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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

perfluoropropane

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

perfluoropropane

1. APPLICANT

Rhone Poulenc Chemicals Pty Ltd, 100 York Street, South Melbourne, Victoria 3205.

2. IDENTITY OF THE CHEMICAL

Chemical name: propane, 1,1,1,2,2,3,3,3 octafluoro

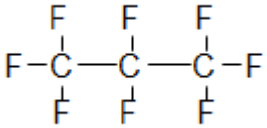
Chemical Abstracts Service (CAS) Registry No.: 76-19-7

Other name(s): perfluoropropane, octafluoropropane, fluorocarbon 218, (FC-218), R218

Trade name: Isceon 218

Molecular formula: C_3F_8

Structural formula:



Molecular weight: 188

Spectral data:

IR spectrum: max absorbance at 1010, 1150, 1220, 1280 cm^{-1}

Mass spectrum: consistent with structure

Methods of Detection and determination

Perfluoropropane may be identified by infrared spectrophotometry and gas chromatography.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	colourless gas
Odour:	odourless
Melting Point:	-183 °C
Boiling point:	-36.7 °C at 760 mm Hg
Liqiuid Density:	1320 kg/m^3
Vapour Pressure: (calculated)	825 Kilopascals at 25°C 1909 Kilopascals at 57°C 2692 Kilopascals at 72°C
Water Solubility:	considered insoluble by analogy with other fluorocarbons. Application by the Department of the Arts, Sport, the Environment and Territories of Irmann's equation (1) provided an estimated solubility of 60 ppm.
Reactivity/Stability:	in general, not reactive; under some conditions may react with alkali metals, under some conditions may react with magnesium or aluminium.
Particle size distribution:	not relevant to a gas.
Flammability:	perfluorocarbons are nonflammable. Concentrations of 10% perfluoropropane have been demonstrated to be extinguishants.
Partition Co-efficient (n-octanol/water)	not applicable due to volatile nature of material.
Hydrolysis as a function of pH	not applicable due to insolubility and known stability of perfluoroalkanes.
Adsorption/Desorption:	not likely to be absorbed

Dissociation Constant: not measured, structure makes it unlikely.

Flash Point, flammability Limits, autoignition temperature and explosive properties were not determined. Perfluoroalkanes are nonflammable and possess fire extinguishing properties. Perfluoropropane has been tested as a component of a non-combustible atmosphere and found to suppress combustion of ignited materials (2). However, some hydrogen fluoride was formed during the process and other toxic or irritating fumes may be formed.

4. PURITY OF THE CHEMICAL

Degree of purity: 99.5%

Toxic or hazardous impurities: none

Non-hazardous impurities: CF_4, C_2F_6, C_6F_{14}

5. INDUSTRIAL USES

Perfluoropropane will not be manufactured in Australia. It will be imported in pressurised containers as a constituent of a refrigerant gas mixtures. The chemical is listed on the EEC Inventory 'EINECS' and the United States Inventory. Anecdotal evidence overseas over a period of years has been stated to show no adverse effects.

According to the notifier, perfluoropropane has been used commercially outside Australia for plasma etching in the electronics industry for at least 10 years. It has also been proposed as a halon replacement in total flooding applications (3).

6. OCCUPATIONAL EXPOSURE

Perfluoropropane will be used as a component in a refrigerant gas. Workers exposed will include airconditioning and refrigeration engineers and maintenance personnel working on

equipment installed in supermarkets, refrigerated transport, small shops and cold stores.

7. PUBLIC EXPOSURE

The potential for public exposure to perfluoropropane is low. Although the compound is a gas at ambient temperatures with a high vapour pressure, it is one constituent of a near azeotropic mix to be used as a refrigerant within sealed refrigerator systems. It appears from the information provided that the use of perfluoropropane within the near azeotropic mix is restricted to commercial usage eg. transport refrigeration, supermarket display cabinets.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

. Use

Perfluoropropane will be used as a component of a refrigerant gas, mainly in supermarkets, with smaller amounts in such applications as low temperature display cabinets, refrigerated transport, cold stores and environmental test chambers. It would appear that household appliances are unlikely to be refilled with the new refrigerant. This latter category of appliance presents the most difficulties when it comes to recovery of unwanted refrigerants.

