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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in Multiguard Hardener

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Director
NICNAS

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1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Wattyl Australia Pty Ltd (ABN 40 000 035 914)
2-44 Graingers Road
West Footscray VIC 3012

NOTIFICATION CATEGORY
Limited: Polymer with NAMW ≥ 1000 (greater than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication:
Chemical identity details
Manufacture volume
Identity of sites
Formulation details

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows:
Melting / boiling point
Density
Vapour pressure
Water solubility
Hydrolysis as a function of pH
Partition coefficient
Adsorption / desorption
Dissociation constant
Particle size
Flash point
Autoignition temperature
Flammability limits
Explosive properties

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
None

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Multiguard Hardener (product containing the notified polymer)
Multiguard Part B

SPECTRAL DATA

METHOD	IR
Remarks	A reference spectrum was provided

3. COMPOSITION

DEGREE OF PURITY
99%

DEGRADATION PRODUCTS
The combustion products of pyrolysis are expected to include hydrocarbons, oxides of carbon and nitrogen, and water.

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
Expected to be stable under normal use conditions. The polymer will be further polymerised during use, when it is mixed with the other component of the two-part system.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified polymer will be manufactured in Australia.

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	1-3	1-3	1-3	1-3	1-3

USE
Hardener in two-part epoxy coating system for marine applications.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, transport and storage

PORT OF ENTRY
Not applicable, as the notified polymer will be manufactured in Australia.

TRANSPORTATION AND PACKAGING
After manufacture, the solution containing the notified polymer will be stored at the site of manufacture in 200 L steel drums. It will be transported by road to the end-use customer sites in Victoria in these 200 L drums and in 5 L and 20 L steel pails.

5.2. Operation description

Polymer manufacture
The notified polymer will be manufactured as a solvent-based emulsion. Monomers and solvents will be pumped into a closed tank where polymerisation occurs. The polymer solution containing 30 to 60% of the notified polymer will be sampled for quality control (QC) testing before being pumped into 200 L steel drums for storage. Some of the solution will be transferred into 5 L and 20 L steel pails prior to transport to end-use sites.

End-use
At the end-use application sites, the paint containing the notified polymer (hardener, also known as Part B of the epoxy) will be mixed with another paint component (Part A) before being applied to boat hulls by brushes, rollers or airless sprayers. A further polymerisation reaction will occur when Part A and Part B are mixed.

5.3. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*

Manufacture			
Reactor operator	25	8 h/day	80-100 days /year
Maintenance personnel	2	1-2 h/day	80-100 days /year
Laboratory personnel	5	8 h/day	80-100 days /year
Warehouse and repacking personnel	4	2-4 h/day	100-130 days /year
Transport – truck drivers	10	1-2 h/day	40-50 days /year
End-use			
Paint applicators	100	5 h/day	20 days /year
Paint application maintenance personnel	2	1-2 h/day	20 days /year

Exposure Details

Manufacture, repacking and storage

Reactor operators, warehouse and repacking staff, laboratory personnel and maintenance workers in the manufacturing plant may be exposed to the notified polymer at 30 to 60% in solution, as manufactured. Dermal exposure could occur during transfer, cleaning and drum or pail-filling operations, however inhalation exposure is not likely, as the polymer has a low vapour pressure and generation of aerosols is not expected. Exposure during manufacture would be reduced because the reactor is enclosed, and transfer occurs using fixed lines. Because of other hazardous materials in the polymer solution, mechanical ventilation and a high level of personal protective equipment (PPE) are used in the above processes. PPE includes chemical resistant gloves, coveralls and goggles, and organic vapour respirators are available for use if required.

Transport

Drums and pails of solutions containing 30 to 60% of the notified polymer will be transported by road to customer sites. Tanker drivers may be exposed to the paint in the case of accidental spills.

End-use

At the end-use sites, product containing 30 to 60% of the notified polymer (known as hardener or Part B) will be decanted and mixed with another paint component (Part A) by operators, and applied to boat hulls by brushes, rollers or airless sprayers. Dermal exposure may occur during any of these processes, and inhalation or ingestion exposure may also occur during spray application. Only natural ventilation is available at the end-use sites. Operators will wear chemical resistant gloves, coveralls and goggles. Organic vapour respirators will be worn during spray application.

Maintenance workers at the end-use sites will repair and clean equipment such as spray guns, brushes and rollers. They will wear chemical-resistant gloves, coveralls and goggles; organic vapour respirators will also be used if required.

Overspray of the paint may result in dust containing the notified polymer being deposited on surfaces surrounding the spray area. Where possible the dust will be collected on protective sheeting and disposed of by waste contractors. Inhalation and dermal exposure to the dust may occur.

