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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Polyester Resin RP-56-8144

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Director
Chemicals Notification and Assessment

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1. APPLICANT

PPG Industries Australia Pty Ltd of McNaughton Rd, CLAYTON, VIC 3169 (ACN 055 500 939) has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Polyester Resin RP-56-8144.

2. IDENTITY OF THE CHEMICAL

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

Marketing Name:	Polymer in Polyester Resin RP-56-8144
Method of Detection and Determination:	infrared spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is produced in solution in a hydrocarbon solvent. As the notified polymer is never isolated, limited data on the physical and chemical properties are available. The properties given below are variously those of the 76 % polymer solution and of the notified polymer, as stated.

Appearance at 20°C and 101.3 kPa:	viscous clear slightly yellow liquid, with a solvent odour (solution)
Boiling Point:	154°C for the solution; the polymer is not expected to be volatile
Specific Gravity:	1.07 for the solution; 1.14 (calculated) for the notified polymer
Vapour Pressure:	the notified polymer is not volatile
Water Solubility:	not determined (see comments below)
Particle Size:	not applicable, as the notified polymer is manufactured

	and used in solution
Partition Co-efficient (n-octanol/water):	not determined (see comments below)
Dissociation Constant:	not determined (see comments below)
Flash Point:	41°C for the solution
Flammability Limits:	Upper Explosive Limit = 7.0 % Lower Explosive Limit = 0.8 % (for the solvents)
Autoignition Temperature:	471°C for the solution
Explosive Properties:	not expected to be explosive
Reactivity/Stability:	expected to be stable under normal environmental conditions

3.1. Comments on Physico-Chemical Properties

The water solubility was not determined, but the notifier states that the solubility for an analogous polymer (PMN 2373) was measured at a range of pH values in accordance with OECD methods and using HPLC for detection. Results were: pH 1, not quantifiable; pH 7, 407 ppm; pH 10, 569 ppm (Bucksath, 1996).

The polymer contains ester linkages that could be expected to undergo hydrolysis under extreme pH conditions. However, due to the low water solubility, this is unlikely in the environmental pH range of between 4 and 9.

The determination of partition coefficient and adsorption/desorption could not be undertaken as the notified polymer is expected to have low water solubility and will largely partition into n-octanol rather than water. The n-octanol solubility of the analogous polymer PMN 2373 (which contains the same ingredients in similar proportions) was determined to be 204000 mg/L using GPC with refractive index detection (Faith, 1995). Due to its low water solubility, the polymer is expected to become associated with the organic component of soils and sediments.

No dissociation constant data was provided as the notifier claims that dissociation is unlikely to occur in the environmental pH range due to the water insolubility and the nature of the polymer. This may refer to the polymer after cross-linking in the final coating product which should leave no units likely to dissociate. However, the polymer may contain a small amount of free carboxylic acid, likely to have a typical acidity.

4. PURITY OF THE CHEMICAL

Degree of Purity: 95.8 %

Maximum Content of Residual Monomers:	residual monomer identities and concentrations have been exempted from publication; concentrations of residual monomers are all below the relevant cutoffs for the notified polymer to be classified as hazardous

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as a component of automotive coatings for Original Equipment Manufacture (OEM). The coatings will be applied by robot or hand spraying to internal and external surfaces prior to the final assembly of the vehicles.

The notified polymer will be imported as a resin solution, RP-56-8144, containing 76 % notified polymer (w/w) in a hydrocarbon solvent. The polymer solution may also be manufactured locally at some later date. The resin solution will be reformulated at one site in Australia to produce the coatings, containing up to 23 % (w/w) notified polymer. The resin solution will be imported in 200 L steel drums. The finished coatings will be stored and transported in 200 L drums.

The notifier estimates that the manufacture or import volume will be 55 tonnes notified polymer per annum in the first five years of use.