Isceon 69L, containing perfluoropropane, is said to be a direct drop in replacement for R-502 [a mixture of CFC-115 (CF_3CF_2Cl) and HCFC-22 ($CHClF_2$)] which will require no modification to existing equipment.

The notified substance will not enter the environment intentionally when used in cooling systems, but any releases during filling or use of refrigeration equipment, or following disposal of obsolete equipment or recovery of refrigerants therefrom, will rapidly volatilise to the atmosphere. It is not possible to estimate how much of the refrigerant might be released in this way, but the notifier indicates that quantities involved will be small. The Supermarket Institute reports that annual losses of CFCs can reach 16% in some sectors (4).

However, losses of refrigerants containing perfluoropropane are expected to be much lower as their high cost will provide a financial incentive to invest in leak detection equipment, and to improve service practices generally.

Global production of CFC-11 ($CFCl_3$), CFC-12 (CF_2Cl_2) and CFC-113 (CCl_2FCClF_2) peaked at more than 1 000 000 tonnes in 1985, with most of the CFCs produced eventually escaping into the environment to accumulate in the atmosphere, if not used as chemical intermediates (5). However, awareness of the environmental hazard posed by CFCs has prompted the introduction of extensive measures to contain them. Rhone-Poulenc operates a policy of recovery and reclamation of refrigerants through local suppliers, which will allow purchasers of perfluoropropane containing gases to voluntarily return their current ozone depleting refrigerants, and eventually the replacements, to the UK. No charge is levied for this service, apart from a small rental charge for cylinders in which to collect the refrigerants. Recovery of ozone depleting refrigerants is mandatory in most States. As noted above, the high cost of perfluoropropane may also discourage its release into the atmosphere and favour recovery. On the question of disposal, the notifier indicates that any venting to the atmosphere of small quantities of Isceon refrigerants should only take place if reclamation is not feasible. Larger amounts should be incinerated at an approved facility with fluoride scrubbers.

8.2 Fate

Given the high volatility, low water solubility and chemical stability of perfluoropropane, any releases to the environment will partition almost entirely to the atmosphere. The high stability and spectral characteristics of perfluoropropane mean that, like the fully halogenated CFCs, it is unlikely to degrade until it diffuses to the stratosphere. Photolysis tends to occur at lower altitudes for more heavily chlorinated CFCs, which thus have shorter lifetimes. Accordingly, the atmospheric residence time of perfluoropropane is likely to be of similar magnitude to those for the longer lived CFCs *eg* CF_3Cl, 400 years and C_2F_5Cl, 380 years (5). Lifetimes in excess of 10 000 years have been assigned to perfluoromethane and perfluorethane (6) but these appear to be an overestimate, particularly for the latter. Photolysis of perfluoroethane and perfluoropropane should proceed more readily because of the availability of a C-C bond, which is

weaker than a C-F bond, and this prediction is supported by the observation (6) that perfluoroethane yields roughly twice as many trifluoromethyl radicals as perfluoromethane in mass spectral analysis.

Degradation of perfluoropropane is expected to proceed via cleavage of the carbon backbone under the influence of ultraviolet radiation in the stratosphere to form perfluoroalkyl radicals in the first instance. Thus perfluoropropane will provide an additional source of such radicals to those currently present in the stratosphere, such as CF_3Cl and C_2F_5Cl.

Reaction with oxygen to form organic peroxy radical intermediates is expected to follow rapidly. The current state of knowledge regarding the atmospheric chemistry of these intermediates, based on laboratory experiments, has recently been reviewed (7). The three mechanisms considered to be important for fully halogenated peroxymethyl radicals are reaction with nitric oxide to form the trihalomethoxy radical, with nitrogen dioxide to form the relatively stable peroxynitrate, and with the hydroperoxy radical to form the hydroperoxide, which undergoes further photolysis to the trihalomethoxy radical.

