 using Kitagawa Dichloromethane 180S Tubes

Sample #	Location	Time	PPM (adjusted)	Comments
1	Tanker truck rear vent line (6 from vent)	9:27am	0 ppm*	Vent valve closed
2	Tanker truck bulk transfer valve (6 from valve)	9:35 am	0 ppm*	Transferring chemical
3	Drum (breathing zone)	9:54 am	0 ppm*	Transferring chemical
4	Drum (breathing zone)	10:00 am	0 ppm*	Transferring chemical
5	Drum (at bung with drum _ to 2/3 full with local exhaust on, 28 from breathing zone)	10:02 am	720 ppm*	Transferring chemical
6	Tanker truck rear vent line (6 from vent)	10:07 am	0 ppm*	Vent valve open
7	Drum (breathing zone)	10:12am	0 ppm*	Transferring chemical
8	Drum (breathing zone)	10:14 am	0 ppm*	Transferring chemical
9	Drum (at exhaust fan duct, 6 from drum bung)	10:17 am	50 ppm*	Transferring chemical
10	Drum (breathing zone)	10:19 am	0 ppm*	Transferring chemical

* All colometric readings adjusted per manufacturer directions for 5. deg. C (41 deg. F) and 1012.4 hPa atmospheric pressure

Based on air-monitoring samples performed with colometric tubes, no detection of employee exposure was observed in employee breathing zones. Two samples were taken with expectation that detectable levels would be observed (at drum bung and exhaust duct 6 from drum bung. Neither observation was near to employee breathing zones.

Note: All employees performing representative tasks were in Supplied Air Respirators and sampling was performed by third party in SCBA.

Human Exposure Pathways

Employees may be exposed to methylene chloride in air, water, food, or from bulk industrial product. Because methylene chloride evaporates easily, the greatest potential for exposure is when you breathe vapors of contaminated air. Background levels in air are usually at less than 1 part methylene chloride per billion parts (ppb) of air. Methylene chloride has been found in some urban air and at some hazardous waste sites at average concentrations of 11 ppb of air. The average daily intake of methylene chloride from outdoor air in three United States cities ranges from 33 to 309 micrograms per day (ug/day). Contact with consumer products such as paint strippers or aerosol cans that contain methylene chloride is another frequent source of exposure. Exposure occurs as a result of breathing the vapors given off by the product or from direct contact of the liquid material with the skin. Air concentrations resulting from the use of consumer

products containing methylene chloride usually ranges from 1 to 23 ppb. The highest and most frequent exposures to methylene chloride usually occur in workplaces where the chemical is used. People who work in these places can breathe in the chemical or it may come in contact with their skin. Concentrations ranging from 1 to 1,000 parts methylene chloride per million parts (ppm; 1 ppm is 1,000 times more than 1 ppb) of air have been detected in general work areas, while higher concentrations (1,400 ppm) have been detected in samples in the breathing zone of some workers. The National Institute for Occupational Safety and Health (NIOSH) estimated that 1,000,000 workers may be exposed to methylene chloride.

Human Metabolism and Methylene Chloride Uptake

Methylene chloride may enter the body when breathing vapors of contaminated air. Because methylene chloride evaporates into air rapidly, exposure by breathing is the most likely source of exposure at chemical storage and hazardous waste sites, in the home, and in the workplace. When breathing methylene chloride, over 70% of it enters the bloodstream and quickly spreads throughout your body, with most of it going to the liver, kidney, brain, lungs, and fatty tissue. Increased physical activity or an increased amount of body fat tend to increase the amount of methylene chloride that remains or accumulates in your body tissue. About half of the methylene chloride in the blood leaves within 40 minutes. Some of the methylene chloride is broken down into other chemicals, including carbon monoxide (CO). Carbon monoxide is also toxic because it combines with hemoglobin to form carboxyhemoglobin (CO-Hb). Unchanged methylene chloride and its breakdown products are removed from the body mainly in the air you breathe out. Small amounts leave in your urine. This usually occurs within 48 hours after exposure. Although the rate of uptake through the skin and stomach have not been measured, uptake is likely to be fast.

Human Health Effects

If breathing methylene chloride (300 ppm) or greater for short periods of time (e.g., 3-4 hours), employees may not be able to hear faint sounds and your vision may be slightly impaired. If employees breathe large amounts (800 ppm), they may not be able to react fast, remain steady, or perform tasks requiring precise hand movements. They may experience dizziness, nausea, tingling or numbness of the fingers and toes, and drunkenness if breathing methylene chloride for a longer time. In most cases, effects disappear after exposure ends. Studies in animals suggest that exposure to higher concentrations (greater than 1,000 ppm) can lead to unconsciousness and death.

Breathing methylene chloride also causes changes in the liver and kidney in animals, but similar effects have not been observed in humans. Studies in animals suggest that breathing methylene chloride does not cause birth defects or affect reproduction, even at high concentrations. Animal studies indicate that should you be exposed to vapors of methylene chloride in air, the vapors may irritate your eyes and affect your cornea. One study reported these effects at concentrations of 490 ppm; however the effects usually disappeared within a few days.

Methylene chloride has not been shown to cause cancer in humans exposed to vapors in the workplace. However, breathing high concentrations of methylene chloride for long periods of time did cause cancer in mice. The International Agency for Research on Cancer has determined that methylene chloride is possibly carcinogenic to humans. No information was found regarding the effects of methylene chloride in humans after oral

exposure. Methylene chloride has caused death in rats following oral exposure to large amounts over a short period of time.

No information was found regarding the effects of methylene chloride in humans after skin exposure or direct contact with the eyes. In rabbits, effects were observed on the eyes (i.e., cornea), but they were reversible within a few days.

Exposed employees can smell methylene chloride at about 200 ppm in air. Because people differ in their ability to smell various chemicals, odors may not be helpful in avoiding overexposure.

If MC is used in the workplace, the employer must monitor employee exposure to MC to determine if any employee is being exposed to MC in excess of the permissible exposure limits (PELs): 25 ppm, as an 8-hour time-weighted average (TWA) PEL; and 125 ppm, as a 15 minute short-term exposure limit (STEL). Employers are required to conduct initial monitoring of airborne MC concentrations and to conduct periodic MC exposure monitoring for all tasks where employee exposures are above the action level (12.5 ppm, 8-hour TWA) or STEL. Validated monitoring methods include OSHA Method 80 (available through OSHA's web site at http://www.osha.gov), badge monitoring, and other methods that meet the accuracy and precision requirements of the MC standard. The spot analysis performed with Kitagawa Dichloromethane colometric detector tubes was only for field evaluation of potential exposure, not as part of any employee monitoring program as described in OSHA s methylene Chloride Standard (29 CFR 1910.1052(d)).

Recommendations:

Although employee exposure was not observed, it is recommended that appropriate engineering controls be implemented to prevent the possibility of exposure when the ambient temperature is much warmer. The local exhaust appears to function well, however, a larger, general explosion-proof (Class 1, Div 1, Group 4) fan with 2500 cfm or more directed crosswise from the transfer operation would probably prevent any potential for employee exposure. Respiratory protection (PPE) is the last level in the hierarchy of controls and should be viewed as an absolute last resort.

Submitted on December 30, 2004 by:

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