6. OCCUPATIONAL EXPOSURE

Transport and Storage
Waterfront, transport and warehouse workers are not expected to be exposed to the notified polymer except in the case of an accident involving spillage of the paint or resin solution. Unloading containers will involve 2 workers for 4 hours per day, 6 days per year. Transport to the reformulation site will involve 1 worker for 4 hours per day, 6 days per year.

Laboratory Development
The notifier indicated that three laboratory workers would be involved in the manufacture and testing of paint. The potential exposure would be for up to 8 hours per day, for up to 80 days per year. One worker would be involved in laboratory trials for the manufacture of the polymer, for 6 hour per day, 10 days per year. Exposure would be by skin contact during the handling of small quantities of the polymer solution and paint. The use of appropriate laboratory ventilation facilities and personal protective equipment such as a laboratory coat and safety glasses would be expected.

Polymer Manufacture
The polymer manufacture, when commenced, will involve 6 workers for up to 6 hours per day, 7 days per year. The reactants and solvents will be added to an enclosed reactor, and the resultant polymer solution will be filtered and filled into 200 L steel drums. During the filling process, there is potential for dermal exposure to the polymer solution in the form of drips and spills. As the polymer solution will be viscous, the formation of aerosols is unlikely.

The filling will be carried out under local exhaust ventilation to prevent exposure to the solvents and reactants. Workers will wear impervious gloves, coveralls and goggles, with additional personal protective equipment being used as required.

Reformulation (Paint Manufacture)
The reformulation of polymer solution into paint components will involve 24 workers for up to 4 hours per day on a daily basis. Three groups of workers will be involved in the process; in paint mixing, quality control and drum filling. The mixers used for preparing the paint will be enclosed and fitted with local exhaust ventilation. Dermal exposure to the polymer will be possible at several points throughout the process; charging the polymer solution into the mixer, removal and testing of quality control samples, and drips and spills during the paint filtration and filling. The formation of aerosols during the high speed mixing will be unlikely because of the viscosity of the mixture.

The mixing and filling will be carried out under local exhaust ventilation to prevent exposure to solvents. Workers will wear impervious gloves, coveralls and goggles, with additional personal protective equipment being used as required.

End Use
The notified polymer will be used at one vehicle manufacturing site in Australia. The paint will be predominantly applied using a robotic system, but manual touchups will be necessary. The notifier indicates that 1 worker will be involved in adding paint to the circulation tank of the robot spraying system (2 hour per day), and 4 workers will apply the paint by hand spray (8 hours per day). A further worker is expected to be involved in cleaning the spray equipment (2 hours per day). All exposures will be on a daily basis.

The paint containing the notified polymer will be transferred by drum pump from the 200 L drum to a 300 L circulation tank, and then pumped through an enclosed 300 L pipework circulation system. There is potential for dermal exposure to the notified polymer for workers installing the drum pumps for transfer to the circulation tank. The paint lines from the circulation system will supply both the robotic sprayers and also the manual spray equipment. Robotic spraying will be carried out in a downdraft spray booth, and no worker exposure is expected during this part of the spraying procedure. There is potential for dermal exposure to the notified polymer during the manual spraying procedure, but exposure will be limited by the engineering controls on the spray booth and the use of personal protective equipment, as described below.

Paint mixing will be carried out in a ventilated paint kitchen. Workers will wear impervious gloves, anti-static coveralls, anti-static footwear and eye protection. 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. Workers will wear nylon overalls, calico hoods, nylon gloves and cartridge type respirators (as required) while inside the spray booth. The requirement for respiratory protection will be determined on the basis of the operation of engineering controls on the spray 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. The spray booths are subject to AS/NZS/4114.1:1995 *Spray Painting Booths – Design, Construction and Testing* (Standards Australia/Standards New Zealand, 1995a) and AS/NZS/4114.1:1995 *Spray Painting Booths – Selection, Installation and Maintenance* (Standards Australia/Standards New Zealand, 1995b). After application of the paint, the automobile will be heated to cure the coating.

Residual paint mixture will be washed from the equipment manually.

Once residual final 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 for dermal absorption.

