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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Acrylic Resin WB-020

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Acrylic Resin WB-020

1. APPLICANT

Dulux Australia of McNaughton Road CLAYTON VIC 3168 has submitted a limited notification statement in support of their application for an assessment certificate for the Polymer in Acrylic Resin WB-020.

2. IDENTITY OF THE CHEMICAL

Polymer in Acrylic Resin WB-020 is considered not to be hazardous based on the nature of the chemical and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition and details of exact import volume and customers have been exempted from publication in the Full Public Report and the Summary Report.

Method of Detection and Determination:	infrared (IR) spectrum for identification; the level of unreacted monomers was analysed by Gas Chromatography-Mass Selective Detection (GC-MSD)

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is never isolated from the polymer solution. The physico-chemical data given below are for the polymer solution unless otherwise stated

Appearance at 20°C and 101.3 kPa:	viscous clear slightly yellow with a solvent odour
Boiling Point:	anticipated to be 171°C (the boiling point of 2-butoxy ethanol)
Specific Gravity:	polymer solution: 1.11; polymer 1.34 (calculated)
Vapour Pressure:	4.9 kPa at 25°C (butoxy ethanol)

Water Solubility:	not determined
Partition Co-efficient (n-octanol/water):	not provided
Hydrolysis as a Function of pH:	not provided
Adsorption/Desorption:	not provided
Dissociation Constant:	not provided
Flash Point:	62°C (2-butoxy ethanol)
Flammability Limits:	Upper Explosive Limit = 1.1 % Lower Explosive Limit = 12.7% for 2-butoxy ethanol
Autoignition Temperature:	230°C (2-butoxy ethanol)
Explosive Properties:	not provided
Reactivity/Stability:	the polymer and its solution primarily 2-butoxy ethanol and 2-(2-butoxy ethanol) is stable but like other organic compounds should be segregated from strong oxidising agents

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Comments on Physico-Chemical Properties

The polymer contains approximately 6% by weight of a carboxylic acid functionality and the water solubility of the polymer will depend on the pH of the medium. At low pH values, at which the polymer exists predominantly in the free carboxylic acid form, the solubility in water is expected to be very low. However, at higher pH the carboxylic acid groups will be deprotonated and the resulting water solubility of the polymer will be higher (further discussed under Environmental Fate). The notifier's experience with polymer and others like it indicates that the polymer is not soluble in water. It is dispersible in water only if neutralised by amine and the organic solvents and other components of the coating formulation. However, this dispersion separates into a water and organic layer over a period of several hours suggesting that the polymer has a low solubility in water.

The polymer has a number of ester groups but hydrolysis is not expected to be significant in the environmental pH range (4-9) due to the low water solubility.

Due to the low solubility of the polymer the partition coefficient, adsorption/desorption behaviour, and dissociation constant will be difficult to measure.

The polymer will have a high partition coefficient in carboxylic acid form again due

to low water solubility.

The polymer contains dissociable carboxylic acid groups and the pKa is expected to be in the range of 3-5. In the polymer formulated product, Acrylic Resin WB-020, sufficient 2-(dimethylamino) ethanol is added to neutralise around half the carboxylic acid groups within the polymer. Hence, in the product the polymer is present as the partially neutralised salt with the corresponding ammonium cation.

Adsorptivity has a strong negative correlation with solubility. Low solubility of the carboxylic acid forms of the polymer suggests that they will have high adsorptivity coefficients. As the water and 2-(dimethylamino) ethanol are lost from the polymer formulation, it becomes viscous and tacky and the polymer will bind to soil and become fixed.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 98%

Toxic or Hazardous Impurities: there are no hazardous impurities; the free monomer levels are below those that would classify them as hazardous by the Worksafe Criteria (1)

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

Additives/Adjuvants:

Chemical Name	*CAS No.*	*Weight %*
2-butoxy ethanol	111-76-2	22.4
2(2-butoxyethanol) ethanol	112-34-5	19.6
2,2' azobis(2,4-dimethyl-) pentanenitrile	4419-11-8	4.0
2-(dimethylamino) ethanol	108-01-0	2.1

5. USE, VOLUME AND FORMULATION

The notified polymer is never isolated but imported as a solution, Acrylic Resin WB-020 (polymer solution). The polymer solution is incorporated as a film forming component of an automotive coating. TWX-700 Waterborne basecoat (basecoat). It is used to coat external primed steel of motor vehicle bodies.

