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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in WE-58-2954

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FULL PUBLIC REPORT**Polymer in WE-58-2954****1. APPLICANT**

PPG Industries Australia Pty Ltd of McNaughton Road, Clayton, Victoria, 3168 (ACN 055 500 939) has submitted a limited notification statement in support of their application for an assessment certificate for the new synthetic polymer in WE-58-2954.

2. IDENTITY OF THE CHEMICAL

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

Marketing Names: WE-58-2954
E6237, E6176

3. PHYSICAL AND CHEMICAL PROPERTIES

The following data relate to the notified polymer at a concentration of 23.3 % w/w dispersed in water, or for the notified polymer itself, as indicated. The polymer itself is never isolated from the *in situ* manufactured resin solution.

Appearance at 20°C and 101.3 kPa:	off white opaque liquid with low viscosity (dispersion)
Boiling Point:	not determined
Specific Gravity:	1.083 (dispersion)
Vapour Pressure:	the notified polymer is not volatile
Water Solubility:	3.15 – 4.75 mg/L at pH 7 (notified polymer); dispersible in water
n-octanol Solubility:	13.3 g/L (notified polymer)
Partition Co-efficient (n-octanol/water):	Log P _{ow} ~ 3.5 (notified polymer)
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 as the polymer is never isolated from solution
Explosive Properties:	not explosive
Reactivity/Stability:	stable at ambient temperatures

3.1. Comments on Physico-Chemical Properties

Testing for water solubility could not be undertaken in accordance with OECD Guideline 105 (standard flask method) because undissolved particles of the test material cannot be removed from saturated solutions by centrifugation or filtration. Water solubility was determined by visual inspection of solutions that were diluted until no undissolved material was observed (Lumsden, 1999). At pH 7 the solubility was found to be between 3.15 and 4.72 mg/L.

The solubility of the polymer in n-octanol was determined as 13.3 g/L (Lumsden, 1999). The determination was carried out using the flask method based on OECD TG 105 and the concentration of the test material in the sample solutions was determined by gel permeation chromatography (GPC).

The n-octanol/water partition coefficient was not determined but can be estimated from the ratio of the solubility in n-octanol to that in water. Given a water solubility range at pH 7 of 3.15 to 4.72 mg/L and n-octanol solubility of 13.3 g/L, the ratio P_{ow} is calculated to be 3241.5 to 4857.1 ($\log P_{ow} = 3.5$ to 3.6). This indicates that the polymer has greater affinity for an oil phase than for an aqueous phase.

Adsorption/desorption data was not presented in the submission, but the positive charges of the quaternary amines in the polymer indicate that if spilled onto soils, the polymer may associate with the surface of negatively charged clay minerals. In this situation adsorption to the mineral surfaces is not expected to be very strong, but due to the low water solubility, high mobility of the polymer through the soil would not be expected.

In the polymer dispersion, the neutralising acid protonates the base polymer sufficiently to stabilise it as a micelle. No pK_a data was provided but both amine groups could be expected to behave as typical aliphatic amines and be appreciably basic. Consequently both would be protonated and carry positive charge in the usual environmental pH range.

The polymer contains no hydrolysable groups and is expected to be stable in the environmental pH range (4 - 9).

4. PURITY OF THE CHEMICAL

Degree of Purity: > 99 %

**Maximum Content
of Residual Monomers:**

<i>Chemical name:</i>	phenol, 4,4'-(1-methylethylidene)bis-
<i>Synonym:</i>	bisphenol A
<i>CAS No.:</i>	80-05-7
<i>Weight percentage:</i>	4 % based on polymer dry weight
<i>Toxic properties:</i>	irritating to eyes, respiratory system and skin; may cause sensitisation by skin contact (NOHSC, 1999a)

Other toxic or hazardous impurities are present at concentrations below the cutoff for classification of the notified polymer or the products containing the notified polymer as hazardous; the exact concentrations are confidential.

