

Introduction

Methyl bromide is an ozone depleting chemical which is listed in the Montreal Protocol. Australia is a signatory to the Protocol, and under the *Ozone Protection and Synthetic Greenhouse Gas Management Act 1989*, most of its applications have been phased out.¹

Those that remain are restricted to fumigation treatments for import or export, soil fumigation for production of strawberry runners, treatment of packaged rice for domestic use and as a minor feedstock in the chemical industry.²



Methyl bromide has the formula CH_3Br , which when viewed at the molecular level, the bromine atom is the dominant feature.

Properties

At room temperature it is a colourless, odourless gas, except at high concentrations where it has a chloroform-like odour. It has the following properties:

- CAS 74-80-9
- MW 94.9
- Solubility 1.75 % (20 deg C)
- Vapour density 3.3 (air = 1.)
- Boiling point 3.6 deg C
- Flash point None
- Flammability range 13.5 – 14.5%

It will only burn in the presence of a continuing strong ignition source. It has no flash point and for all practical purposes, can be considered to be non-flammable

Dangerous Goods

It is supplied as a liquefied gas in cylinders, that evaporates quickly upon release. A small amount of a very irritating material known as chloropicrin, MAY be added to provide a warning property through odour. However, depending on the final application, it may NOT be present either.

It may also be transported as mixture containing much larger amounts of chloropicrin under UN 1581, or as a mixture with ethylene dibromide under UN 1647, however, neither are known to be present in WA.

UN 1062

METHYL BROMIDE with not more than 2% chloropicrin

Division 2.3



The invisible danger

Methyl bromide is particularly hazardous for two reasons. First, it is colourless and odourless; and secondly, the symptoms of poisoning are usually delayed. This delay can range from 1 hour up to 48 hours in some instances, and so a person can be quite easily exposed without being aware of the danger.

Methyl bromide is readily absorbed through the lungs and to a lesser extent through the skin. It has an Exposure Standard of 5 ppm (skin), and an IDLH value of 250 ppm.

Symptoms of exposure can include dizziness, drowsiness, headache, nausea, blurred vision, numbness, tremors, speech defects, fluid on the lungs and death.

As a fire extinguishant

In its early history, methyl bromide was found to be one of the most effective fire extinguishants, and was used in this way from the late 1920's till the late 1960's. Because of its toxicity, most countries were slow to adopt it until World War II, when it found extensive use in aircraft engines.

It became the precursor of much safer halons as fire extinguishants, such as BCF, or Halon 1211. Methyl bromide itself became designated as Halon 1001.

The bromide component is the agent which is particularly effective in inhibiting the free radical chain reaction that enables combustion to proceed. Unfortunately it is also this same property that makes it so damaging to the ozone layer that became the reason for the Montreal Protocol.

As a fumigant

The second primary application of methyl bromide is its use as a fumigant. It is particularly effective because it is able to diffuse readily into cracks and crevices to kill all types of pests in all stages of development; from the eggs, larvae, pupae and adult forms. It leaves no residue, and usually only 24 hours is required to give complete control.

When things go wrong

Methyl bromide's use as an extinguishant or fumigant can unfortunately be readily traced by records of exposures and fatalities.⁴

As an extinguishant this includes leakages during cylinder filling operations, inadvertent discharge of cylinders in such places as truck cabins and bedrooms, and even during fire fighting.

The last fatality recorded was in 1986, when a scrap metal worker discharged several obsolescent aircraft engine extinguishers containing methyl bromide in the process of discarding them.⁵

As a fumigant, there are reports involving exposures after removal of tarpaulins from fumigated soils when all the gas was supposed to have gone, people walking inadvertently into fumigated areas, or returning to fumigated areas too soon or without testing, or working in adjoining areas where fumigations were being undertaken. There are reports of burglars, transients and the intoxicated breaking in to premises undergoing fumigation, even though well posted signage was in place.⁶

For example, in 1961, at a major fumigation project involving 2,700 houses, 7 workers at one point were given old army type respirators with canisters, where it was subsequently found they only provided 30 seconds protection.⁷

What can happen

Sometimes a chain of circumstances can come together that lead to a tragedy. Such a chain occurred when a restaurant was fumigated one evening with methyl bromide.⁸ According to the established protocols, the air was tested several hours later, with a testing device that was either mistakenly set within its high range, or was non-functional, and so gave a "non-detectable" reading.

This led the fumigator to assume the air was "safe," and was probably partly the reason why he forgot to turn the ventilation system back on. This could have saved a worker who turned up at the restaurant at about 3.00 am to commence the day's activities. He was found dead in the bathroom about 5.30 am, by five other workers who in turn were all exposed to a lesser degree and later experienced some symptoms.

A 'non-detectable' reading, wrong assumptions, carelessness, being in a hurry, late at night, fatigue, forgetfulness, failure to communicate - some things are forgiving of human error, but if methyl bromide is ever involved, this is not one of them.

Conclusion

In conclusion, methyl bromide hasn't quite disappeared off the scene yet, and therefore it remains incumbent on local emergency services to remain aware of its hazards.

1

<http://www.environment.gov.au/atmosphere/ozone/ods/methylbromide/index.html>, accessed 14/7/2010

2 Ibid

3 http://en.wikipedia.org/wiki/Methyl_bromide, accessed 14/7/2010

4 www.inchem.org (accessed 30/6/2010)

5 Behrens RH & Dukes DCD, "Fatal Methyl Bromide Poisoning." British J Ind Med, 43(1986):561

6 www.inchem.org (accessed 30/6/2010)

7 Ruthus EM & Landy PJ, "Methyl Bromide Poisoning." British J Ind Med, 18(1961):53

8 Fuortes LJ, "A Case of Fatal Methyl Bromide Poisoning." Veterinary & Human Toxicology, 34(1992):240

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