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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

RP2778 Polymer

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

RP2778 Polymer

1. APPLICANT

Courtaulds (Australia) Pty Ltd of 51 McIntyre Road SUNSHINE VIC 3020 has submitted a limited notification statement in support of their application for an assessment certificate for RP2778 Polymer.

2. IDENTITY OF THE CHEMICAL

The following requests for exempt information were accepted: chemical name, molecular and structural formulae, constituents, exact use and or manufacture volume.

Other Names:	Polyester RP2778
Trade Name:	the polymer will be manufactured as a 60% (w/w) solution in aromatic hydrocarbon solvent 150, isobutanol, xylene; this solution is labelled Polyester Resin R-4940
Method of Detection and Determination:	gel permeation chromatography (GPC) and infrared (IR) spectroscopy
Spectral Data:	an IR spectrum for the polymer was provided

3. PHYSICAL AND CHEMICAL PROPERTIES

The notifier stated that the polymer would be a hard, brittle amber coloured resin at room temperature. However, it is manufactured as a solvent solution which is a clear viscous liquid under ambient conditions. The physico-chemical properties below refer to the solvent solution unless otherwise specified.

Appearance at 20°C and 101.3 kPa:	the polymer solution as manufactured is a clear, viscous amber coloured solution
Boiling Point:	182°C
Specific Gravity:	1.065 at 20°C

Vapour Pressure:	polymer has no measurable vapour pressure 0.5 kPa at 38°C (aromatic hydrocarbon solvent 150); 1.3 kPa at 20°C (isobutanol)
Water Solubility:	not determined (see comments below)
Partition Co-efficient (n-octanol/water):	not determined (see comments below)
Hydrolysis as a Function of pH:	not determined (see comments below)
Adsorption/Desorption:	not determined (see comments below)
Dissociation Constant:	not determined (see comments below)
Particle Size:	not applicable; the notified polymer is in solution
Flash Point:	not applicable to polymer
Flammability:	not applicable to polymer
Autoignition Temperature:	not applicable to polymer
Explosive Properties:	not applicable to polymer
Reactivity:	the notifier states that under normal conditions of use the polymer does not break down but is cross-linked into an inert surface coating film at a temperature of 235°C; under ambient storage conditions the polymer solution is completely stable

Comments on Physico-Chemical Properties

The notifier stated that water solubility could not be measured because the polymer is produced in solution and removing the solvents will also remove some residual monomers and low molecular weight fractions, thus changing solubility. The notifier claims that the polymer is insoluble and the hydrophobic structure also indicates that water solubility would be low.

The polymer contains a large proportion of ester functionality, but hydrolysis in the environmental pH range (4-9) is not expected due to the low water solubility.

Partition coefficient and adsorption/desorption have not been determined due to the low water solubility of the polymer. The partition coefficient is expected to be high and the polymer can be expected to bind strongly to, or be associated with, soil and sediment.

The polymer does not contain dissociable or reactive functionalities except for a small amount of free carboxylic acid groups expected to have typical acidity.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 99.5%

Toxic or Hazardous Impurities: none

Non-hazardous Impurities (> 1% by weight): none

Maximum Content of Residual Monomers: 0.5%

Additives/Adjuvants: none

Chemical name:	xylene (mixed isomers)
CAS No.:	1330-20-7
Weight percentage:	up to 1 % in polymer resin solution
Regulatory Controls:	national exposure standard 80 ppm TWA, 150 ppm STEL
Toxic properties:	R20/21 Harmful by inhalation and in contact with skin R38 Irritating to skin (NOHSC, 1999b)

Chemical name:	isobutanol
CAS No.:	78-83-1
Weight percentage:	up to 3 % in polymer resin solution
Regulatory Controls:	national exposure standard 50 ppm TWA
Toxic properties:	R20 Harmful by inhalation (NOHSC, 1999b)

Chemical name:	Aromatic Hydrocarbon 150
CAS No.:	64742-94-5
Weight percentage:	up to 35 % in polymer resin solution
Regulatory Controls:	none
Toxic properties:	R65 Harmful: may cause lung damage if swallowed (NOHSC, 1999b)

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as an ingredient in a paint as a heat cured coil coating. It is to be manufactured as a solvent solution, with the formulation of the solution as follows:

Chemical Name	*CAS No.*	*Weight %*
RP2778 Polymer	none	60
aromatic hydrocarbon solvent 150	64742-94-5	35
isobutanol	78-83-1	3
xylene	1330-20-7	1

The notified polymer solvent solution will be formulated into paint containing 23.6% (w/w) notified polymer.