Toxic or Hazardous Impurities: none present apart from residual monomers

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

Additives/Adjuvants:

<i>Chemical name:</i>	rosin
<i>CAS No.:</i>	8050-09-7
<i>Weight percentage:</i>	< 1 % in polymer solution; exact concentration is exempt information
<i>Toxic properties:</i>	may cause sensitisation by skin contact (NOHSC, 1999a)

<i>Chemical name:</i>	exempt information
<i>Synonym:</i>	polymer in HR-44-5085, NA/887
<i>CAS No.:</i>	none allocated
<i>Weight percentage:</i>	exempt information
<i>Toxic properties:</i>	see NICNAS report NA/887

<i>Chemical name:</i>	4-methyl-2-pentanone
<i>Synonym:</i>	methyl isobutyl ketone
<i>CAS No.:</i>	108-10-1
<i>Weight percentage:</i>	< 1 % in polymer solution; exact concentration is exempt information
<i>Toxic properties:</i>	eye, mucous membrane and skin irritant (American Conference of Government Industrial Hygienists, 1998)

NOHSC exposure standard 50 ppm TWA, 75 ppm
STEL (NOHSC, 1995)

Other additives and adjuvants are present at concentrations below the cutoff for classification of the notified polymer or the products containing the notified polymer as hazardous; the exact concentrations are confidential.

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be imported as part of an aqueous coating resin formulation at less than 20 % (w/v). The formulated product will be diluted by approximately a factor of two prior to end use. The coating resin formulation will be imported mainly in 20000 L isotanks, but 208 L drums or 1041 L tote tanks will be used for around 10 % of the imported volume.

The polymer will be used as a binder resin in an electrodepositable coating composition used as a primer coating for automobile bodies in an immersion bath. The polymer will only be used in automobile assembly plants.

The import volume within the first five years will be a maximum of 250 tonnes per annum.

6. OCCUPATIONAL EXPOSURE

Transport and Storage

The notified polymer as part of a formulated aqueous coating resin product will be transported from the docks to the notifier's warehouse, where it will be distributed to the customer sites. The notifier expects that 2 - 6 waterside workers and 2 - 4 warehouse workers, along with an unspecified number of transport drivers, will handle the containers of the coating formulation containing the notified polymer, for approximately 6 hours, 100 times a year. The original containers will not be opened, so it is unlikely that these workers will be exposed, except in the event of an accident involving the rupture of a drum or tank.

Primer Application

The notified polymer is used in a section of the automated production line in automobile assembly plants. The electrodeposition process involves the use of a potentially dangerous electric current in a wet environment, so the plant operators and the bath containing the notified polymer are physically separated during the normal operation of the production line.

The notifier estimates that a total of 12 plant operators, 12 plant technical operators and 4 laboratory workers will be exposed to the notified polymer. The exposure is estimated to be for 2 hours per shift, 250 times per year for plant operators, 4 hours per shift, 250 times per year for plant technical operators and 6 hours per shift, 100 times per year for laboratory workers.

The product containing the notified polymer will be transferred by plant operators from the import tanks to a storage tank using a coupling hose. There is possibility of dermal exposure to drips and spills when the containers are exchanged and the transfer hoses are disconnected

and reconnected.

The formulation containing the notified polymer is dispensed into a large water bath from the storage tank via a fixed automated transfer system.

The automobile bodies are lowered into the water bath by the production line conveyor until completely submerged; a negative voltage is then applied and the electrostatically charged paint is deposited onto the body. The conveyor then lifts the automobile body out of the bath and excess polymer solution is washed off back into the bath with water; the concentration of the bath is maintained as the wash water is recirculated from the bath through an ultrafiltration system. The automobile body is then transferred by conveyor to a baking oven, where the crosslinking reaction occurs. After this process, the polymer coating is crosslinked and the notified polymer is no longer separately available for exposure.

There is a need for periodic sampling and testing of the bath contents to ensure that the concentrations of all of the paint components, including the notified polymer, are maintained. Dermal exposure of plant technical operators to the bath contents is possible during sampling. The testing is performed by laboratory personnel. Dermal exposure to small quantities of the bath contents of these workers is also possible.