5.4. Release

RELEASE OF CHEMICAL AT SITE

The polymer solution is manufactured and formulated in closed reactors and drummed off for further processing into coating products. Environmental release of the notified polymer is unlikely during manufacture and storage on site. Should a spill occur it will be contained to the plant by existing bunding. The notifier expects that at most 1% of the notified polymer (<30 kg at the maximum proposed rate of manufacture) will be lost due to spills that during formulation via mixing vessels, holding vessels, filling pots and lines and empty drums. All equipment will be washed with recycled solvent resulting in approximately 2% (60 kg) waste of the notified polymer. Wastes will be removed from the site by a licensed waste contractor.

RELEASE OF CHEMICAL FROM USE

The notified polymer is formulated into one part of a two part coating system which will be mixed prior to application and applied to the hulls of boats. The majority of the coatings will be applied using spray application techniques with small areas applied using brushes or rollers. Losses through spray application include overspray (30%) and equipment cleaning (1-2%). Application using brushes and rollers results in releases from dripping (<1%) and equipment cleaning (generally 5%). Application will occur in dry docks, and it is anticipated that overspray will be collected on protective sheeting and surrounding surfaces and wherever possible disposed of by licensed waste contractors.

Residues in coating containers are expected to account for less than 1% of the import volume of the

notified polymer. At the maximum proposed volume of manufacture this would equate to 30 kg of the notified polymer which will be disposed of through drum recyclers or disposed of to landfill adhering to the containers.

As a worst case, assuming 100% of the coating is applied through spray application, the maximum total amount of the notified polymer land filled or incinerated as a result of use of the coatings containing the notified polymer is:

$1\%_{container} + 30\%_{over\ spray} + 2\%_{cleaning} = 33\%$ of notified polymer manufactured in Australia.

Thus, at the maximum proposed volume of manufacture of 3 tonnes per annum, 990 kg is the maximum that will be lost to the environment through application.

There is potential release of the notified polymer coating dust from the preparation of old surfaces with abrasive blasting and hydroblasting, which would include flakes and chips of coating. Washdown of slipways and hulls in dry dock could be a localised source of contamination of the aquatic environment. Losses of the notified polymer occurring from removal after service periods and during application will be collected in the discharge bunding of the slipways and dry docks.

5.5. Disposal

Waste notified polymer will be generated annually during the manufacture of the coating and in cleaning coating equipment. This waste will largely be disposed of through licensed waste disposal contractors, generally this is likely to be landfilled but may be incinerated. It is expected that the drums recycling will be cleaned by incineration. Waste coating such as from overspray is also most likely to be land filled.

5.6. Public exposure

Public exposure to the notified chemical is not expected under normal use conditions as it manufactured and used under industrial conditions. Exposure to the paint containing <20% of the notified polymer could occur if an accident occurred in transport. After mixing with another paint component and application to boat hulls and curing of the coating, the notified polymer will be part of a solid matrix and not available.

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20ºC and 101.3 kPa Yellow liquid (polymer solution)

Melting Point/Freezing Point Not determined

Remarks The notified polymer is manufactured in solution and is not isolated.

Density Not determined

Remarks The notified polymer is manufactured in solution and is not isolated.

Vapour Pressure Not determined

Remarks The vapour pressure is expected to be low, based on the molecular weight.

Water Solubility Low solubility

METHOD Qualitative testing only was carried out, using the polymer solution.

Remarks A 0.1 g aliquot of the polymer solution containing 30 to 60% of the notified polymer was mixed with 1 mL, 2 mL, 10 mL, 100 mL and 200 mL of water. The mixtures were stirred and allowed to sit for 96 h, and observed at 24 h intervals.
All the samples precipitated and appeared to be only slightly miscible with water.
The solubility of the polymer solution was estimated to be 0.1 to 1 mg/L.

TEST FACILITY Wattyl (2005)

Hydrolysis as a Function of pH Not Determined

Remarks Based on the provided structural formula the notified polymer does not contain any functional groups which would be expected to hydrolyse under the environmental pH range (4-9).

Partition Coefficient (n-octanol/water) Not Determined

Remarks No data is available for the partition coefficient for the notified polymer. Based on the provided structural formula and low water solubility the notified polymer would be expected to have a relatively high partition coefficient.

Adsorption/Desorption Not Determined

Remarks Based on the low water solubility, cationic nature and expected high partition coefficient the notified polymer is expected to adsorb to soils and sediments.

Dissociation Constant pKa not provided

Remarks The notified polymer contains amine groups and can be expected to be protonated throughout the environmental pH range (4-9).

Particle Size Not determined

Remarks Not applicable as the polymer is never isolated from solution

Flash Point Not determined

Remarks The flashpoint of the polymer solution is reported to be 31^0C. This is considered to be due to the solvent content.