The expected fates of the trifluoroperoxynitrate and trifluoromethoxy radicals are treated in detail in a recent review (8). Transformation of the former to the latter can occur through photolysis, and elimination of a fluorine atom to form carbonyl fluoride is then likely to ensue. This species is somewhat resistant to photolysis and may persist in the stratosphere, but can be removed from the troposphere by incorporation into rain, cloud or fog water followed by hydrolysis and/or precipitation.

The pentafluoroperoxyethyl radical is expected to undergo similar degradation to form the pentafluoroethoxy radical, which can then undergo dissociation to carbonyl fluoride and the trifluoromethyl radical, the latter reacting with oxygen to form peroxymethyl intermediates as outlined above. Alternatively, the ethoxy radical may eliminate a fluorine atom to form trifluoroacetyl fluoride, which can photolyse further or be removed through hydrolysis and/or wet deposition.

In conclusion, perfluoropropane is expected to undergo photochemically induced degradation in the stratosphere at

similar rates to the heavily fluorinated CF_3Cl and C_2F_5Cl to give the same range of degradation products.

9. EVALUATION OF TOXICOLOGICAL DATA

9.1 Acute Toxicity

The notifier requested a variation of the Schedule requirements. Data on oral or dermal toxicity could not be submitted on this gas. No specific tests of skin or eye irritation or of skin sensitisation could be submitted. However, data on irritation can be gained from the acute and short term, repeated dose inhalation studies, the mouse micronucleus study and a report of the injection of perfluoropropane into the vitreous humour of the rabbit eye.

9.1.1 Inhalation Toxicity (2)

The acute inhalational toxicity of perfluoropropane was assessed in ten male Sprague Dawley albino rats receiving a concentration of 80% perfluoropropane and 20% oxygen in the breathing mixture. Controls received air. Animals were exposed for a period of one hour and monitored for a fourteen day period post exposure. Chamber concentrations of the test gas were monitored continuously during exposure.

No deaths occurred during the study. All animals receiving perfluoropropane exhibited initial hyperactivity, later decreased activity, redness of the skin and closed eyes. Growth curves were considered normal.

Perfluoropropane was considered to show no acute toxicity on inhalation of concentrations up to 80%.

9.1.2 Skin and eye irritation

No specific tests were carried out to assess the irritant potential of the notified chemical. However, information may be drawn from other studies and will be discussed in paragraph 9.4.

An abstract (9) of a report of injection of perfluorocarbons into the rabbit eye showed that perfluoropropane noted that there was '*No evidence of damage to the membrane or subcellular damage to the retina*.'

9.1.3 Cardiotoxicity

Fluorocarbons have been reported to sensitise the myocardium to the effects of sympathomimetic amines or to have a direct arrhythmic induction capacity. A translation of a comprehensive literature review (10) was included in the submission. No specific information on the cardiotoxicity of perfluoropropane was included nor was any found in the recent scientific literature.

9.2 Ten day inhalation study in Rats and Guinea Pigs

The inhalational toxicity of perfluoropropane was assessed in parallel studies in two species (2), investigating the toxicity of several fluorocarbons using identical methodology. The study was carried out in the early 1970's with the standards of laboratory practice and reporting of the time. Test animals used were not pathogen free.

Groups of ten male and ten female rats and ten male and ten female guinea pigs were exposed to concentrations of approx 10% perfluoropropane in air for 24 hours/day over a ten day period. The breathing mixture was recirculated, carbon dioxide and moisture removed and oxygen added to maintain oxygen content at 20%. Control groups of ten male and ten female rats and ten male and ten female guinea pigs received room air. Concentrations of perfluoropropane were monitored by infra red spectrophotometry, confirmed by gas chromatography. Mean actual concentrations over the ten day study period were 11.3%, range 8.5% - 13.7%.

Animals were observed for behavioural or clinical symptoms daily during exposure. Body weights were recorded the day before exposure began (day 0), on day 5 and on day 10 at necropsy. After sacrifice, tissues were examined macroscopically for gross abnormalities. Histopathological examination was carried out on the lungs, liver, adrenals, heart, kidneys, spleen and testes of half of the animals plus tissues showing gross abnormalities.

