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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

EFKA-36/39

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

EFKA-36/39

1. APPLICANT

Multichem Pty Ltd of Suite 6, 400 High Street, KEW VIC 3101 has submitted a notification statement in support of their application for an assessment certificate for the polymer in EFKA-39 and EFKA-36 as a Synthetic Polymer of Low Concern.

2. IDENTITY OF THE CHEMICAL

The chemical name, molecular and structural formulae, molecular weight, spectral data and details of the polymer composition have been exempted from publication in the Full Public Report.

Trade Name:	EFKA-39 EFKA-36

Characterisation as a Synthetic Polymer of Low Concern

Number-Average Molecular Weight (NAMW):	>1 000
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	0.7%
Molecular Weight < 1 000:	1.4%
Residual Monomer/Reactants:	All <1%
Reactive Functional Groups:	The polymer contains no reactive functional groups.
Charge Density	Polymer contains no charged groups.
Method of Detection and Determination:	gel permeation chromatography (GPC), infrared spectroscopy (IR) and gas chromatography (GC)

The polymer meets the criteria for assessment as a synthetic polymer of low concern under Regulation 4A of the *Industrial Chemicals (Notification and Assessment) Act 1989*.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	opalescent liquid
Boiling Point:	>300°C (EFKA-39)
Vapour Pressure:	9 x 10^{-3} kPa at 20°C (EFKA-39)
Density:	0.93 g/cm^3
Water Solubility:	immiscible with water (see comments below)
Flash Point:	> 100°C (EFKA-39)
Flammability Limits:	Upper Explosive Limit = 7.0% (EFKA-39) Lower Explosive Limit = 0.6% (EFKA-39)
Reactivity:	Polymer is not designed to be reactive under normal conditions of use.
Polymer Stability:	Stable under normal environmental conditions.

Comments on Physico-Chemical Properties

The water solubility of the notified polymer was determined using ASTM Standard D 2030. The notified polymer was shaken with water, allowed to stand for 30 minutes at room temperature, then compared for clarity with water. The polymer formed droplets within the water which, on standing, formed an upper layer.

Data such as partition coefficient are not relevant to surface active compounds, which prefer to reside at or on the interface between polar and apolar media, rather than partitioning between them. Alkyl-substituted polysiloxanes are generally extremely hydrophobic.

The siloxane and ether linkages of the polymer are not expected to hydrolyse in the pH range 4-9. At pH values below 2 and above 11 and temperatures above 90°C, cleavage of the Si-O-Si bonds in the siloxane backbone will occur. The extent to which hydrolysis would occur in the environment is unclear, given that silicones adsorb strongly to surfaces.

The notified chemical contains no dissociable hydrogens or basic functionalities.

4. PURITY OF THE CHEMICAL

Degree of Purity: high

Impurities: none
(Hazardous or non-hazardous)

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified polymer is not manufactured in Australia. It is imported in 25 kg steel drums for use as an additive in surface coatings such as acid-cured polyurethane wood finishes, stoving enamels based on alkyd, acrylic or polyester resins, self-leveling epoxy flooring compounds and UV-cured paper lacquers. The coating products will contain 0.05 to 0.5% notified polymer.

The projected import volumes for the notified polymer is between 1 to 5 tonnes per annum for the first five years.

6. OCCUPATIONAL EXPOSURE

Transport and Storage
The notified polymer will be imported as a 100% polymer solution in 25kg steel drums. Following importation, the polymer solution is transported to the notifier's site for storage prior to reformulation into paint products. Under normal circumstances, waterside, transport and store personnel are unlikely to be exposed to the polymer solution.

Formulation
During paint formulation, a production operator will weigh the required amount of notified polymer by dispensing the polymer solution via a tap attached to the steel drum. The polymer solution will then be manually added into a mixing vessel containing other additives to produce paint products. After mixing, the operator will drum off the formulated paint product in 4, 20 or 200L drums through a closed filtering system. Filled drums are then warehoused for distribution to customers for coating applications.