The following is a schematic for the formulation procedure:

polymer solution and other ingredients ----> blending batch in a mixer testing ----> filtration and filling ---> warehouse for distribution

The basecoat will be applied at only one site by automatic electrostatic atomised spray and then heat cured. During the heat curing process, the new polymer reacts with other components in the paint formulation to form an integral part of the paint film. The notifier claims that transfer efficiencies will be approximately 75%. The following is a schematic for the application procedure.

stir -----> add to circulation tank --------> coat substrate with automatic equipment ----------> product heat cured

In the first year between 1 and 5 tonnes of Polymer in Acrylic Resin WB-020 will be imported. In the next four years up to 20 tonnes per annum will be imported.

6. OCCUPATIONAL EXPOSURE

There is the potential for transport workers to be exposed to the polymer solution during transport from the docks to the Dulux site, but this would only occur in the unlikely event of an accident spillage.

There are three main groups of workers at the Duluxe site in laboratory development, paint manufacture and paint application, that may be exposed to the polymer solution. Manufacture and testing of paint will be conducted by workers in the laboratory working eight hours per day, 20 days per year. Basecoat will be made up by workers for three hours per day, 30 days per year. Quality control testing and drum filling will be carried out for eight hours per day for 30 days per year.

The notified polymer, as a blend with other basecoat ingredients, will be filtered and transferred into 200L steel polylined drums and transported by road to one customer. There is the potential for exposure to the basecoat, containing the notified polymer, during transport in the unlikely event of spillage. When the polymer is blend is added to the circulation tank at the customer's facility, dermal and ocular exposure may occur. This work is usually conducted by one worker and it takes approximately one hour per day, 20 days per year.

During spray painting, workers will be afforded protection as the main spray booth and assembly plant repair area have down draft ventilation. Paint application involves the use automatic spray equipment in a spray booth with an effective fume extraction system thus exposure to the notified polymer and solvent components will be minimal. The notifier states that solvent vapour levels arising from use of mixtures containing the polymer (polymer solution and paint) are measured a matter of routine. Personal monitoring will be conducted for solvent levels at the

customer's site, to ensure engineering controls are operating satisfactory.

Workers will touch up the basecoat will use a hand spray for eight hour per day, 200 days per year and the spray equipment will be cleaned for one hour per day, 200 days per year. There is the potential for dermal and ocular exposure if spillage of basecoat occurs. Should a spill occur it would be contained within the plant through bunding. Good work practice however, will minimise the probability of spillage occurring.

The polymer solution contains solvents which may cause concern for occupational health. It has been classified as hazardous according to Worksafe Australia's Approved Criteria for Classifying Hazardous Substances (1) due the presence of 2-butoxy ethanol and 2(2-butoxyethoxy) ethanol and 2-(dimethylamino) ethanol. 2-butoxy ethanol and 2-(dimethylamino) ethanol are listed on the Worksafe List of Designated Hazardous Substances (2) and have the potential to cause skin, eye and respiratory irritation. 2-butoxy ethanol also has atmospheric occupational exposure standards assigned by Worksafe Australia (3). For 2-butoxyethanol a 25 ppm time-weighted average (TWA) and a skin notation indicates that it is readily absorbed by the skin.

The paint, TWX 700 Waterborne Basecoat, also contains both solvents but they are present at concentrations below the threshold for classification as hazardous.

There is an increased likelihood of inhalation exposure to potentially hazardous solvent components during mixing and filling. To minimise exposure to potentially hazardous vapours, mixers and paint filling equipment are fitted with exhaust ventilation and volatiles are captured at the source. In addition further steps should be taken to minimise exposure by means of personal protective equipment; details are provided in the recommendations section of the report.

Material Safety Data Sheets (MSDS) will be available at both sites and training is provided by Dulux and their customer for handling chemicals including the use of personal protective equipment. The control measures and safety procedures described above are considered to be satisfactory in minimising worker exposure to the potentially hazardous solvents present in the polymer solution and paint.