Lungs, adrenals, heart, kidneys, testes and liver were weighed and the organ weight body weight ratio calculated.

Samples from 50% of the animals were taken for examination:

. haematology examinations; consisting of red blood cell count, white blood cell count, haemoglobin and haematocrit; and

. serum biochemistry; consisting of blood urea nitrogen, fasting blood sugar, alkaline phosphatase, SGOT and SGPT.

Findings Rats

No gross symptoms or behavioural changes were noted during the ten day observation period in either the test or the control group. Weight gains were slightly depressed initially in the test group but were comparable to the control group over the last stages of the study.

Most females showed a slight increase in WBC count. Group means were increased for both sexes exposed to the notified gas but this was not statistically significant. The increase appeared to be due to two animals, one male and one female.

At necropsy, four male and six female rats in the control group had red and brown discolouration of areas of the lungs; four males and nine females receiving perfluoropropane had areas of red, brown and grey discolouration of the lungs. (Rats in other test groups also had discolouration of the lungs at necropsy.) Histopathology showed a high incidence of interstitial pneumonitis with perivascular and/or peribronchial infiltrate in control and in all test groups. There was an increased incidence of lymphocytic infiltrate in liver in the test group (from 7/10 to 10/10). Foci of necrosis were present in the liver of four test animals but not controls.

Findings Guinea Pigs

All female guinea pigs and eight male guinea pigs receiving 10% perfluoropropane appeared normal during the study. Two males receiving perfluoropropane and one control male appeared to be

ill and were sacrificed on day 6 of the study. Body weight changes were otherwise comparable to controls.

Results of the macrospcopic examination at necropsy on the sacrificed animals were reported. However, no results of any histopathological examination, haematological analysis or biochemistry from these animals were identified in the report.

At necropsy, all but two male guinea pigs had areas of red and brown discolouration of the lungs. (Guinea pigs in other test groups also had discolouration of the lungs at necropsy.)

Both animals sacrificed on day 6 because of suspected infective pneumonitis had uneven colouration of the liver surface.

The ratio of liver and adrenal weights/body weight was significantly increased in females. Histopathological examination revealed interstitial pneumonitis in all control animals and in all test animals treated with perfluoropropane or other perfluorocarbons. Focal necrosis was observed in the livers of 5/10 examined test animals compared to 3/10 examined control animals.

9.3 Genotoxicity

9.3.1 Bacterial Mutation Assay (11) (OECD Guideline No 471)

The mutagenic potential of perfluoropropane was determined in *Salmonella typhimurium* strains TA 1535, TA 1537, TA 1538, TA 98, TA 100. Two independent studies were conducted in the presence and absence of metabolic activation.

Bacteria were exposed by incubating plates overnight in a sealed desiccator with known concentrations of perfluoropropane and then incubated for two days in air. Concentrations of up to 80% of the test gas were found not to be bacteriotoxic. Concentrations of 80, 40, 20, 10 and 5% were therefore used for the test. S-9 mix was used as the metabolic activator. Air was used as a negative control. Positive controls were run by addition of known concentrations of the appropriate chemical to a plate followed by incubation for three days:

without S-9		
TA1537	9 aminoacridine	80 ug/plate
TA100	N-ethyl-N'-nitro-N-nitrosoguanidine	3 ug/plate
TA1535	N-ethyl-N'-nitro-N-nitrosoguanidine	5 ug/plate
TA98	2-nitrofluorene	1 ug/plate
TA1538	2-nitrofluorene	2 ug/plate

with S-9 mix		
TA1537	2-aminoanthracene	0.5 ug/plate
TA98	2-aminoanthracene	0.5 ug/plate
TA100	2-aminoanthracene	1 ug/plate
TA1535	2-aminoanthracene	2 ug/plate
TA1537	2-aminoanthracene	2 ug/plate

All positive controls showed an increase in revertant colonies compared to the negative control. No increase was noted with any concentration of perfluoropropane. Perfluoropropane was not found to be mutagenic against *Salmonella typhimurium* in this test.