The manufacture volume of polymer is anticipated to be greater that one tonne per year for the first 5 years.

6. OCCUPATIONAL EXPOSURE

The notified polymer is to be manufactured at a single site in Victoria as a resin solution and blended into paint/varnish products at the same site. The finished paint is then transported to New South Wales to a single site to be used in coil coating.

Polymer Production
The notified polymer will be manufactured from the constituent monomers in an enclosed reactor. The monomers, solvents and low viscosity additives are added via piping to the reactor. Other low viscosity additives are poured manually into the reactor from the drum through a bung and tap assisted by drum lifters and trolleys. Low viscosity small volume materials are decanted into smaller containers and poured directly to the reactor through inspection/loading ports. Powdered material stored in bulk bags is introduced to the reaction vessel by means of a metered loading system while material in smaller bags (25 kg) is introduced manually into a loading hopper.

After polymerisation, the polymer solution is adjusted to 60% (w/w) by adding solvent and QA sampled, then 200 L drums or bulk holding containers are filled via a closed filling system. The reaction vessels have local exhaust ventilation at access points.

One batch of polymer solution is prepared per month requiring 2 days to produce. Production operators are potentially exposed for 12 hours per operator, per day. The notifier states that up to 20 reactor operators may be exposed in any one year. The reactor operators are trained and expected to wear appropriate personal protective equipment such as gloves, overalls, goggles and respirators.

Cleanup of the reactor vessels is by solvent wash although it is stated that the need for clean

up is minimised by the routine production of compatible resin solutions.

Paint Production
Up to 20 operators are involved in the production of 15 batches of paint per month, 1 batch per day with a shift of 12 hours per operator, per day.

The polymer solution from the manufacturing plant is poured directly to the mixing tanks from 200L drums through a bung and tap. The solvents, resins and low viscosity additives are added via fixed piping. Small volumes of liquids and powdered material are introduced into the mixing tank either manually or via a metered loading system. Exhaust ventilation points are located around the mixing tank. The finished product is filled into 200 L drums via a closed filtering system. The main opportunities for exposure to the notified polymer will be during sampling, testing and filling of drums. Exposure will mainly be dermal with a limited possibility of inhalation exposure to aerosols. The polymer is at 23.6% (w/w) in the final paint. The notifier states all workers are provided with personal protective equipment.

Maintenance workers
Up to two maintenance personnel may be exposed for up to 2 days per month, 8 hours per day. Maintenance workers perform emergency and routine maintenance on vessels, pumps, pipelines and valves. The notifier states that workplace procedures are in place.

Quality assurance workers
Up to 4 laboratory technicians/chemists/development personnel will be involved in quality control during polymer manufacture and paint production. Other workers collect samples from the reactor and provide these to the technicians in sealed containers for analysis. The laboratories are fitted with local fumehood extraction, facilities for the safe storage of samples and removal of waste. Some dermal exposure to the polymer may occur.

Paint Coating
At the customer site, approximately 12 coating operators can be potentially exposed for 8 hours/day, 26 days/year. The 200L drums of paint are transported to the coating room, the lid removed and the paint air stirred. A small sample is taken and checked for viscosity, which is then modified by the manual addition of solvent. The paint is then mixed and a recirculating pump is inserted to feed the paint into the coating heads which feed the paint into a paint tray, and collect and feed unused paint back into the drum. The paint is applied by roller coating to a continuous coil. Some exposure via inhalation, dermal and ocular routes is possible at this stage. The coating company states that the coating room is enclosed and fitted with fume extraction. The operator control panel is located away from the coating room. Local exhaust ventilation is used during set-up, application and baking of the paint and workers are supplied with gloves and safety glasses.

Transport and storage
Workers involved in transport and storage of paint containing the notified polymer are not likely to be exposed to the notified polymer except in the event of an accident.

7. PUBLIC EXPOSURE

Minimal public exposure is anticipated through the synthesis, transfer, or disposal of the

notified polymer at the manufacture, reformulation or application sites.