7. PUBLIC EXPOSURE

The notified polymer is not available for sale to the public and will be used as an ingredient in automotive paint products. The potential for public exposure to the notified polymer during manufacture, transport, use and disposal is assessed as negligible. Members of the public may make dermal contact with automobiles coated with products containing the notified polymer. However, exposure will be negligible because the notified polymer will be bound within a cured paint film.

8. ENVIRONMENTAL EXPOSURE

8.1. Release

There is potential for release of the notified polymer during polymer manufacture, paint formulation and the paint application. The manufacturing and formulation processes will take place at the notifier's plant and any spills that occur will be contained by the plant bunding. The waste produced during the manufacturing and reformulation processes will be treated by a process known as the Dusol treatment process which separates the polymer solids from the solvents on site; the solids are then collected by licensed contractors for disposal by incineration.

The notifier estimates that the manufacture of the polymer solution and the paint reformulation process will cause the following releases of waste polymer from the PPG plant. This includes the waste generated by equipment cleaning (wash-out solvents from the manufacture are added to the paint batch) and residues remaining in the 'empty' drums (sent to a licensed drum reconditioner and 'burnt').

Release estimates from notifier's plant:

Resin cooking	2 %	1100 kg per annum
Filtration and filling	1 %	550 kg per annum
Drum residues	1.5 %	825 kg per annum
Equipment cleaning	0.5 %	275 kg per annum
Paint reformulation	1 %	550 kg per annum
Spills	<1 %	<550 kg per annum

The total annual release from the notifier's plant is estimated to be up to 7 % or 3850 kg, virtually all of which should be collected in the Dusol process and incinerated by licensed contractors.

The paint is applied to motor vehicles with approximately 35 % efficiency for hand spray and 80 % for the automated method. The average transfer efficiency is estimated by the notifier as 75 % ie. approximately 25% (13750 kg per annum) of the import volume of the notified

polymer will be wasted via overspray. This waste polymer will be collected by the spray booth control measures, such as a filtering system and masking materials. The waste will be collected by licensed contractors and incinerated. Cleaning of the spray gun and mixing equipment will generate waste that will be collected and disposed of in the same manner as wastewater from the spray booth, approximately 500 kg per annum.

Some residue will also remain in the 'empty' containers after use. It is estimated that up to 1100 kg per annum will remain as residue in the containers and will be incinerated by licensed drum reconditioners.

The total annual release from the customer's plant is estimated to be 15350 kg per annum, virtually all of which should be collected and incinerated by licensed contractors.

8.2. Fate

Once applied to the metal panels of vehicles, the notified polymer will be incorporated in a hard, durable, inert film and would not present a significant hazard. Any fragments, chips and flakes of the lacquer will be of little concern as they are expected to be inert. The metal panels 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. When recycled, the polymer would be destroyed in the blast furnaces and converted to water vapour and oxides of carbon.

The solid waste generated in the formulation and application of the coating will be incinerated by licensed contractors. The containers and their residue will also be disposed in this manner. Any of the polymer that may be released to the environment through spills would be expected to become associated with the soils and sediments and be slowly degraded through abiotic and bacteriological processes. It would not be likely to remain mobile in the aquatic environment and is not expected to cross biological membranes, due to the low solubility and high molecular weight, and as such should not bioaccumulate (Connell, 1990).

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicology data for acute oral toxicity of a closely analogous polymer solution, PMN 2373, were submitted as part of the notification package. This polymer contains the same ingredients in similar proportions. A similar proportion of solvent is also present. No other toxicology data was provided.

9.1 Acute Toxicity

Summary of the acute toxicity of PMN 2373

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50} > 2000 mg/kg	(Varsho, 1995)

9.1.1 Oral Toxicity (Varsho, 1995)

Species/strain: rat/Crl:CD®BR

Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	gavage; dose 2000 mg/kg
Test method:	OECD TG 401
Mortality:	there were no premature decedents during the study
Clinical observations:	no clinical signs of toxicity were observed
Morphological findings:	no treatment related pathological abnormalities were observed at necropsy
LD_{50}*:*	> 2000 mg/kg
Result:	the notified chemical was of very low acute oral toxicity in rats

9.2 Overall Assessment of Toxicological Data

The notified polymer is of very low acute oral toxicity in rats. The polymer is stable with low volatility. Polymers of high molecular weight and low water solubility do not readily cross biological membranes.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier has provided the following test results for the analogous polymer PMN 2373.