9.3.2 Effect of perfluoropropane on *E coli* (12,13)

Published reports were submitted of studies in which *E coli* 417, *E coli* B and *E coli* K12 were exposed to various gases including perfluoropropane. Preliminary studies showed perfluoropropane had some bacteriotoxic action and that on bubbling perfluoropropane through a series of incubation media there was a progressive decrease in bacteriotoxic effect. Gases were bubbled through the incubation mixture for ten minutes, the container sealed and the suspensions incubated at 25^{O}C for 24 hours. Penicillin selection was used to determine perfluoropropane-induced forward mutation from prototrophy to auxotrophy. Penicillin survival increased about 100-fold after gas treatment and this was interpreted as an increase in the mutation rate. However, no biochemical mutants were found after testing individual surviving colonies and, although it was claimed that pronounced changes in carbohydrate metabolism were induced by the gases, only a small effect on mannitol fermentation was observed in the perfluoropropane treated cells. It is unlikely that a true mutagen would exhibit this level of specificity and the results are not inconsistent with the negative Ames test.

9.3.3 Mouse Micronucleus Study (14)

(Draft report containing original results)

Groups of 15 male and 15 female SD1 SPF outbred mice were exposed to a breathing mixture of 80% perfluoropropane with 20% oxygen for a period of six hours. A negative control group were housed under similar conditions and received air. Positive controls were treated with Mitomycin C, 12 mg/kg in aqueous 0.9% saline by gavage.

Five males and five females from the test and the negative control group were sacrificed 24, 48 and 72 hours after the commencement of exposure. Positive controls were sacrificed 24 hours after treatment. Those animals sacrificed after 72 hours were examined macroscopically for gross changes. Liver, kidneys and lungs were reserved for possible examination.

Stained smears of the femoral marrow were examined for numbers of micronucleated cells (MNNs) per 1000 polychromatic erythrocytes (PCEs) and to determine the ratio of PCEs/ normochromatic erythrocytes(NCEs)

Positive controls showed an increased numbers of MNNs/1000 PCEs. Mice treated with perfluoropropane did not show any increase in numbers of MNNs or in the ratio of PCEs/NCEs.

Animals treated with the test compound had a slight increase in activity, shortly after exposure was terminated. No other clinical signs were noted and no signs of irritation of the eyes or exposed skin or mucus membranes was reported.

Perfluoropropane did not cause chromosome damage in this test, nor was there any evidence of irritant potential.

9.4 Overall Assessment of Toxicological Data

Perfluoropropane showed little acute toxicity to the rat or the mouse (micronucleus study) at extremely high concentrations (80%). It was not mutagenic against *Salmonella typhimurium* nor did it cause an increase in micronuclei formation in the mouse micronucleus test.

No specific studies for irritation were reported. However, the rats in the one hour inhalation study, (concentrations 80%) were

noted as having reddened skin and 'closed eyes'. No specific comment on the irritation potential was made in the reports of the ten day inhalation study and the mouse micronucleus study. No suspicious symptoms were reported in either study. An abstract of a report of injection of perfluoropropane into the rabbit eye reported no membrane or subcellular damage. It can be concluded that perfluoropropane is a non-irritant for practical purposes.

The pneumonitis seen in both rats and guinea pigs in the ten day inhalation study had a high incidence in the control group of both species. (The test was carried out prior to the routine use of specific pathogen free animals in testing.) The pneumonitis was considered infective in origin rather than chemical.

Although there is no specific information on the cardiotoxicity of perfluoropropane, the chemical should be regarded as potentially cardiotoxic with sudden exposure to high concentrations.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Effects on organisms are not expected as the notified substance, like other perfluoroalkanes, is chemically and biologically inert. Apart from ozone depletion and possible greenhouse warming, there is no evidence available for any direct ecological effects from the fully halogenated chlorofluoromethanes and ethanes (5), and perfluoropropane would not be expected to depart from this low ecotoxicological profile.