Exposure may also occur during bath cleaning. The process is continuous with topping up of the electrocoat concentration through the automated system, but bath cleaning will occur every one to two years. The notifier states that the bath contents will be pumped into a storage tank through fixed piping, along with water used to rinse the walls of the tank. Residual washings and sludge will be removed by waste disposal contractors who may have dermal exposure to low concentrations of the notified polymer.

The bath containing the notified polymer is enclosed and local exhaust ventilation is used to remove any solvent vapours which may be present. The baking oven will be vented to the atmosphere through an afterburner at 760°C, which will remove any oven fumes.

Workers in the electrocoat sections of the car plants would be expected to wear gloves, protective eyewear and clothes, and other personal protective equipment as required.

7. PUBLIC EXPOSURE

The notified polymer will only be used by industrial automobile manufacturers, and is not available to the public. Once applied to the automobile body, the notified polymer is bound in an insoluble polymeric matrix, and not separately available for exposure. In addition, it will be covered by several layers of paint. Consequently, the potential for public exposure to the notified polymer through all phases of its life cycle is considered to be extremely low.

8. ENVIRONMENTAL EXPOSURE

8.1. Release

Due to the transfer efficiency and material recovery systems inherent to the electrodeposition process, release of the notified polymer is not expected during the coating operation.

Accidental spillage from material transfer processes at customer sites may be a source of release. Any spills would be contained to the plant by bunding, collected and disposed of by licensed waste contractors. The notifier estimates that the maximum amount of spillage would be 1 % per year, which is equivalent to 2500 kg of the notified polymer. Licensed waste contractors could take liquid recovered from a spillage to a liquid waste treatment plant where treatment would result in the notified polymer separating to sludge and either being incinerated or disposed of to landfill. Small spills collected onto absorbent material could be disposed of to landfill.

Large import containers containing residual polymer will be returned to the USA. Polymer released from the washing of small import containers is expected to be up to 3 % of the volume in these containers, equivalent to 750 kg per year (based on 10 % of the total import volume arriving in smaller containers). The notifier states that licensed waste contractors would dispose of this liquid waste, presumably in a similar manner to waste from spills.

Samples withdrawn for quality testing will result in release to the environment of approximately 50 kg/year of the polymer (equivalent to 0.02 %). The notifier indicated that all waste is to be disposed of by licensed waste contractors, presumably in a manner similar to accidental spills.

The notifier indicated that electrodeposition baths are cleaned approximately every one or two years. The process involves transferring the bath contents to a fully enclosed storage tank via permanent piping. Water washing is used to rinse the internal walls of the bath as the contents are transferred. Residual washings and sludge from the bottom of the tank are removed by licensed waste contractors. After collection the waste is treated by flocculation, filtration and centrifugation to separate the solid polymeric material from the water. The water is discharged to the sewer and the sludge is dried and sent to secure landfill. The notifier did not indicate the volume of new polymer likely to be released as a consequence of these operations, but it is estimated that it would be unlikely to exceed 5 % of total imports. This equates to a maximum annual release of around 12.5 tonnes of the notified polymer.

After the polymer has been cross linked into the paint matrix, there is little possibility for release. Any release would be in the form of inert flakes of cured paint.

8.2. Fate

Most of the notified polymer becomes part of a durable paint film on the metal surfaces of motor vehicles, and consequently the fate of the majority of the material and the car bodies themselves will be shared. This is likely to be either recycling for metal recovery, or deposition into landfill.

During metal recovery, the organic paint coatings would be destroyed in the high blast furnace temperatures, and the polymer decomposed to water vapour and oxides of carbon and nitrogen. Any material incinerated as a consequence of trade waste disposal operations would be destroyed in a similar manner.

Information on biodegradability was not provided. However, in landfill the cured paint film containing the notified polymer would be expected to be very slowly degraded as a consequence of micro-biological processes with release of gases such as carbon dioxide,

methane, ammonia and nitrogen.

