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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in WE-87-2934

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Polymer in WE-87-2934****1. APPLICANT**

PPG Industries Australia Pty Ltd of McNaughton Road, Clayton, Victoria, 3168 has submitted a limited notification statement in support of their application for an assessment certificate for the new synthetic polymer in WE-87-2934.

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-87-2934
E6126 cationic vehicle

3. PHYSICAL AND CHEMICAL PROPERTIES

The following data relate to the imported product WE-87-2934 which contains the notified polymer at a concentration of 10 - 29 % w/w dispersed in water/2-butoxyethanol (97:3). The polymer itself is never isolated from the *in situ* manufactured acrylic resin solution.

**Appearance at 20°C
and 101.3 kPa:** colourless viscous liquid

Boiling Point: not determined

Specific Gravity: 1.03 (for the dispersion)

Vapour Pressure: 2.3 kPa (for the dispersion; see comments below)

Water Solubility: < 186 mg/L (30 % notified polymer in dispersion, pH 7;
see comments below)

**Partition Co-efficient
(n-octanol/water):** Log P_{ow} = 1.33

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:	polymer expected to be stable under normal use conditions
Reactivity/Stability:	stable at ambient temperatures

Comments on Physico-Chemical Properties

Specific gravity, vapour pressure and water solubility were measured for the notified polymer as a 30 % aqueous dispersion, also containing a low level of 2-butoxyethanol.

Water solubility data could not be determined by the standard flask method specified by OECD guidelines because the notified polymer could not be separated from saturated solutions by centrifugation and/or filtration. Hence a visual estimation was carried out using Ultra-Violet spectroscopy. A mixture of the test material and glass double-distilled water adjusted to pH 7.0 with 0.1M sodium hydroxide. The mixture was shaken for 1 minute. The extent of dissolution was assessed visually.

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

The n-octanol/water partition co-efficient is relatively low however, the notified polymer can still be expected to bind moderately to, or be associated with, soil and sediment.

Adsorption to the mineral surface is not expected to be very strong, but due to the relatively low water solubility, high mobility of the polymer through the soil would not be expected. Furthermore, upon drying the polymer crosslinks to form an insoluble clear solid that would be immobile.

The polymer does contain dissociable amine groups that could behave as typical aliphatic amines and be appreciably basic. Consequently, they would be protonated and carry positive electrical charge in the usual environment pH region where $4 < \text{pH} < 9$

4. PURITY OF THE CHEMICAL

Degree of Purity: up to 30 % in aqueous dispersion

Maximum Content of Residual Monomers: All residual monomers are present at below the cutoff levels for classification of the polymer as hazardous. Other reactants used in forming the final polymer are also below the respective cutoff levels for classification of the polymer as hazardous.

Toxic or Hazardous Impurities:

The toxic or hazardous impurities 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.

<i>Chemical name:</i>	benzyldimethylamine
<i>CAS No.:</i>	103-83-3
<i>Weight percentage:</i>	confidential
<i>Toxic properties:</i>	On the NOHSC <i>List of Designated Hazardous Substances</i>
	R20/21/22 Harmful by inhalation, in contact with skin and if swallowed
	R34 Causes burns

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

Additives/Adjuvants:

<i>Chemical name:</i>	2-butoxyethanol
<i>CAS No.:</i>	111-76-2
<i>Weight percentage:</i>	confidential

Toxic properties:

On the NOHSC *List of Designated Hazardous Substances*

R20/21/22 Harmful by inhalation, in contact with skin and if swallowed

R36 Irritating to eyes

R37 Irritating to respiratory system

NOHSC exposure standard 25 ppm TWA with skin notation

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. Initially, it will be imported as part of an aqueous coating resin formulation at a concentration of less than 5 % (w/v). Later it will be imported as a resin dispersion at a concentration of up to 30 % (w/v) in water/2-butoxyethanol (97/3) and blended locally to produce the aqueous coating resin formulation. The formulated product will be diluted by approximately a factor of two prior to end use. The coating resin formulation and aqueous resin dispersion will be imported in 200 L drums or 1000 L tote tanks.

