

ESCAPE RESPIRATORS

FOREST INDUSTRY HEALTH RESEARCH PROGRAM

c/o Pulp and Paper Forum
#100-620 Royal Avenue
New Westminster, BC
V3M 1J2
Telephone: (604) 777-1533
Facsimile: (604) 777-1567

The **Forest Industry Health Research Program (FIHRP)** has completed a study investigating the capacity of escape respirator cartridges to adsorb pulp mill gases: chlorine; chlorine dioxide; sulphur dioxide; hydrogen sulphide; methyl mercaptan; and dimethyl sulphide. A report is now available titled "**Life-Expectancy of Cartridges for Escape Respirators**". To request a copy, phone **Agi Lee** at the Pulp and Paper Forum at (604) 777-1533, send a fax to (604) 777-1567 or email alee@paperforum.com. Non-members of the Forum may be charged for the reports.

Eight types of cartridges were installed at two bleached kraft pulp mills in British Columbia. At each mill, cartridges were exposed to bleach plant atmospheres near the washer after the second chlorine dioxide stage. Another set of cartridges at each mill was exposed to an atmosphere containing reduced sulphur gases.

Cartridges were exposed 24 hours a day, 7 days a week, then withdrawn for laboratory challenge tests after 3, 6, 9, and 12 months in the mill.

Cartridges were also installed on millwrights' tool carts and exposed to the environment where the millwright was working. These intermittently-exposed cartridges gave breakthrough results equivalent to unexposed cartridges.

Challenge tests measured breakthrough of gases at a flow rate was 32L/min, temperature 30°C, and humidity 70%.

Chlorine or chlorine dioxide did not breakthrough any cartridges at challenge concentrations up to 470 ppm chlorine and 100 ppm chlorine dioxide for at least 60 minutes.

Sulphur dioxide (790 ppm) did not breakthrough in 60 minutes for a mouthbite respirator, and broke through at a level of 4 ppm after 48 minutes for a dual-cartridge type.

All types of cartridges had a large capacity for **hydrogen sulphide and methyl mercaptan** with challenge mixtures of 300 ppm H₂S, 400 ppm MeSH, and 400 ppm DMS. Breakthrough did not occur within 60 minutes.

Dimethyl sulphide was not adsorbed to the same extent. Unexposed (zero exposure) cartridges tested with the TRS mixture listed above gave breakthrough of 10 ppm DMS after 38 to 76 minutes.

Relative humidity in the mill atmosphere was the key factor in determining the breakthrough time for DMS. Water vapour adsorbs onto the packing material increasing the weight of the cartridge and decreasing the number of adsorption sites for DMS. The greater the weight gain, the shorter the breakthrough time.

Results from the study indicate that a 12-month replacement schedule for unused cartridges is appropriate.

Cartridges used during an emergency should still be changed immediately.

Reliability of cartridges exposed to very high humidity can be checked by weighing the cartridges. If the weight gain exceeds 5%, then the cartridges should be discarded.

New metal cartridges should be inspected for dents in the base or threads and should not be installed if the seal could be compromised.

When incorporated into an effective respiratory protection program, results from this study provide assurance that escape respirator cartridges will protect workers during an emergency.