The production operator may experience dermal exposure to the polymer solution when manually weighing and adding ingredients into the mixing vessel. Similarly, skin contact to spills and drips may also occur when drumming off formulated paint products. The notifier states that local exhaust ventilation is provided when weighing and charging the mixing vessel and during paint formulation to remove fugitive emissions. The notifier also indicated that the production operator would wear personal protective equipment such as PVC gloves, goggles, safety footwear, overalls and impervious aprons.

Application
The coating products will be transported by road to customers throughout Australia. Most of the coating products (70%) will be applied by curtain coating. The remainder of the coating products will be applied by spray painting.

Curtain coating
Curtain coating uses a slot-coating head, which is aimed downward, and the coating emerges as a falling film or sheet. The notifier did not describe the work process involved in curtain coating, but indicated that curtain coating is a high-speed process which allows excess paint to be recirculated thereby eliminating wastage. Skin contact may occur when loading the coating products into the reservoir for curtain coating application. Coating operators will wear personal protective equipment at all times: respirators, PVC gloves, goggles, safety footwear, overalls and impervious aprons while conducting coating activities.

Spray painting
Spray application uses spray guns for application. The notifier did not describe the work process or control measures in spray painting. For the purpose of this assessment, the following is a precis of a spray painting process in work places that implement good hygiene practices and precautionary measures to control exposure to hazardous substances. Typically the spray painter will measure the appropriate amounts of the different components required in a particular formulation, including the pre-prepared paint containing the notified polymer, into an open container and pour this mixture into a spray gun. The spraying of the automobile will be carried out in a laminar flow downdraft spray booth, which is designed to rapidly remove aerosol particles and solvent vapour from the atmosphere. Several possible booth designs may be used. In a dry floor booth, the overspray will be collected in filters contained in the floor of the booth; any unremoved particulates will reach the exhaust stack with the solvent vapours. In a wet floor booth, overspray will collect in a pool of water below the grill floor or in a wet scrubber in the exhaust and will be removed with a filter. The residual solids will be disposed of to secure landfill.

Dermal and eye contact, and inhalation of vapour or spray mist are possible during spray application of coating products. Spray painters will wear personal protective equipment at all times: respirators, PVC gloves, goggles, safety footwear, overalls and impervious aprons during spray painting activities.

Once the paint mixture has dried, the notified polymer will be irreversibly bound within the cured matrix and not separately available for either exposure to workers, or dermal absorption.

7. PUBLIC EXPOSURE

There is little potential for exposure of the public to the notified polymer because the formulated end-use products containing the notified polymer will not be available to the general public. The notified polymer is designed for use in specialty industrial coating and not for decorative coatings used in the do-it-yourself market.

8. ENVIRONMENTAL EXPOSURE

Release
The preparation of the final paint product containing the notified polymer will occur at the end user facility immediately prior to application. The notifier estimates that approximately 70% of the paint product will be applied by curtain coating and 30% by spraying. The spray

application will occur in spray booths with a fume extraction system and residues will be trapped in filters and disposed of to landfill.

Curtain coating is generally accepted as a very efficient process, and the notifier estimates that approximately 10% of the notified polymer will be wasted from application procedures and residues left in the 'empty' pails and drums. This would equate to an annual release of 100-500 kg of the polymer. Most of this would be disposed of to landfill after recovery through existing solvent recovery systems. However, there is potential for some low level release to the sewer where the small amount of polymer remaining in solution will be adsorbed to the sludge, which in turn would also be disposed of to landfill.

Fate

The fate of the polymer will be associated with the fate of the articles to which it is applied. These articles containing the cured polymer are likely to be disposed of to landfill or by incineration.

Solid waste containing the polymer, generated during formulation and application of the paint product, is expected to be disposed of through landfill. Polymer disposed of to landfill is likely to remain immobile due to its high molecular weight and low water solubility.

The environmental properties of similar polysiloxane fluids have been well reviewed in the literature (Hamelink, 1992).

Silicone fluids are very surface active because the flexible siloxane linkages permit alignment of the hydrophobic alkyl substituents towards the non-polar phase, and of the polysiloxane backbone towards the polar phase.