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 22 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 13 possible customer sites in Australia. After the first year, the notified polymer will be imported as a 30 % dispersion for local blending. The blended product will then be delivered by tanker to the customer sites. The notifier expects that 2 waterside workers and 2 warehouse workers, along with an unspecified number of transport drivers, will handle the containers of the coating formulation or resin dispersion containing the notified polymer, for approximately 2 hours, 30 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.

During tanker transfer, there is possible exposure of drivers and storage workers being exposed to drips and spills containing the notified polymer while connecting and disconnecting transfer hoses.

Reformulation

The blending operation, when commenced, will be carried out in a sealed, automated blending system. The imported resin dispersion, containing up to 30 % notified polymer will be pumped from the import containers into the sealed blend tank and mixed with water and other ingredients to produce the formulated aqueous coating resin product, containing up to 5 % notified polymer. The reformulated product will be pumped to a storage tank, and then to delivery tankers.

The notifier estimates that 2 plant operators and 1 laboratory worker will be involved in handling the notified polymer in this operation. The exposure is estimated to be for 4 hours per day, 50 days per year.

Dermal exposure to drips and spills containing the notified polymer will be possible when containers are exchanged and transfer hoses connected and disconnected. The product will be sampled through sampling valves, and dermal exposure is also possible at this time, as well as during laboratory testing.

The notifier states that workers handling the notified polymer during this process would wear impervious gloves, coveralls and goggles.

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 2 plant operators per shift will be exposed to the notified polymer at each production facility. The exposure is estimated to be for 2 hours per shift, 250 times per year.

The product containing the notified polymer will be transferred 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 product can alternatively be pumped from the imported drums directly into the water bath where it is used by drum lance. Again the transfer from the imported container will involve possible dermal exposure to drips and spills.

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 operators to the bath contents is possible during sampling. The testing is performed by laboratory personnel. Dermal exposure of these workers is also possible.

Exposure during disposal and plant cleaning is unlikely, as the process is continuous with no buildup of impurities which would require the changeover of bath solutions. The notifier states that changing from one electrodeposition paint system to another would be done by adding the new paint materials when topping up the bath contents, so that the bath contents would be gradually changed and no cleaning and disposal would be required.

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.

Plant operators 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 general 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 negligible.

8. ENVIRONMENTAL EXPOSURE

Release

There is potential for release of the notified polymer by accidental spillage during transfer of the imported dispersion to the enclosed blending system at the notifier's plant. Potential for spillage also exists when transferring the blended product from the storage tank to delivery tankers. Such spills will be contained to the plant by existing bunding, and collected by licensed waste disposal contractors.

The hoses, pumps and tanks used during the blending process are rinsed with water and the rinsate is returned to the process. Very little waste is therefore produced during the blending process.

The notifier estimates that 220 kg per annum of residue will remain in the empty containers after use, and 10 kg per annum of residue from test samples will occur. A further 55 kg per annum may result from spills during local blending operations.

The majority of the aqueous coating resin product will be delivered to the customers in bulk in returnable tanks and transferred to the customer's storage tank using a coupling hose. The returnable tank and hoses will be rinsed with water and the rinsate added to the storage tank. There is potential for release of the notified polymer by accidental spillage at this stage. Such spills would be contained by bunding, and would be collected by licensed waste disposal contractors. The notifier estimates that a further 22 kg per annum of notified polymer may be released in this way.

It is likely that the release estimates provided by the notifier are low, and a reasonable estimate would be 3.5 % of the imported volume (spillage 1 %, cleaning 1 % and residue 1.5 %). This would result in the release of approximately 770 kg of notified polymer per annum.