Test	***Species***	***Results***
Static Acute Toxicity to Fish (OECD TG 203) (Sword, 1996)	Rainbow trout *Onchorhynchus mykiss*	Nominal LC_{50} (96 h) >100 mg/L NOEC (96h) ≥100 mg/L Mean Measured LC_{50} (96 h) >35.8 mg/L NOEC (96h) ≥35.8 mg/L

The study was conducted on the following nominal concentrations of the test substance: 0.0 (control), 3.1, 6.3, 13, 25, 50 and 100 mg/L and a blank of 0.10 mL/L acetone. Ten fish (5 in each of 2 replicates) were exposed to each test concentration and control. The concentration of each test solution was determined analytically from samples collected at 0 and 96 h. Mean measured concentrations for the samples were 3.19, 4.91, 11.7, 25.9, 34.4 and 35.8 mg/L.

Water quality parameters of temperature, dissolved oxygen and pH were measured and found to be within acceptable limits throughout the test. The control, blank, 3.1 and 6.3 mg/L nominal concentration solutions remained clear during the test. The 13 and 25 mg/L solutions

were cloudy with no precipitate. The 50 and 100 mg/L solution were cloudy with some film or precipitate present on some days.

All fish in all test solutions remained normal throughout the test with no observed abnormal effects or mortality. It was concluded that the analogue polymer PMN 2373 is not toxic to fish up to the limits of its water solubility.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer cross-links with other paint components to form a very high molecular weight and stable film that adheres firmly to the external surfaces of the motor vehicle panel to which it is applied. The polymer, as part of this surface coating, will therefore share the fate of the vehicle panel. The paint will slowly deteriorate under the action of UV light, but this is negligible over the life of the motor vehicle. When the vehicle panel is recycled, the polymer would be destroyed through incineration.

The majority of waste notified polymer from the manufacture, reformulation and application of the coating to the automotive surface should not enter the environment as it is expected to be incinerated by licensed contractors. Approximately 3850 kg per annum of waste polymer from the manufacturing and reformulation processes at the notifier's plant and 15350 kg per annum of waste polymer from the application process at the customer's plant is expected to be disposed of in this way.

In the event of accidental spillage of the polymer solution into waterways, the polymer is not expected to disperse into the water, but settle out onto sediments. If the polymer is spilt on land, either during usage or transport, it is expected that the polymer would become immobilised in the soil layer. Contaminated soil can then be collected and disposed to landfill.

Given the above, environmental exposure and the overall environmental hazard is expected to be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Hazard Assessment
Little toxicological information has been provided for the notified polymer and therefore the substance cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b). The notified polymer is of very low acute oral toxicity in rats. However, the polymer solution RP-56-8144 is a hazardous substance because of the high concentration of a hydrocarbon solvent, which is classified as an aspiration hazard. It is also classed as a Class 3 dangerous good (flammable liquid) because of the solvent content. The Material Safety Data Sheet (MSDS) for the polymer solution RP-56-8144 lists a number of potential health effects, namely headaches, dizziness, nausea, vomiting, skin, eye and respiratory irritation, irritant contact dermatitis and central nervous system depression. These relate mainly to the hydrocarbon solvent rather than the notified polymer.

Occupational Health and Safety

There is little potential for significant occupational exposure to the notified polymer in the transport and storage of the polymer solution or of paint components containing the notified polymer. There will be exposure during manufacture of the polymer, production of the paint components and in the use and disposal of the paints.

