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August 2000

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Polymer in Hyflon MFA Series**

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Director  
Chemicals Notification and Assessment

**FULL PUBLIC REPORT**

**Polymer in Hyflon MFA Series**

**1. APPLICANT**

Swift and Company Ltd of 64 Trenerry Crescent ABBOTSFORD VIC 3067 (ACN 000 005 578) has submitted a notification statement in support of their application for an assessment certificate for the synthetic polymer of low concern (PLC), Polymer in Hyflon MFA Series.

**2. IDENTITY OF THE POLYMER**

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

**Marketing names:**

Hyflon MFA Grades 620, 640, 840, P6010X and P6012X.

**Reactive functional groups:**

The polymer only contains functional groups of low concern.

Functional group equivalent weight (FGEW):

Not applicable, as the polymer contains only functional groups of low concern.

**3. POLYMER COMPOSITION AND PURITY**

Details of the polymer composition have been exempted from publication in the Full Public Report.

**4. PLC JUSTIFICATION**

The notified polymer meets the PLC criteria.

## 5. PHYSICAL AND CHEMICAL PROPERTIES

Property	Result		Comments
Appearance	White, odourless powder or pellets.		
Melting point	280-290 °C.		
Specific gravity	2.1-2.2 g/cm <sup>3</sup> .		
Water solubility	Not determined.		It is expected to be <5 mg/L.
Particle size	<u>Size Range (µm)</u> >92.05 >62.44 >42.35 >28.72 >19.48 >13.21 >8.96 >6.08 >4.12 <4.12  <b>D50%</b>	<u>Weight percent age</u> 0.5 10.0 31.2 52.6 68.0 80.4 90.1 96.8 99.9 0.1  <b>30.4</b>	Measurements were made on a powder sample of MFA 6010 RR05.  Particle size was determined by the Coulter Counter method.  Pellet size not provided.  D50% is the volume median diameter.
Flammability	Not flammable.		
Auto ignition temperature	N/A.		Not flammable.
Explosive properties	Not explosive.		
Stability/reactivity	Stable under normal conditions of use.		
Vapour pressure	Not determined.		Expected to be negligible under ambient conditions due to high melting range.
Hydrolysis as a function of pH	Not determined.		Due to its lack of water solubility the polymer is unlikely to hydrolyse.
Partition coefficient	N/A.		Cannot be measured since the polymer is insoluble in water and organic solvents.

Adsorption/desorption	Not determined.	Unlikely to migrate from landfills due to its insolubility in water.
Dissociation constant	Not determined.	The polymer does not contain ionisable groups.
Flash point	N/A.	Polymer is solid and not flammable.

N/A – Not applicable

### Comments on physical and chemical properties

The water solubility of the polymer was not measured. It is expected to be below 5 mg/L due to the high molecular weight and structure. Polymers similar in nature are stated to have a measured water solubility of <5 mg/L.

Hydrolysis was not determined. However the polymer only contains functional groups of low reactivity and hydrolysis is not expected.

The polymer is reported to be stable under normal conditions of use. This polymer is thermally stable up to 400°C and exhibits resistance to photo-degradation. At high temperatures (exceeding 400°C) decomposition of the polymer may occur releasing hydrogen fluoride (HF) and carbonyl fluoride (COF<sub>2</sub>).

Partition co-efficient cannot be measured, as the polymer is not soluble in either water or organic solvents.

Adsorption/desorption of the polymer was not determined. Given the large molecular weight and low water solubility, this polymer is expected to be inert and not mobile within the environment.

## 6. USE, VOLUME AND FORMULATION

### Use:

The notified polymer is a thermoplastic resin which can be processed in a number of ways, including extrusion, injection moulding, transfer moulding, blow moulding, rotomoulding, rotolining and electrostatic powder coating. The articles so produced will be used where fire safety and chemical resistance are required, such as in cable insulation, chemical process industry components, semiconductor processing equipment and tubing, rod and coatings for the oil and gas industries.