Due to the manner in which the new polymer is used, very little release of the liquid polymer formulation is anticipated during application to the vehicle bodies. The notifier has indicated that any spills that occur during this process are contained within bunded areas and collected by licensed waste disposal contractors. After collection, this waste (presumably combined with other liquid wastes) is treated by flocculation, filtration and centrifugation, which separates the solid polymeric material from the water. The water is discharged to sewer, while the solid sludge is dried and sent to a secure landfill. Empty drums are sent to a drum recycler and are cleaned by incineration.

The cleaning of the application bath is normally done every 2 years. The product is pumped from the bath to a reserve bulk tank and the bath cleaned with water. The wash water is removed and treated by a licensed waste contractor. Apart from accidents during transport, the possible release of uncured polymer to the environment is negligible. Furthermore, the cured polymer will be further coated with paint before release to the environment.

Fate

Once the notified polymer is applied as part of the automotive surface coating the polymer 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. 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 and nitrogen.

The small amount of solid waste generated in the application of the coating will be disposed of to landfill (although incineration is an option). Presumably, the polymer is recovered as an

insoluble solid from the wastewater used for cleaning and also disposed of to landfill. The containers and their residues will also be disposed of in this manner.

When deposited into landfill as residues from transport containers or sampling apparatus, the organic components of the paint coating including the new polymer would be inert and immobile, but could nevertheless be expected to be very slowly degraded through the biological and abiotic processes operative in these facilities. Leaching of the polymer from landfill from these sites is unlikely, given the low solubility of the substance.

A study was performed to assess the ready biodegradability of PMN 2155 using the Closed Bottle Test (OECD TG 301B) (Sewell, 1997c). Sealed bottles containing the test substance (6.5 mg/L) and inorganic nutrient medium were inoculated with activated sewerage sludge bacteria and incubated for up to 28 days at 20°C. Biodegradation was assessed by the determination of CO₂ produced. The test substance attained 86 % degradation after 28 days. Therefore, PMN 2155 may be termed readily biodegradable.

The polymer is not expected to cross biological membranes, due to low solubility, high molecular weight and the expected limited exposure to water is likely to inhibit the bioaccumulation potential of PMN 2155.

9. EVALUATION OF TOXICOLOGICAL DATA

There is no toxicity data on the notified polymer. Data are available for a 30 % aqueous dispersion, also containing a low level of 2-butoxyethanol (referred to as PMN 2155). The dose was corrected for the concentration of active ingredient.

9.1 Acute Toxicity

9.1.1 Oral Toxicity (Allen, 1994)

<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; 30 % 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, which is acceptable for a limited notification of a polymer with NAMW > 1000.

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 could be a skin irritant through skin defatting. It is also potentially basic or acidic, depending on the conformation of the polymer in the micelles, and could have irritant properties associated with the pH of the aqueous polymer dispersion.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicity data is required according to the Act, since the notified polymer has a number average molecular weight (NAMW) > 1000. However, the notifier has provided the following ecotoxicity data:

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

<i>Test</i>	<i>Species</i>	<i>Results</i>
acute toxicity	rainbow trout (<i>Oncorhynchus mykiss</i>)	96 hr LC ₅₀ = 1.3 mg/L
acute toxicity	<i>Daphnia magna</i>	48 hr EC ₅₀ = 4.0 mg/L NOEC = 0.56 mg/L

* NOEC - no observable effect concentration

The ecotoxicity tests were performed in accordance with OECD Test Guidelines. The test substance used in the studies below was carried out on a 30 % aqueous dispersion, also containing a low level of 2-butoxyethanol.

The tests on rainbow trout (Sewell, 1997a) were performed using a semi-static test methodology. Groups of 10 fish were exposed to a range of nominal concentrations of 1.0, 1.8, 3.2, 5.6 and 10 mg/L of the test substance. The cumulative mortality was recorded after 3, 6, 24, 48, 72 and 96 hours. There were sub-lethal effects observed as fish swimming to the surface or bottom of test vessel at test concentrations of 1.8 – 3.2 mg/L or mortalities recorded in the groups of fish exposed for a period of 3 - 24 hours.