The notifier submitted aquatic toxicity test reports for the analogous compound perfluoroperhydrofluorene. No toxic effects were noted at the highest concentrations tested (100 ppm for rainbow trout and 0.1 ppm for daphnids). The latter test is uninformative as it was hampered by poor water solubility and toxicity of the dispersing agent to daphnids. However, exposure of aquatic organisms appears unlikely, except transiently in the case of spills, because of the high volatility of perfluoropropane. This volatility also renders aquatic toxicity testing difficult.

The main environmental effect associated with volatile haloalkanes is their ozone depleting capability, which is manifested when they are photodegraded and release chlorine or

bromine atoms in the atmosphere. As noted above, they may also release fluorine atoms, but these are not considered to give rise to ozone depletion because of their much higher electronegativity and consequent affinity for hydrogen. Perfluoropropane contains neither chlorine nor bromine, and thus has zero ozone depletion potential.

Haloalkane gases in the atmosphere can also increase the greenhouse effect by restricting heat loss from the Earth's atmosphere through absorbing infrared emissions from the surface. The main greenhouse gases are carbon dioxide and water vapour, but their infrared spectra leave an atmospheric window between 8 and 12 mm. Leaving aside possible feedback mechanisms, such as cloud formation, gases absorbing in this window will warm the Earth's atmosphere. Perfluoropropane absorbs strongly in the middle of this spectral band and has a very long atmospheric lifetime, both of which are undesirable properties from the perspective of global warming. However, the wavelengths and intensities of this and other infrared absorptions in the window do not differ significantly from those of the highly persistent CFC-115 (C_2F_5Cl), which perfluoropropane will replace. Thus the transition to perfluoropropane containing refrigerants would not be expected to significantly increase the direct global warming potential of the atmosphere. However, as ozone is a greenhouse gas, substitution of the ozone depleting CFC-115 by perfluoropropane will introduce an inevitable greenhouse penalty associated with restoration of the stratospheric ozone layer.

The notifier assumes a lifetime of 1 000 years to calculate as a "worst case" that perfluoropropane has a global warming potential (GWP) after 100 years time integration of 1.73×10^4 (relative to carbon dioxide with GWP 1.0). This is approximately double the reported GWPs of perfluoromethane and perfluoroethane (15). While this appears to indicate an increased global warming hazard, it should be noted that considerable uncertainty surrounds the calculation of GWP, especially regarding indirect effects. Accordingly, the above numerical estimates must be regarded as approximate and therefore not significantly different in magnitude. In addition, other global warming impacts from refrigeration particularly energy consumption, are likely to outweigh any direct impact from the refrigant.

11. ASSESSMENT OF ENVIRONMENTAL HAZARDS

Perfluoropropane is not expected to exert a direct effect on living organisms as it is chemically stable and biologically inactive. The high volatility should ensure minimal exposure of aquatic and terrestrial compartments.

The principal hazard is likely to be to the atmosphere, as the notified substance absorbs infrared radiation strongly between 8 and 12 mm and is predicted to be very persistent in the atmosphere. Accordingly, perfluoropropane would be expected to contribute to global warming if released to the environment. However, these properties also characterise CFC-115, which it will replace, and an increased global warming hazard from the transition is not apparent. In the interest of risk reduction, such persistent substances should be replaced by others of lesser persistence at the earliest opportunity, and the notifier has indicated an intention to use perfluoropropane as an interim replacement while awaiting the completion of toxicity testing requirements for HFC replacements.

The notifier has indicated that safeguards are in place to minimise release of refrigerants containing perfluoropropane, and these safeguards are reinforced by the legislative requirement in most States for mandatory recycling of ozone depleting gases and the high replacement cost should losses occur.
The proposed refrigerants containing perfluoropropane will be difficult to fractionate into their various components for reuse and will have to be destroyed, probably by high temperature incineration, when the HFC containing replacements become available.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY

The potential for public exposure to perfluoropropane is low. It is one constituent of a azeotropic mix to be used as a 'drop-in' replacement refrigerant in existing refrigerator systems. It is present therefore, in sealed refrigerator systems restricted to commercial usage.