### Import volume:

The notified polymer will be imported into Australia. The notifier estimates that between 1 and 10 tonnes of notified polymer will be imported in the first year, 10-100 tonnes in the second and third years and 200 tonnes in the fourth and fifth years.

### Formulation details

The notified polymer will be imported in pure form, as pellets or powder, in 25 kg polyethylene bags enclosed in cardboard drums, which are shrink wrapped on pallets. It is used directly by customers for electrostatic powder coating or plastic processing by extrusion and injection moulding.

## 7. OCCUPATIONAL EXPOSURE

Scenario	Exposure route	Exposure details	Controls indicated by notifier
<b>Transport and storage</b> <u>Dock:</u> (6-10 workers, 10 days/year)  <u>Warehouse:</u> (25-40 workers, 50 days/year)	Inhalation and dermal	Workers may be exposed only if packaging is breached.	Not provided.
<b>Article Production</b> (12 customers, 6 each in the powder coating and plastics processing industries. 20-30 operators; 8 hr/day; 250 days/year)	Inhalation and dermal	<u>Powder coating:</u> Worker exposure is possible when manually transferring the polymer powder/pellets to the hopper and when cleaning up spills. Coated objects are heat cured.  Exposure to the notified chemical in aerosol form may occur during the spray operation.	Automated transfer from the sealed hopper to the application equipment. Electrostatic spraying is automated and enclosed (spray booths used). Overalls, gloves and safety glasses are recommended. In situations where dust is present, a dust respirator or mask is recommended. Powder not deposited on the object is recovered by extraction system.

	Inhalation and dermal	<u>Extrusion an injection moulding:</u> Worker exposure is possible when manually transferring the polymer powder/pellets to the hopper and when cleaning up spills. During processing, toxic and corrosive decomposition products (HF, COF <sub>2</sub> ) may be released if the normal temperatures are exceeded.	Automated transfer from the sealed hopper to application equipment. Extrusion is automated. Decomposition fumes and gases are trapped by local exhaust ventilation. Overalls, gloves and safety glasses are recommended.
<b>Use of plastic articles</b>	Dermal	Once articles have been formed, the notified polymer becomes inert and contact with the finished articles will not lead to any significant exposure.	Not required.
<b>Disposal</b>	Dermal and inhalation	Waste polymer, articles and coatings from manufacturing operations will be collected by waste disposal contractors for disposal to controlled landfills.	Not provided.

## 8. PUBLIC EXPOSURE

The notified polymer will not be sold to the public. Exposure of the general public to the notified polymer during transport, storage and industrial use is expected to be minimal, except in the event of an accidental spill. The public will come into contact with the notified polymer only as finished articles or as coatings on articles. In this form, the polymer will be inert and not available for absorption.

## 9. ENVIRONMENTAL EXPOSURE

### Release

The notified polymer has two main applications, powder coating and plastics. Waste and environmental release are expected to be minimal. Powder coats are applied by electrostatic spray guns in spray booths, and the object is then heat cured. Any notified polymer not deposited onto the metal surface is recovered by the exhaust system. This system is fitted with cyclone filters that are reported to have efficiency rates better than 99%.

The notified polymer used in plastic applications involves the heating of the polymer and the use of moulds, pressure and other related methods to achieve the final product. If processing temperatures are exceeded, the polymer may thermally degrade producing HF and COF<sub>2</sub>. Rejected plastic products can be ground and reprocessed minimising waste products. Equipment used in both processes requires little cleaning. The notifier estimates less than 0.5% (1 tonne/annum) notified polymer would be released as waste from the cleaning process. The maximum total of the notified polymer going to waste as rejected products is less than 2 tonnes per annum.

The notifier estimates that 0.5% (1 tonne/annum) of the polymer may remain in the 'empty' import containers after use. This volume of polymer will be disposed of to landfill along with the packaging.