7. PUBLIC EXPOSURE

No public exposure to the notified polymer is expected to occur during paint formulation, manufacture or transport. However, if accidental spillage occurs the notified polymer will be contained and cleaned-up according to practices recommended in the MSDS. No public exposure to the notified polymer is expected to occur during application of the basecoat as it occurs in an automated controlled factory environment. Paints containing the notified polymer will not be sold to the public. The public will only come into contact with notified polymer after it has been applied to and becomes and integral part of a hard durable coating on motor vehicles. However, in this form Polymer in Acrylic Resin WB-020 will not be bioavailable and its incorporation into the paint film and physico-chemical

properties will be sufficient to preclude absorption across the skin or other biological membranes.

Public exposure to wastes containing Polymer in Acrylic Resin WB-020 is not anticipated given the methods of disposal and physico-chemical properties of the notified polymer in solution.

8. ENVIRONMENTAL EXPOSURE

Release

Releases to the environment will be limited to those that occur during formulation and when the paint containing the polymer is applied.

Dulux have developed a process whereby waste resin and paint are processed to reclaim solvents in which they are dissolved, and the residue converted to an inert solid which is landfilled or incinerated. Waste generated in this manner is expected to be less than 250 kg per annum. If a spill occurs during formulation it will be limited to an on-site sealed surface and contained to the plant by bunding. It will be cleaned up according to the MSDS.

Paint containing the polymer is expected to be used by only one automotive manufacturer and applied in a spray booth. The spray booth is a down draft self contained unit with a water scrubbing system (quoted efficiency of 99.6%) which uses recycled water. The paint products are applied by automatic electrostatic atomised spray. Transfer efficiencies of around 75% are expected. The water from the spray booth is treated by flocculation, which will remove most of the waste paint, with the 'clean' water returned to the spray booth. Solid residue from the flotation tanks, expected to be less than 5,000 kg per annum (25% overspray), will be sent to via a licensed waste contractor (Collex) to the Tullamarine Landfill site in Victoria.

The painted vehicles are baked to cure the polymer into a paint film. The cured polymer will be effectively inert and be disposed of with the vehicles. Releases of the cured polymer during vehicles repairs etc. will be diffuse and limited to small quantities of the cured polymer.

Transportation of the paint containing the polymer will be over short distances (within the Melbourne metropolitan area). During transport risk of environmental release is limited to accidents where the drums containing the polymer are ruptured, releasing a maximum of 16.5 kg per drum of the notified polymer.

Drums containing polymer residues will be disposed of by recycling. The drums will be recycled by a drum reconditioner where they will be incinerated, washed and recycled.

Fate

Overspray and waste paint from cleaning of spray equipment, scrubber apparatus, and filters will be disposed of to landfill where the polymer would be immobilised in the dry paint. Polymer residues in drums will be incinerated by drum recyclers. Incineration would destroy the polymer generating water and oxides of carbon and phosphorous.

The notified polymer is a water-reducible polymer. Water-reducible polymers generally contain pendant carboxylic acid groups along the polymer backbone. Although the polymer in carboxylic acid form is water insoluble, the pendant carboxylic acid groups can be neutralised with basic compounds to produce water-soluble soaps of the polymer. In this case the basic compound used is the amine 2-(dimethylamino) ethanol. The presence of the amine is critical to the water solubility of the polymer. Loss of amine, or insufficient amine, can lead to a decrease in solubility resulting in precipitation of the polymer from aqueous solution (4). Therefore, in the landfill as the solvents and 2-(dimethylamino) ethanol are lost from the polymer formulation, it is likely to become viscous and tacky and bind to the soil and be immobilised.

After application the paint dries to form a protective coating. Any waste product of the dry paint through chipping or flaking will be inert and form part of the soil and sediments.

Biological membranes are not permeable to polymers of very large molecular size and therefore bioaccumulation of the notified polymer is not expected (5).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were provided for the notified polymer, which is acceptable for polymer with a NAMW of greater than 1 000.