The polar medium is generally water, and apolar media to which alkyl-substituted polysiloxanes become attached may be textiles, sewage sludge, algae or sediment. In aqueous environments, strong, complete and permanent adsorption of high molecular weight silicone fluids to sediment may be assumed. Hence, this modified silicone will be removed from solution by adsorption onto sediment or sludge with little, if any, contained in natural or treated wastewater. Sludge containing the notified substance may then be incinerated or landfilled. Incineration would destroy the substance and liberate water and oxides of carbon and silicon, while disposal to landfill would immobilise the polymer.

Similar polysiloxanes are thought to be unstable in terrestrial environments, where clays can catalyse cleavage of the siloxane linkage, but are probably more permanent in aquatic sediment as the catalytic action of clays is inversely related to their degree of hydration (Hamelink, 1992).

As noted above, the hydrolytic stability of this modified silicone in the environment is unclear. However, hydrolysis products do not appear to be of significant ecological concern.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were submitted for the notified polymer. However, the following toxicity data on a polysiloxane precursor to the notified polymer were obtained from the literature (Micromedex Inc, 1999):

Oral LD_{50} (rat):	>3500 mg/kg
Dermal LD_{50} (rabbit):	>3000 mg/kg
Inhalation LC_{50} (rat):	>1100mg/kg
Eye irritation (rabbit):	mild irritant
Human Patch Test:	non irritant
	non-sensitiser

90-day Subchronic Inhalation Study: no toxic response
No Observable Effect Level (NOEL): 450mg/m^3

Excessive use or prolonged contact may lead to defatting, drying and irritation of sensitive skin. When heated at high temperatures, inhalation of fumes and oxidation products from methyl silicones can be irritating and toxic. Massive exposure to vapours of heated silicone oil can depress nervous system and cause death. Aspiration of silicone fluids or emulsions may cause chemical pneumonitis.

Methyl hydrogen polysiloxanes did not affect the function or structure of the testes in rats and rabbits (Hobbs et al, 1972).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided. The high molecular weight of the substance suggests that it will not cross biological membranes, and will therefore be of low toxicity and not bioaccumulate. It is well accepted that alkyl-substituted polysiloxanes become permanently adsorbed to sediment and should not exert adverse environmental effects. Physical effects such as surface entrapment has been observed when testing aquatic invertebrates in clean laboratory water. Similar effects are not expected in natural environments where a large variety of other surfaces provide opportunities for deposition (Hamelink, 1992).

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The majority of notified polymer should not enter the environment until it is cured onto the articles to which it is applied. Wastes during the formulation and application processes are minimised, with the notifier estimating the losses collected and sent to the landfill to be 100-500 kg per year at maximum import quantities.

Disposal of the articles containing the cured polymer is expected to be through landfill, incineration or recycling. In all these cases it is anticipated that the polymer will be destroyed either through the agency of a vigorous chemical environment, or through slow biological or abiotic processes. Even without substantial degradation, the diffuse nature of disposal patterns would indicate slow release into the wider environment. Any polymer sent to landfill should remain immobile, with leaching from landfill sites not expected.

Incineration of the polymer will produce oxides of carbon, silica and water, with no major environmental hazard.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Hazard Assessment
The notified polymer contains a large proportion of a polysiloxane precursor to the notified polymer. Although there are no toxicological data submitted for the notified polymer, the notified polymer is likely to have low toxicity based on the animal toxicity data for the presursor. The notified polymer also has a NAMW of >1 000, which should preclude transport across biological membranes. Defatting of skin due to excessive and prolonged exposure to silicon compounds, aspiration hazard for silicone fluids or emulsions, and inhalation of vapours and fumes of silicone are of concern for workers handling the imported substance with 100% notified polymer ; however, the low vapour pressure (9×10^{-3} kPa) and concentration (0.05 to 0.5% notified polymer) of the notified polymer in the coating products should minimise polymer-related health effects in end users.

The polymer has low levels (<1%) of residual monomers and it does not contain reactive functional groups likely to undergo further reaction. As the polymer solution contains no solvents and has low volatility, there will be minimal release of the notified polymer.