The Median Lethal Concentration (LC₅₀) based on nominal test concentrations was 1.3 mg/L with a 95 % confidence limits of 1.0–1.8 mg/L. The No Observable Effect Concentration (NOEC) was greater than 1.0 mg/L.

The tests on *Daphnia magna* (Sewell, 1997b) were performed using a 48 hour static acute immobilisation study. Two groups of 10 daphnids were exposed to nominal loading rates of 0.18, 0.32, 0.56, 1.0, 1.8, 3.2, 5.6, 10 and 18 mg/L. The percent immobilisation was recorded after 24 and 48 hours. The 48-Hour median concentration (EC₅₀) for the test material to *Daphnia magna* based on nominal test concentrations was 4.0 mg/L with 95 % confidence limits of 3.1 – 5.2 mg/L. The NOEC was determined to be 0.56 mg/L.

Results are based on nominal concentrations and indicate that PMN 2155 is moderately toxic to the above organisms tested.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notified polymer will be imported as a semi-finished concentrated polymer dispersion which will subsequently be reformulated to produce a primer coating solution for automobile bodies. This coating solution is then applied to car bodies in a controlled factory environment.

The polymer is applied as a primer layer and crosslinks with other paint components to form a very high molecular weight and stable paint film. The polymer, as part of the 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.

There will be some waste (< 5 %) through spillage, residues and cleaning. The majority of the notified polymer associated with the waste from the application of the coating to the automotive surface should not enter the environment until it is disposed of in landfill or incinerated. Movement of the polymer by leaching from landfill sites is not expected because of lack of mobility due to either its relatively low solubility and moderate binding affinity to soil, or crosslinking in the cured coating.

The ecotoxicity data for the notified polymer indicate that it is moderately toxic to fish (96 h LC₅₀ = 1.3 mg/L) and daphnia (48 h LC₅₀ = 4.0 mg/L). In the fish acute toxicity study, 100 % mortality was observed at a concentration of 1.8 mg/L, indicating a very steep curve. However, the potential effects of this toxicity are relatively low due to the low amounts released into the aquatic compartment and the ready biodegradability of the polymer.

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* (National Occupational Health and Safety Commission, 1994b). 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 concentrated solutions of the polymer has surfactant properties and could be a skin and eye irritant, as indicated in the MSDS. The MSDS for the polymer solution E6126 Cationic Vehicle lists 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 solvent, 2-butoxyethanol, 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 resin dispersion and the primer components containing this polymer.

The blending system in which the primer component is manufactured is enclosed and exposure to the notified polymer is only likely when containers are coupled and uncoupled from the blending system, and when samples are removed from the blend tank for testing.

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, and when samples of the electrodeposition bath are removed for testing to allow the concentration of polymer in the bath to be maintained. 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.

Public Health

There is negligible 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 hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to WE-87-2934 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 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) and AS 3765.2 (Standards Australia, 1990);
- Impermeable gloves or mittens should conform to AS 2161 (Standards Australia/Standards New Zealand, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);
- 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 the conditions of use are varied from use by industrial automobile manufacturers, greater exposure of the public to the notified polymer may occur. Under such circumstances, further information may be required to assess the hazards to public health.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994a).

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.

16. REFERENCES

Allen, D. J. (1994) PMN 2155: Acute Oral Toxicity Study (Limit Test) in the Rat, Project No. 1014/015, Safepharm Laboratories Ltd, Derby, UK

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Sewell, I. G. (1997a) PMN 2155: Acute Toxicity to Rainbow Trout (*Oncorhynchus mykiss*), Project No. 1014/016, Safepharm Laboratories Ltd, Derby, UK

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

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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, 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/Standards Association of New Zealand, Sydney/Wellington.