No release of the polymer to the water compartment is expected, except in the case of a transport accident. However, in the event of such an accident, the polymer would be expected to settle and associate with the sediment. It would not be expected to cross biological membranes due to its high molecular weight and should not bioaccumulate (Connell, 1990).

If the uncured polymer were released to the soil as result of accidental spills, it would be expected to associate weakly with the surface of clay minerals. Given the low water solubility, the notified polymer is not expected to be mobile in soil.

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicity data are available for the notified polymer as a 23.3 % aqueous dispersion. The dose was corrected for the concentration of active ingredient. No other toxicity data are available.

9.1 Acute Toxicity

9.1.1 Oral Toxicity (Allen, 1999)

<i>Species/strain:</i>	rat/Crl:CD [®] BR
<i>Number/sex of animals:</i>	5/sex
<i>Observation period:</i>	14 days
<i>Method of administration:</i>	gavage; 23.3 % aqueous dispersion
<i>Dose:</i>	single dose, 2000 mg/kg notified polymer
<i>Test method:</i>	OECD TG 401
<i>Mortality:</i>	there were no deaths during the study
<i>Clinical observations:</i>	no clinical signs of toxicity were observed during the study
<i>Morphological findings:</i>	there were no gross pathological changes observed
<i>LD₅₀:</i>	> 2000 mg/kg
<i>Result:</i>	the notified polymer was of very low acute oral toxicity in rats

9.2 Overall Assessment of Toxicological Data

The acute oral toxicity of the notified polymer is very low. No studies of dermal or inhalation toxicity or skin irritation or sensitisation were provided by the notifier, and the notified polymer cannot be classified for these health effects.

Polymers of high molecular weight do not readily cross the skin or other biological membranes, and the overall toxicity is expected to be low. The notified polymer will have surfactant properties and is a possible skin and eye irritant due to its defatting properties.

In addition, the notified polymer contains the residual monomer Bisphenol A at a level of 4 % on the basis of polymer dry weight; this chemical is on the NOHSC *List of Designated Hazardous Substances* (NOHSC, 1999a) with a concentration cutoff of 1 % and is a skin sensitiser.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier provided the following ecotoxicity data in support of their application.

<i>Test</i>	<i>Species</i>	<i>Results (nominal)</i>	<i>Reference</i>
acute immobilisation [OECD TG 202]	<i>Daphnia magna</i>	EC50 (48 hr) > 100 mg/L NOEC (48 hr) = 100 mg/L	Wetton, 1999

* NOEC - no observable effect concentration

Based on a range-finding study where daphnia were exposed to a series of five nominal test concentrations ranging from 0.01 to 100 mg/L, a limit test was conducted for the definitive study at a nominal test concentration of 100 mg/L. The test involved exposure of 40 daphnids (4 groups of 10 daphnids) to the test material over 48 hours. A further 20 daphnids (2 groups of 10 daphnids) acted as a control and were maintained under identical conditions without exposure to the test material.

Pre-study chemical analysis highlighted a difference between samples prepared in reverse osmosis water and test medium. There was a significantly lower recovery rate of the test material in test medium compared to preparation in reverse osmosis water, indicating that the test material was reacting with one or more of the components of the test medium. Precipitation of any insoluble components of the test material as a result of reaction with the test medium would mean that results would be variable if the test medium was filtered prior to analysis. As a sufficiently accurate method of analysis could not be developed for the test material in the test medium, chemical analysis was not performed during the study. Observations made on the test material preparations at 0, 24 and 48 hours showed all test concentrations to be very pale white homogenous dispersions.