The notified polymer has a NAMW of greater than 1 000 and this will restrict passage across biological membranes. The notified polymer contains low levels of residual monomers which are unlikely to present a toxicological hazard. Properties of the solvents, present at higher concentrations in the polymer solution and basecoat, are more hazardous and the methods proposed by the notifier to reduce exposure to the solvents will also be sufficient to reduce exposure to the polymer.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided which is acceptable for polymers with a NAMW greater than 1,000 according to the Act.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The polymer is unlikely to present a hazard to the environment when it is incorporated into the paint and applied to automobiles. The automobiles will be consigned to landfill or recycled at the end of their useful life and the paint containing the notified substance will share the fate of the automobile.
The main environmental exposure arises from landfill disposal of recovered waste paint (up to 25% of that imported) containing the polymer. Such material will be bound to soil and remain immobile in the environment. Hence, the overall environmental hazard is expected to be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

As transport workers are only likely to be exposed to the notified polymer in the unlikely event an accident, the occupational health risk to these workers is low.

During blending, filtering and filling of drums for transport, workers may be exposed via dermal and ocular routes to the notified polymer. Due to the large NAMW of the polymer and its physico-chemical properties it is unlikely to cross biological membranes and therefore presents negligible risk to workers. Any risk due to the low molecular weight species will be minimised by the safety measures employed for the solvent components in the polymer solution.

There is however a health risk posed to workers handling the polymer solution and paint due to the solvent components. Workers should be aware that the solvent may cause skin, eye and respiratory irritation if exposure occurs. However, the engineering control measures and safety procedures at both the manufacturing and application sites are considered to be satisfactory in minimising worker exposure and result in low risk to occupational health when using the polymer solution or the paint.

Paints containing the notified polymer will not be sold to the public and no public exposure is likely to occur during plant manufacture and application. The public may be exposed to the polymer solution and basecoat in the event of accidental spillage during transport; adequate practices for clean-up and disposal are provided in the MSDS. The public will come into contact with the notified polymer as a component of heat cured, inert paint when it has been applied to motor vehicles. There will be negligible public health risk based on its physico-chemical properties and use pattern.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in Acrylic Resin WB-020
the following guidelines and precautions should be observed. It should be noted that these recommendations take into account the form in which the notified

polymer is imported (in solvent solution) and the fact that the polymer is never isolated..

- Safe practices for handling any chemical formulation should be adhered to and include:

  - minimising spills and splashes;
  - practicing good personal hygiene; and
  - practicing good house keeping and maintenance including
  - bunding of large spills which should be cleaned up promptly
  - with absorbents and put into containers for disposal.

- It is expected that in the industrial environment, protective clothing conforming to and used in accordance with Australian Standard (AS) 2919 (6) and protective footwear conforming to Australian/New Zealand Standard (AS/NZS) 2210 (7) should be worn as a matter of course. In addition, it is advisable when handling the polymer solution or hasecoat containing potentially hazardous solvents to wear chemical-type goggles (selected and fitted) according to AS 1336 (8) and meeting the requirements of AS/NZS 1336 (9); impermeable gloves AS 2161 (10) should be worn to protect against any unforeseen circumstances.

- Exposure standards should be observed to minimise exposure to hazardous components in the polymer solution and basecoat application, and appropriate personal protective equipment should be used.

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

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical were provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (11).

These MSDS were provided by the applicant as part of the notification statement. These are 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

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

2. National Occupational Health and Safety Commission, 1994. *List of Designated Hazardous Substances (NOHSC:10005(1994),* Australian Government Publishing Service Publ., Canberra.

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

4. Browning, S.B. (1983) *Water Reducible Resins. In: Surface Coatings Raw Materials and Their Use.* Vol 1, The New South Wales University Press, NSW, Australia. pp 263-293.

5. Gobas FAPC, Opperhuizen A & Hutzinger O (1986) Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation. Environmental Toxicology and Chemistry 5:637-646.

6. Standards Australia 1987, *Australian Standard 2919-1987, Industrial Clothing*, Standards Association of Australia, Sydney.

7. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear*, Part 1: Guide to Selection, Care and Use. Part 2:Specifications, Standards Association of Australia Publ., Sydney, Australia, Standards Association of New Zealand Publ., New Zealand.

8. Standards Australia 1994, *Australian Standard 1336-1994*, *Eye protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney.

9. Standards Australia/Standards New Zealand 1992, *Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications*, Standards

10. Standards Australia 1978, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding electrical and medical gloves),* Standards Association of Australia Publ., Sydney.

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