

Industrial Hygiene Report

Control of Xylene Vapors in a Lab Setting:

O-Xylene Vapors

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Sentry Air Systems
6999 W. Little York Rd, Suite P1
Houston, TX 77040

BACKGROUND:

Xylene is a name given to any one of three aromatic hydrocarbon isomers produced from crude oil. The three isomers are distinguished and named by the relational position of the two methyl groups: ortho-xylene, meta-xylene, and para-xylene (abbreviated to o-xylene, m-xylene, and p-xylene). Each of the isomers is similar in its properties and xylene has many industrial applications including uses as a solvent in the leather, rubber, and printing industries. Xylene is also used often as a chemical intermediate. Xylene is also used in the semiconductor industry because it is a good cleaning agent for silicon wafers. It is also used as a sterilizer. However, xylene vapors are toxic and extended exposure can lead to problems in the respiratory tract. Consequently, adequate controls must be used to prevent prolonged exposure. Sentry Air Systems offers a variety of ductless fume hoods to prevent exposure to various chemicals

TEST OBJECTIVE:

A test was setup to determine the filtering efficiency of a Sentry Air Systems carbon filter cartridge on xylene vapors within a Sentry Air hood. A 99% solution of O-xylene was used for this specific test. To determine the absorption ability of the filter on xylene, the concentration of xylene was measured at four locations in the lab. These locations included within the hood (before the filter), at the hood effluent (after the filter), on the operator, and at the opposite end of the lab. A send test was run as a control with concentrations at two locations being measured: on the operator and at the opposite end of the lab. The measurements were obtaining using sorbent tubes in air sampling pumps that were to absorb xylene vapors in the air. The tubes were then sent to the independent HIH laboratory for analysis.

PROTOCOL:

- 1) Sentry Air Systems Model SS-330-DCH was set up with a 10 lb Carbon filter. The 300 series unit with carbon filter generates sufficient air volume to keep the air velocity at the hood inlet greater than 100 FPM.
- 2) A total of 125 ml of O-xylene was placed within the hood, 75 ml in a tray and 50 ml in a beaker. The sorbent tubes were placed in their respective locations in the laboratory. The hood was turned on after which all the sampling pumps were turned on. The o-xylene was then allowed to evaporate for 25 minutes while the sampling pumps and the hood were running. The sampling pumps were placed under the hood, directly over the fan effluent, on the operator, and at the other end of the room respectively.
- 3) After the 25 minute time period, the sample tubes were collected and capped and the remaining o-xylene was collected. The amount of xylene evaporated was noted.

- 4) The next day, the control test was run by placing 125 ml of o-xylene under the hood (75 in the tray and 50 in a beaker). The sampling pumps/sorbent tubes were placed on the operator and at the other end of the room. The sampling pumps were turned on and were run for 25 minutes. The hood was never turned on.
- 5) After the 25 minute time period, the sample tubes were collected and capped and the remaining o-xylene was collected. The amount of xylene evaporated was noted.
- 6) Once testing was completed, samples were labeled and sent to an independent laboratory (HIH Laboratory) for results.
- 7) Results were analyzed to determine filter efficiency.

Results:

The sorbent tubes were analyzed by HIH Laboratory and the results were reported in the following table:

Chemical being tested	Sample Location	Sampling Time	Concentration (mg)	Concentration (ppm)
o-xylene	Inside hood (inlet of fan)	25 min	0.54	82.9
o-xylene	Hood Effluent (outlet of fan)	25 min	< 0.01	.4
o-xylene	Operator	25 min	< 0.01	.4
o-xylene	Room Air	25 min	< 0.01	.4

Table 1 - Test 1: with hood running

Chemical being tested	Sample Description	Sampling Time	Concentration (mg)	Concentration (ppm)
o-xylene	Operator	25 min	0.03	1.5
o-xylene	Room Air	25 min	< 0.01	.5

Table 2 - Test 2: without hood running

Analysis:

The results from the independent lab show that the xylene vapors were removed from the airstream with 99% efficiency. The control shows that the filter basically eliminated any exposure that the operator had to the fumes during a 25 min period. The exposure level while the hood was running is at least 3x less than what it was during the control experiment. It most certainly is much lower than that but the lower limit of detection was reached so it is impossible to say what the exact level of efficiency achieved is with confidence. Had the test been significantly extended, it is likely that the operator would have been exposed to much greater than 1.5 ppm of xylene vapor, whereas, the hood and filter would have prevented this exposure. Under the conditions present on the date of this test, the Sentry Air Systems ductless created a NIOSH compliant working environment for the operator and eliminated 99% of xylene vapors from the airstream.

For additional information, please contact Sentry Air Systems, Inc.

McKay Hansen
Chemical Applications Specialist
Sentry Air Systems, Inc.