There was no immobilisation or abnormal behaviour or appearance in 40 daphnids exposed to a nominal test concentration of 100 mg/L for a period of 48 hours. Hence a 48-Hour EC₅₀ of greater than 100 mg/L was indicated and correspondingly the No Observed Effect Concentration (NOEC) was equal to 100 mg/L.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Most of the polymer will remain as part of a highly cross-linked paint coating on the metal surfaces of vehicle bodies. At the end of their serviceable lives, vehicle bodies coated with primer containing the notified polymer would be either recycled for metal recovery, or placed into landfill. During the smelting of old vehicle bodies for metal recovery the polymer would

be decomposed to water vapour and oxides of carbon and nitrogen. Any polymer incinerated as a result of industrial waste disposal practices would be decomposed in a similar manner. Some polymer may be placed into landfill, either as a coating on old vehicle parts, in waste from spillage, in sludge from coating baths or other losses (estimated to be < 9 % of total imports, or 22.5 tonnes). Although the polymer is not expected to be biodegradable, it is expected that over a prolonged period the polymer would be very slowly degraded by abiotic and biological processes, producing water and oxides of carbon and nitrogen.

An ecotoxicity study indicated that the polymer is not toxic to daphnia (48 h EC₅₀ > 100 mg/L (nominal) with a NOEC = 100 mg/L). It is likely that fish would not experience toxicity to the polymer. Further, it is unlikely that the polymer will be released into the water compartment in a non cross-linked form. Consequently, the risk to the aquatic environment from normal use of the polymer is assessed as low.

The polymer is not expected to be mobile in the soil compartment, and is unlikely to bioaccumulate.

The notified polymer is not likely to present a hazard to the environment when it is stored, transported and used in the proposed manner.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Little toxicological data has been provided and the notified polymer cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b). The notified polymer is of very low oral toxicity. Polymers of high molecular weight do not readily cross the skin or other biological membranes, and the overall toxicity is expected to be low. The polymer has surfactant properties and could be a skin and eye irritant due to defatting properties. The Material Safety Data Sheets (MSDS) for the imported products ED-6650 and E-6176 Electrocoats indicate that these are possible skin and eye irritants. The notified polymer is a hazardous substance based on the concentration of the residual monomer Bisphenol A (4 %); this chemical is on the NOHSC *List of Designated Hazardous Substances* (NOHSC, 1999a) with a concentration cutoff of 1 % and is a skin sensitiser. However the concentration of Bisphenol A in the imported primer is below 1 % and the imported product is therefore not classified as a hazardous substance on this basis.

The MSDS for the imported products list a number of potential health effects due to inhalation, namely nausea, headaches, dizziness, mucous membrane and respiratory irritation and central nervous system depression. These relate mainly to the solvents present in the products 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 primer components containing this polymer.

The system by which the primer component is dispensed and used is enclosed, and exposure to the notified polymer is only likely when containers are coupled and uncoupled from the production line, when samples of the electrodeposition bath are removed for testing to allow the concentration of polymer in the bath to be maintained, and during electrodeposition bath

cleaning. In normal operation, the electrodeposition bath containing the notified polymer will be completely enclosed due to the electrocution hazard associated with the electrodeposition process.

Plant operators and laboratory staff who may come into contact with the notified chemical should take adequate precautions, including the wearing of protective clothing, eyewear and gloves to prevent dermal or ocular exposure.

After the car bodies coated with the primers including the notified polymer have been baked and overcoated with additional paint layers, the notified polymer will not be available for exposure.

Public Health

There is little potential for public exposure to the notified polymer arising from use in automobile primers. There is little chance of public contact with the notified polymer in the lower paint layers of motor vehicles, and its adhesion to the substrate and the physico-chemical properties of the cured primer will be sufficient to preclude absorption across the skin or other biological membranes. Therefore, based on its use pattern and physico-chemical characteristics, the notified polymer will not pose a significant risk to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in WE-58-2954 the following guidelines and precautions should be observed:

- 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;
- 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) and other internationally acceptable standards.

14. MATERIAL SAFETY DATA SHEET

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

The MSDS for E-6176 Electrocoat 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, the director must be informed if any of the circumstances stipulated under subsection 64(2) of the Act arise, and secondary notification of the notified chemical may be required. No other specific conditions are prescribed.

16. REFERENCES

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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.

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