During the manufacture and reformulation processes and the addition of paint to the circulation tank in the end use facility, the main exposure route for the notified polymer will be dermal. The paints and polymer solutions will be viscous, and ready formation of aerosols is not expected. The polymer is not expected to be hazardous by dermal exposure as the high molecular weight will preclude absorption through the skin. Protective measures used to prevent exposure to the hazardous solvents should provide sufficient protection against the notified polymer.

During manual touchups, the paint containing the notified polymer will be applied by spraying. The final paint mix, including the pre-prepared paint containing the notified polymer, could contain a wide variety of additional ingredients once fully mixed. This is likely to introduce human health hazards because, apart from a range of potentially toxic solvents, there may be components containing resins with reactive functional groups. The spraying procedure also produces a dense aerosol of paint particles which would adversely affect human health even in the absence of additional hazardous components.

For these reasons, the notified polymer must be assessed for the contribution it makes to the hazards associated with use of the spray paints. The presence of many potential and actual hazardous substances in the formulations requires the use of stringent engineering controls, such as a correctly constructed and maintained spray booth, and of a high level of personal protective equipment, such as impermeable overalls and gloves and a full face shield and respirator, where the engineering controls are insufficient to provide sufficient protection form inhalation of the spray mist and vapours. The use of the paint containing the notified polymer should be in accordance with the NOHSC *National Guidance Material for Spray Painting* (NOHSC, 1999c). The level of protection from exposure afforded by the standard protective measures will provide adequate protection from the notified polymer, which is likely to be less intrinsically toxic than most of the solvents, pigments and other paint resins.

Once the applied final paint mix has hardened, the polymer will not be separately available for exposure or absorption.

The employer is responsible for ensuring that exposure standards pertaining to all components of the final paint mix are not exceeded in the workplace.

The paint components containing the notified polymer are flammable due to their solvent content. Precautions must be taken to avoid sources of ignition, e.g. use of earthing leads. Operators should wear antistatic overalls and footwear.

Similar considerations apply in the disposal of the polymer. The wastes containing the notified polymer may be hazardous substances on the basis of the solvent and other resin content, and the precautions used on the basis of these additional materials should be adequate for protection from the notified polymer. In addition, much of the polymer will be crosslinked, hardened and immobilised by the time of disposal.

Public Health
The notified polymer is not available for sale to the public and will only be used in automotive paint products. Members of the public may make dermal contact with automobiles coated with paints containing the notified polymer. However, the risk to public health from the notified polymer will be negligible, because it is bound within a cured paint film, from which it is unlikely to be bioavailable.

Based on the above information, it is considered that Polymer in Polyester Resin RP-56-8144 will not pose a significant hazard to public health when used in the proposed manner.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in Polyester Resin RP-56-8144 the following guidelines and precautions should be observed:

- Use of the paint containing the notified polymer should be in accordance with the NOHSC *National Guidance Material for Spray Painting* (NOHSC, 1999c);
- Employers should ensure that NOHSC exposure standards for all of the components of the final paint mix are not exceeded in the workplace;
- Safety goggles, chemical resistant industrial clothing and footwear and impermeable gloves should be used while handling the product containing the notified polymer; where engineering controls and work practices do not reduce vapour and particulate exposure to safe levels, an air fed respirator should also be used;
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS should be easily accessible to employees.

If products containing the notified chemical are hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b), workplace practices and control procedures consistent with State and territory hazardous substances regulations must be in operation.

Guidance in selection of goggles may be obtained from Australian Standard (AS) 1336 (Standards Australia, 1994) and Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); for industrial clothing, guidance may be found in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990); for impermeable gloves or mittens, in AS 2161 (Standards Australia/ Standards New Zealand, 1998); for occupational footwear, in AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994a); for respirators, in AS/NZS 1715 (Standards Australia/ Standards New Zealand, 1994b) and AS/NZS 1716 (Standards Australia/ Standards New Zealand, 1994c).

14. MATERIAL SAFETY DATA SHEET

The MSDS for the solution containing the notified polymer was provided in a format consistent 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 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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