Perfluoropropane is not manufactured in Australia. It will be imported as an ingredient of a formulated gas in pressurised containers. Contact with the liquid will cause 'cold burns' as

the liquid evaporates. Similarly, contact with the cold or expanding gas may cause cold burns.

At extreme concentrations, perfluoropropane may displace oxygen in the breathing mixture with resultant oxygen deprivation. The gas is denser than air and care must be taken to avoid accumulation in confined or low-lying spaces.

Perfluoropropane is an extinguishant and is not flammable. However, at temperatures which may occur in a fire, it will form toxic or irritant fumes, including hydrogen fluoride. Localised sources (eg welding, smoking) of high temperature in the breathing zone should be avoided where possible. Fire services should wear appropriate protective clothing. The pressurised tanks should be sprayed with water to avoid heat expansion and over-pressurisation leading to rupture of the tank.

Perfluoropropane may potentiate sympathomimetics. As a precaution, those workers taking sympathomimetic agents such as bronchodilators or cold medications should have their medication reassessed to ensure that the prescribed agent has minimal cardiac effects, unless this is medically inappropriate. Workers receiving sympathomimetics and those taking over-the-counter cough and cold preparations should take extra precautions to avoid inhalational exposure. Doctors treating hypoxia or any case after overexposure to this (or any other) fluorocarbon should not administer adrenaline or other sympathomimetic amine stimulants.

13. RECOMMENDATIONS

The following guidelines and precautions should be observed when using perfluoropropane:

. as good housekeeping practice, areas where perfluoropropane is vented or may escape should have good general ventilation or local exhaust ventilation.

. care should be taken not to allow concentrations to accumulate in sunken (especially confined) areas with the possibility of oxygen deprivation. Where possible, the gas should not be vented in areas where there are confined spaces at low level. Any such areas should be marked and

breathing apparatus conforming to Australian Standard 1715-1991 (16) donned before entering.

. localised sources of high temperature in the region of the notified chemical should be avoided if possible. If welding is necessary, appropriate protective equipment should be worn.

. if skin contact with the liquid or with the cold or expanding gas is possible, impermeable thermal gloves (elbow length) conforming to Australian Standard 2161 -1978 (17) should be worn.

. if eye contact with liquid or with the cold or expanding gas is possible, goggles which conform to Australian Standard 1337-1984 (18) should be worn.

. those taking sympathomimetics, bronchodilators or cough and cold medications should have their medication evaluated by their medical adviser, if exposure to the notified chemical is likely.

. physicians treating a patient after exposure to high concentrations of perfluoropropane should not administer adrenaline or other sympathomimetic amine stimulants.

Release of perfluoropropane into the atmosphere must be minimised. As it will be used in a blend with ozone depleting substances, this can be achieved through the mandatory recycling requirements for ozone depleting gases existing under State legislation, which must be rigourously policed and enforced. As further safeguards we recommend:

. that Rhone-Poulenc introduce the recycling technology currently used in the UK for refrigerants containing perfluoropropane into Australia at the earliest opportunity;

. that Rhone-Poulenc make every effort to expedite the transition to less environmentally persistent refrigerants;

. that Rhone-Poulenc provide yearly information to the Commonwealth Environmental Protection Agency (CEPA) through the Director, Chemicals Notification and Assessment on amounts of perfluoropropane imported into or used in Australia; and

. that Rhone-Poulenc bring any adverse findings related to the use of perfluoropropane to the immediate attention of the Director of Chemicals Notification and Assessment.

14. MATERIAL SAFETY DATA SHEET

Attached to this Full Public Report is a Material Safety Data Sheet (MSDS) for the the refrigerant gas containing perfluoropropane. This MSDS was provided by Rhone Poulenc Chemicals Pty Ltd as part of their notification statement. It is reproduced here as a matter of public record. However the accuracy of this information remains the responsibility of Rhone Poulenc Chemicals Pty Ltd.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989* (the Act), secondary notification of perfluoropropane shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

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