

INDUSTRIAL HYGIENE REPORT

Control of Methylene Chloride

In the Workplace

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For: Sentry Air Systems, Inc.
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Introduction: Methylene chloride (MC) is a volatile organic liquid that is often used as a solvent and paint remover or stripper in furniture refinishing. It is only slightly soluble in water and is not flammable. Methylene chloride has a boiling point of 39.6° C or (103° F). MC is less toxic than most chlorinated hydrocarbons; OSHA has established worker exposure limits of 25 ppm (8-hr. TWA) and 125 ppm STEL (15-minute, short-term exposure limit). It may be a carcinogen and should be handled with care to avoid skin contact and inhalation of vapors.

Purpose: The purpose of this experiment was to demonstrate the effectiveness of the Sentry Air Systems Model 300 *Winged Sentry™* with Lid (WSL) in collecting and removing methylene chloride vapors produced by the evaporation of a measured amount of liquid MC. The Model 300 WSL was equipped with an activated charcoal filter. There are two WSL models available (Model SS-200 WSL and Model SS-300 WSL); the latter was used in this project.

Discussion: Solvent vapors are best captured near their source and the Model 300 WSL is very efficient in capturing and removing MC vapor before it mixes with the surrounding workplace air. Methylene chloride that escapes into the room air can be a health concern for personnel since it has poor warning properties and air concentrations could exceed the recommended limit before its odor is detected. For purposes of this experiment a measured amount of liquid methylene chloride was distributed drop-wise from a burette onto several cotton balls placed in a shallow pan. The cotton provided a large surface area to facilitate the evaporation of the methylene chloride. When the Model 300 WSL was turned on, a stream of air was drawn across the cotton balls and into the Sentry fume extractor.

Experimental: On July 27, 2011, an activated carbon filter, which is generally employed for organics removal, was installed in the Model 300 WSL. The air flow rate with this filter was measured to be approximately 250 cfm (cubic feet per minute). 25.0 ml of methylene chloride was dispensed from a 50-ml burette and evaporated into the air stream over a 30-minute period. Air samples were collected during the experiment using SKC 226-001 sorbent tubes and battery-powered sampling pumps. The pumps were set to pull about 100 cc/min. and were pre- and post-calibrated. All personnel involved in the sampling project had available half-face, air-purifying respirators equipped with an organic vapor cartridge while methylene chloride was being handled. The operator also wore

eye protection. Samples were taken at the inlet and outlet of the Model 300 WSL. A personal sample was collected on the operator and an area sample was obtained at a point approximately six feet from the operation. All samples, including a blank, were sent to an AIHA-certified laboratory for analysis using gas chromatography with flame ionization detection (OSHA Method 7).

Results: The sampling results are presented in the following table:

Sample #	Sample Description	Avg. Flow Rate, cc/min	Sampling time, min.	Sample vol., liters.	Methylene chloride found, mg (ppm)	% Removal
RFA-06	<i>Winged Sentry™</i> Inlet	97.81	30	2.934	0.84 (81)	-----
RFA-07	<i>Winged Sentry™</i> Outlet	96.55	30	2.896	0.062 (6.2)	92.6
RFA-08	Personal sample (Operator)	95.45	30	2.863	0.069 (6.9)	-----
RFA-09	Area Sample	101.8	30	3.053	0.056 (5.3)	-----
RFA-10	Blank	-----	30	-----	<0.003	-----

Results and Conclusions:

1. The Sentry Air Systems SS-300-WSL unit did a good job of removing methylene chloride from the air in the experiment described herein. The calculated efficiency of removal was 92.6%.

Results and Conclusions, continued:

2. The personal sample taken on the operator during the experiment was found to be 6.9 ppm of methylene chloride, compared with the OSHA exposure limit of 25 ppm. Assuming no further exposure to methylene chloride during the day, the 8-hr. TWA would have been 0.43 ppm.
3. The area sample was collected approximately six feet from the operation during the experiment. The area sample showed a concentration of 5.9 ppm of methylene chloride in the ambient air. Potential exposures, without regard to the use of a respirator, were found to be well below the OSHA workplace limit (PEL) for MC of 25 ppm.
4. It should be noted that methylene chloride vapors are not as strongly adsorbed on activated charcoal as many other organics because of MC's relatively low molecular weight and small molecular structure. Sentry Air Systems recommends the use of activated carbon in the Model 300-WSL and in other Sentry Air System extractors in laboratories and other workplaces for the control of methylene chloride vapors. The Sentry Air Systems SS-300-WSL should be used as an auxiliary or backup system for intermittent use. Routine work with MC should be done in a standard hood vented to the outside.

If you have any questions or comments regarding this report, please contact me at 713-983-7910 or by e-mail at BobCIH@aol.com.

Respectfully submitted,

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NOTE: An MSDS (Material Safety Data Sheet) for methylene chloride as used in this project can be found at: <http://www.soest.hawaii.edu/krubin/MSDS/dichloromethane.html>