Public exposure to the notified polymer is expected through handling of household domestic appliances to which paint containing the notified polymer has been applied. However, the notified polymer will not be bioavailable due to the curing process, which renders the polymer inert.

8. ENVIRONMENTAL EXPOSURE

Release

The varnish is decanted from the 200L drums into 20L pails, thinned if necessary, and applied by roller to the coils. The coated product is baked in the oven when a firmly adhering thin film of the polymer is laid on the material. The solvents that evaporate are combusted in the incinerator.

At the manufacturer site waste from accidental spills and residues accumulating on filters are disposed of to landfill. Wash solvent residues produced in the solvent recovery unit are combined with other resin residues and also disposed to landfill. The empty drums are cleaned by licensed drum reconditioners who would dispose of the residues by approved methods. Test samples of polymer solution are discarded in a highly diluted form through authorised waste disposers. The notifier claims that all waste waters originating from the process areas are passed through a treatment tank prior to discharge to the sewer. The notifier estimates the maximum waste of polymer through all these sources to be 1.2% per annum, equating to 660 kg.

Roller coating is a very efficient process. At the applicator's plant minor spills are collected into the empty drums. These drums are taken away by a licensed waste disposal agent where the residual liquid waste is collected and the drum discarded to landfill. The residual liquid waste is distilled to recover the solvent and the residue containing the polymer is incinerated. Some polymer is also lost as coating on rejected metal. Rejected metal is collected through metal recyclers, to be melted under high temperature which would destroy the polymer. It is estimated that up to 0.75% of the polymer would be lost per annum as waste at the applicator's plant, equating to a maximum of 410 kg per annum.

The total waste from both the manufacturer and applicator sites would be approximately 2% of the manufacture volume, or about 1.1 tonnes per annum. The paint product coating of external coils containing the polymer will gain nation-wide distribution.

Fate

The fate of most of the polymer will be tied to the fate of the external coated and heat cured coils. Most cured coils will go through metal recycling, where the high temperatures will destroy the polymer with conversion to oxides of carbon and water vapour.

Some of the metal products and part of the waste generated during manufacture and application of the polymer will be disposed of to landfill sites in a very dispersive manner. Due to the low solubility and the highly cross linked nature, the polymer will not leach but remain associated with soil and sediment and will undergo slow abiotic and biotic

degradation. Once the notified polymer is applied to the coil and heat cured, it will be incorporated in an inert film and would not present a significant hazard. Any fragments, chips or flakes of the coating will be of little concern as they are expected to be inert. Coils coated with the polymer are likely to be either recycled for steel reclamation or be placed into landfill at the end of their useful life. During metal recycling the polymer would be destroyed in the blast furnaces and converted to water vapour and oxides of carbon. Incineration will destroy the polymer.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer is unlikely to present a hazard to the environment when handled, used and disposed of as proposed. Disposal to landfill of waste polymer, discarded appliances or metals coated with the polymer will not pose a hazard to the environment due to high molecular weight and the low solubility. Any fragments, chips or flakes of the coating will be of little concern as they are expected to be inert. Most coils coated with the polymer are likely to be recycled for steel reclamation, where the polymer would be destroyed in the blast furnaces and converted to water vapour and oxides of carbon. Incineration will break also down the polymer into oxides of carbon and water vapour. The US EPA considers polynonionic polymers with NAMW>1000 and low solubility to be of low environmental concern (Nabholz *et al*. 1993). The environmental hazard from the notified polymer can be rated as low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological data was provided for the notified polymer. The notified polymer has a NAMW greater than 1 000 which should limit the potential for systemic toxicity by minimising absorption across biological membranes. The type and level of residual monomers does not result in the polymer being classified as hazardous according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1994a). In addition there is a low level of low molecular weight species, < 5% with NAMW less than 1 000.

The Material Safety Data Sheet (MSDS) for the polymer resin solution specifies health effects such as irritation of the skin, eyes and respiratory tract irritation, gastro intestinal effects, dizziness, nausea, headache and drowsiness. These health effects are most likely to be due to the solvents in the resin solution rather than the notified polymer.

Occupational Health and Safety

Transport and storage workers are unlikely to be exposed to the notified polymer except in the event of an accident.