The maximum predicted amount of waste polymer that will be disposed to landfill as a result of the processing of the polymer granules into finished products would be approximately 4 tonnes/annum at the maximum proposed import volume.

Used articles incorporating the cured polymer will be deposited to landfill at the end of their useful life.

## **Fate**

Following accidental spillage in the manufacture process, the notified polymer will be swept up for disposal to landfill. Clean-up procedures should prevent spills during transportation from entering the waterways or sewer systems.

Fluorinated compounds do not undergo biodegradation under either aerobic or anaerobic conditions (A. Remde and R. Debus, 1996), and are persistent in the environment.

At the end of their useful lives, products containing the notified polymer will be discarded to landfill. Although stated in the notification dossier that the polymer is stable to light, it is likely to undergo slow photo-degradation under ultra violet light to lower molecular weight fluorinated compounds. Most highly fluorinated compounds have no affinity for water and little affinity for the organic component of soil and sediments. Lower molecular weight fragments are likely to be appreciably mobile in the soil compartment. The ultimate fate of these fragments would possibly be to the atmosphere where final mineralisation to carbon dioxide, water and hydrogen fluoride would take place through reactions with atmospheric ozone and further exposure to ultra violet radiation.

It should be noted that some fluorinated compounds have recently been detected at low levels in both humans and animals (3M Press Release, 2000) and although fluorinated compounds have little affinity for fat, there appears to be mechanisms operating in the environment, which allow for some bioaccumulation of fluorinated compounds.

If the polymer were incinerated or burnt at temperatures in excess of 400°C, decomposition products of HF and COF<sub>2</sub> may be released to the atmosphere.

## **10. EVALUATION OF HEALTH EFFECTS DATA**

No toxicological data were provided. Polymers of low reactivity and high molecular weight do not readily cross skin or other biological membranes, therefore, the toxicity of the notified polymer is expected to be low.

## **11. EVALUATION OF ENVIRONMENTAL EFFECTS DATA**

No ecotoxicological data were provided.

## **12. ENVIRONMENTAL RISK ASSESSMENT**

The maximum predicted amount of residual waste polymer disposed to landfill as a result of manufacturing of powder-coated products and plastics is estimated to be four tonnes per year. Eventually all articles coated with or containing the notified polymer are likely to be discarded to landfill.

Disposal of the spent notified polymer to landfill is unlikely to present an environmental hazard, as it will be very dispersed. Although the polymer will not be susceptible to biodegradation, it is expected to be slowly degraded through abiotic processes, e.g. ultra violet radiation, to lower molecular weight fragments. The ultimate fate of these is likely to be to the atmosphere where they will be mineralised to carbon dioxide, water and HF. However, recent evidence indicates that fluorinated compounds may have the potential to bioaccumulate.

Incineration of the polymer is likely to produce toxic decomposition products including HF and COF<sub>2</sub>. Disposal of the polymer products by incineration is not acceptable and all polymer waste created in the manufacturing process should be disposed of to landfill or recycled back into production.

## **13. HEALTH AND SAFETY RISK ASSESSMENT**

### **13.1 Hazard assessment**

Due to the high molecular weight and low reactivity of the polymer, the notified polymer would not be classified as a hazardous substance, according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999).

The Material Safety Data Sheet (MSDS) for the notified polymer indicates that thermal decomposition products such as hydrogen halides and carbonyl halides produced as a result of fire or very high temperatures will severely irritate eyes and respiratory system.

### **13.2 Occupational Health and Safety**

There is little potential for significant occupational exposure to the notified polymer during transport and storage.



The processing equipment is highly automated, and exposure will normally only occur during loading of the polymer pellets or powder into the equipment, and cleaning up spills. When the notified polymer exists in powder form, greater than 90 % of the particles are in the inspirable range (approximately 3% respirable particles), so exposure to dust by dermal, ocular and inhalation routes is possible. Dust may also be generated when the polymer is present as pellets.