Occupational Health and Safety
There is potential for a production operator to be exposed by skin contact to the 100% polymer solution during weighing, and manual addition of ingredients to the mixer and to any spills of the finished paint during the filtering and filling of containers. There is a low risk of silicone oil mists being generated unless the mixer is not enclosed. Local exhaust ventilation is provided during these processes and personal protective equipment including PVC gloves, goggles, safety footwear, overalls and impervious aprons is recommended for workers. Due to the expected low toxicity of the notified polymer and the control measures provided to minimise exposure, the risk of adverse health effects arising from exposure to the notified polymer during paint formulation is low.

Paint may be applied by curtain coating or spray painting.

During curtain coating application, coating operators may be exposed to the notified polymer by skin contact when loading the coating products into the coating machine reservoir. Although the notifier did not provide specific details of the work process involved in curtain coating, coating application is expected to be a controlled process and therefore, exposure to the notified polymer present at 0.05 – 0.5% during these activities would be low. Coating operators will wear personal protective equipment at all times: respirators, PVC gloves, goggles, safety footwear, overalls and impervious aprons while conducting coating activities.

Spray paint application is carried out in a spray booth with a fume extraction system. The use of personal protective equipment including respirators, PVC gloves, goggles, safety footwear, overalls and impervious aprons is recommended. Eye wash units are also provided. Given the expected low toxicity and low concentration (0.05 – 0.5%) of the notified polymer and control measures in operation, the occupational health risk from exposure to the notified polymer would be low.

The notifier did not provide information on the processes involved in curing the notified polymer. However, it is expected that once curing is complete, the notified polymer is bound to the coated surface and is not bioavailable.

Exposure to the notified polymer by transport and storage personnel is not expected, unless spillage occurs.

The coating product containing the notified polymer may be flammable due to solvents in the coating products. Precautions must be taken to avoid sources of ignition, e.g. use of earthing leads. Workers handling the coating product should wear anti-static overalls and footwear.

Similar considerations apply in the disposal of the coating product. Wastes containing the notified polymer in uncured form may be hazardous substances because of the solvent and other resin content, so precautions pertaining to these additional materials should be taken. These would provide adequate protection from the notified polymer.

Employers should ensure that NOHSC exposure standards, if applicable, are not exceeded in the workplace.

Public Health
There is negligible potential for public exposure to the notified polymer arising from its use as paint and surface coatings. There will be public contact with the notified polymer when incorporated into coated products, but the very low concentration of the notified polymer in the coating products indicates a negligible risk to the public. Based on the above information, it is considered that the notified polymer will not pose significant hazard to public health when used in the proposed manner

13. RECOMMENDATIONS

To minimise occupational exposure to the notified polymer the following guidelines and precautions should be observed:

Safety goggles should be selected and fitted in accordance with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); respirators should conform to AS/NZS 1715 and AS/NZS 1716 (Standards Australia/Standards New Zealand, 1994a,b); industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990), impermeable gloves or mittens should conform to AS 2161.2 (Standards Australia, 1998), all occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994c) and spray booths should conform to AS/NZS/4114.1 (1994d) and AS/NZS/4114.2 (1994e)

- Spillage of the notified chemical should be avoided; spillages should be cleaned up promptly with absorbents which should be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the appropriate MSDS should be easily accessible to employees.

NOHSC exposure standards for paint components, where applicable, should not be exceeded in the workplace.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified polymer was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical may be required if any of the circumstances stipulated under section 64 of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

Hamelink JL (1992) Silicones. In: The Handbook of Environmental Chemistry, Anthropogenic Compounds: Detergents. N T de Oude (ed). Springer-Verlag, 3: 383-394.

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Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Australian/New Zealand Standards for the Selection, Use and Maintenance of Respiratory Protective Devices. Standards Australia and Standards New Zealand, Sydney/Wellington.

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Standards Australia/Standards New Zealand (1994c) Australian/New Zealand Standard 2210-1994, Australian/New Zealand Standard Occupational Protective Footwear. Standards Australia and Standards New Zealand, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994d) Australian/New Zealand Standard 4114.1 Spray Painting Booths – Design, Construction and Testing and AS/NZS/4114.2 (1994e) Spray Painting Booths – Selection, Installation and Maintenance.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Australian/New Zealand Standard Occupational Protective Gloves Part 2: General Requirements. Standards Australia and Standards New Zealand, Sydney/Wellington.