Dermal, ocular and inhalation exposure of reactor operators is unlikely due to the high level containment required for manufacturing polymers of this type. However, exposure to the polymer during and following manufacture may occur due to spillage during maintenance work and sampling the small volumes for quality control and testing. As these operations involve small volumes, exposure is expected to be limited. Resin solution manufacture is conducted using a closed system. The notifier states that personal protective equipment such as protective clothing, gloves, goggles and respirators is used. Maintenance workers also rely on personal protective equipment to limit exposure. The use of engineering controls and protective equipment is necessary to prevent exposure to solvent components via dermal, inhalation and ocular routes.

Exposure scenarios are similar for polymer solution manufacture and paint manufacture although the final concentration of polymer is 60% (w/w) in the former case and approximately 23.6% (w/w) in the latter. During paint manufacture some exposure to drips and spills may occur when transferring resin solution to the paint mixing vessel and filling the paint containers. Use of personal protective equipment is necessary to minimise exposure.

End use of the paint in coil coating will not lead to significant exposure of workers to the notified polymer. The polymer is present at a low concentration. There is some opportunity for exposure during paint stirring and thinning with solvent. Personal protective equipment will be employed to reduce exposure. The coating process is controlled from a remote location so is not expected to result in worker exposure.

A number of ingredients in the resin solution (aromatic hydrocarbon 150, isobutanol and xylene) and the paint containing the notified polymer (titanium dioxide, n-butanol, isophorone and aromatic hydrocarbon 150) may present health hazards to workers. They are listed as appropriate in the relevant MSDS, together with the NOHSC exposure standards (National Occupational Health and Safety Commission, 1995).

The polymer solution and paint are harmful by inhalation. Therefore, employers should ensure that a respirator is used if there is a likelihood of exposure to the resin solution containing aromatic hydrocarbon 150.

The coating room should be equipped with adequate air extraction. The employer must ensure that a respirator is used if any aerosols are likely to be formed during mixing, thinning or application of the paint and impervious gloves, goggles and protective clothing worn. The manufacturer of the paint must ensure that the label adequately identifies ingredients present at levels above the concentration cut-offs in accordance with NOHSC *National Code of Practice for Labelling Workplace Substances* (National Occupational Health and Safety Commission, 1994c) and that the appropriate risk phrases appear on the label. Similar requirements apply to the MSDS for the paint.

For both the polymer solution and paint, employers are responsible for ensuring that the relevant NOHSC exposure standards are not exceeded in the workplace.

Public Health
Under normal conditions of transport, handling and industrial use, the likelihood of public exposure to the notified polymer is very low. Exposure of the public to paint containing the notified polymer will occur during handling of household domestic appliances, however, it will not be bioavailable. Based on the use pattern and physicochemical characteristics of the notified polymer, the public health risk from transport, storage, industrial or domestic use or waste disposal of the notified polymer is considered to be low.

13. RECOMMENDATIONS

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

- Employers should ensure that NOHSC exposure standards for all of the components of the polymer solution and final paint mix are not exceeded in the workplace;

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); Industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987); Impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia/ Standards New Zealand, 1998); and Occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);

- Spillage of the notified polymer should be avoided. Spillage 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; and

- A copy of the MSDS should be easily accessible to employees.

Public Health
If conditions of use are varied, greater exposure to the public may occur. In such circumstances, further information may be required to assess the hazards to public health

14. MATERIAL SAFETY DATA SHEET

MSDS for the resin solution containing the notified polymer and the product were provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994d).

These MSDS were 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 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

Nabholz JV, Miller P & Zeeman M (1993) Environmental Risk Assessment of New Substances under the Toxic Substances Control Act Section Five. In: W. G. Landis, J. S. Hughes and M. A. Lewis ed. Environmental Toxicology and Risk Assessment, American Society for Testing and Materials. ASTM STP 1179, Philadelphia, pp 40-55.

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

National Occupational Health and Safety Commission (1999b) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994c) National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1994d) 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: ed. Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards. Australian Government Publishing Service, Canberra.

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. Standards Association of Australia, Sydney.

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

Standards Australia/Standards New Zealand (1992) Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

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

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Standards Association of Australia, Sydney.