During powder coating application of the polymer, worker exposure to aerosol may occur, however, the spray operation is automated and enclosed within a booth.

In the manufacture of plastic articles (e.g. extrusion), workers are not expected to be exposed to the notified polymer after the pellets are added to the hopper. Workers will not handle molten polymer. Worker exposure may occur when moulded products, formed by extrusion or injection moulding, are solidified and released from the die. Inhalation exposure to polymer dust during grinding of resin for recycling and dust and fumes evolved from the extrusion process may occur.

Due to the anticipated low toxicity of the notified polymer and the high level of engineering control, the health risk during powder coating and article manufacture is considered low.

During thermal processing, particularly if the normal temperatures are exceeded, toxic and corrosive decomposition products including HF and COF<sub>2</sub> may be formed. Therefore, precautions must be taken to prevent release of toxic fumes and any consequent inhalation exposure to the thermal decomposition products. Ventilation, including local exhaust ventilation, must be used where thermal decomposition products may result, and anywhere where the powdered notified polymer is transferred. The exposure standard of 10 mg/m<sup>3</sup> for inspirable dust must be observed in the workplace, and dust respirators used if the atmospheric dust level exceeds this value. The NOHSC exposure standards for the decomposition products (HF – 2.6 mg/m<sup>3</sup>, and COF<sub>2</sub> – 5.4 mg/m<sup>3</sup>, time weighted average) must be observed by employers. This information is included in the notified polymer MSDS.

Once the articles have been formed, the notified polymer is not bioavailable and contact with the finished articles will not lead to exposure.

### **13.3 Public Health**

The notified polymer will only be used by industry. Public exposure will arise from dermal contact with finished plastic articles composed of the notified polymer, and with powder-coated metal items. The inert nature plus extremely high molecular weight will render the notified polymer biologically unavailable. Therefore the public risk from the notified chemical in finished plastic articles and powder coatings is considered to be low when used in the proposed manner.

## **14. MSDS AND LABEL ASSESSMENT**

### **MSDS**

The MSDS of the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets*. It is published here as part of the assessment report. The accuracy of the information on the MSDS remains the responsibility of the applicant.

### **Label**

The label for the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances*. The accuracy of the information on the label remains the responsibility of the applicant.

## **15. RECOMMENDATIONS**

To minimise occupational exposure to polymer in Hyflon MFA series, the following precautions should be observed:

- A spray booth must be used for powder-coating application;
- Overalls and safety glasses should be worn when handling the notified polymer; where engineering controls and work practices do not reduce dust concentrations to safe levels, respirators should also be used;
- Spillage of the notified chemical should be avoided. Spillages should be swept up promptly and put into containers for disposal;
- A copy of the MSDS should be easily accessible to employees;
- Employers should ensure that NOHSC exposure standards for inspirable dust and for any decomposition products of the notified polymer are not exceeded in the workplace;

To minimise environmental exposure to polymer Hyflon MFA series, the following controls are required:

- The notified polymer should not be disposed of by incineration.

## **16. REQUIREMENTS FOR SECONDARY NOTIFICATION**

Secondary notification may be required if:

- (i) any of the circumstances stipulated under subsection 64(2) of the Act arise. If any importer or manufacturer of (the notified chemical) becomes aware of any of these circumstances, they must notify the Director within 28 days; or

- (ii) the notified polymer is introduced in a chemical form that does not meet the PLC criteria.

## 17. REFERENCES

3M Press Release; "3M Phasing Out Some of its Specialty Materials" 16 May 2000.

National Occupational Health and Safety Commission (1994) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1995) Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment, [NOHSC:1003(1995)]. In: Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

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Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Standards Association of Australia.

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Standards Australia/Standards New Zealand (1994) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Standards Association of Australia/Standards Association of New Zealand.

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