Autoignition Temperature Not determined

Remarks The autoignition temperature of the polymer solution containing 30 to 60% of the notified polymer is reported to be > 305^0C.

Explosive Properties

Remarks From examination of the polymer structure, there are no chemical groups that would infer explosive properties. The reported lower explosion limit of the polymer solution is 1.04%.

Reactivity

Remarks The notified polymer will polymerise further when reacted with Part A of the epoxy paint.

7. TOXICOLOGICAL INVESTIGATIONS

No toxicity data were submitted.

8. ENVIRONMENT

8.1. Environmental fate

No environmental fate data were submitted.

8.2. Ecotoxicological investigations

No ecotoxicity data were submitted.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

Up to 90 kg of notified polymer is expected to enter the environment each year due to polymer and coating manufacture, while up to 990 kg of notified polymer will be released locally due to wastes generated during coating use. It is expected that waste generation and disposal will occur at the several use sites, with the majority being released through overspray (accounting for up to 900 kg annually), which after recovery in dry docks using protective sheeting will be directly disposed of to landfill. Some may fall to the ground. Up to 90 kg from cleaning of equipment will go to solvent recovery companies and then to landfill in the sludge that is generated. Residues in coatings containers (<30 kg) will be disposed of to landfill as a cured coating on the containers or incinerated during container recovery. In soil environments, the notified polymer is not expected to be mobile or leach from the soil into ground or surface water, but rather is expected to bind to the organic and mineral phases in soils. Under these conditions it would be slowly degraded to gases such as carbon dioxide and oxides of nitrogen through the agency of abiotic and biotic processes.

Under normal usage, the notified polymer is not expected to enter the aquatic environment. The majority of the notified polymer will end up being applied as a two pack coating system which will be mixed prior to application. The coating components will react to form an inert cross-linked coating on the boat hulls to which it has been applied.

The cured polymer will be exposed to the aquatic environment as a result of it use pattern either on the hulls of ships or as coating dust from the preparation of old surfaces with abrasive blasting and hydroblasting, which would include flakes and chips of coating. However, in both cases this will not occur until after the polymer has been reacted with the second part of the coatings formulation to form an inert crosslinked polymer matrix.

The polymer incorporated in this coating will ultimately either be removed by the abrasive techniques outlined above or disposed of along with the surfaces which will either go to metal recyclers or be disposed of to landfill. Abrasively removed coating will be collected and either incinerated or disposed of to landfill. During metal recycling, the coating matrix will be destroyed via incineration generating water and oxides of carbon and nitrogen.

Due to the nature of the release pattern a Predicted Environmental Concentration (PEC) cannot be estimated.

In the event that the unreacted polymer enters the aquatic environment, it is expected to partition mainly into sediment and sludge owing to its low water solubility in the environmental pH range.

9.1.2. Environment – effects assessment

The notified polymer has a number average molecular weight greater than 1000 and therefore is not likely cross biological membranes. The polymer is also potentially polycationic throughout the whole environmental pH range of 4-9. Polycationic polymers have been shown to be very highly toxic to aquatic organisms (Boethling and Nabholz 1997).

9.1.3. Environment – risk characterisation

A risk quotient cannot be calculated as an accurate PEC cannot be estimated. However, the notified chemical is not expected to pose any significant hazard to the environment. The proposed application and the anticipated use of the product at several sites indicate that the levels of release of the notified polymer to the environment will be dispersed. Though the notified polymer is potentially toxic, under normal usage there will be no release into the aquatic environment.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

No exposure to transport or warehouse workers is expected, except in the case of accidental breaching of the containers.

There is potential for worker exposure to the notified polymer during its local manufacture, and repacking at the same site. Dermal exposure is the most likely, because the polymer would have a low vapour pressure and no aerosols are expected to be generated during these procedures. The engineering and PPE controls in place at the manufacturing site should be sufficient to minimise exposure.

The greatest potential for exposure would occur at end-use sites, during mixing and application of paints containing the notified polymer to boat hulls. The extent and type of exposure is likely to be related to the method of application. During mixing of the paint components and application by brush or roller, exposure would be primarily dermal. The protective clothing used to reduce exposure includes gloves, coveralls and goggles.

In addition to dermal exposure, spray application may also lead to inhalation and ingestion exposure through formation of aerosols. This method of application may also generate dust after drying of the spray, which may contain both the notified polymer and its reaction product with the other component of the coating. Only natural ventilation is available. The additional PPE available for use in spray application are organic vapour respirators.

9.2.2. Public health – exposure assessment

The public is not expected to have other than incidental exposure to the notified polymer. It is possible that spills during transport of the coating component may lead to accidental exposure. Once the coating components are mixed, applied to boat hulls and cured, the notified polymer will be contained in a solid matrix and/or further reacted with the other component of the coating, and will not be bioavailable.

9.2.3. Human health – effects assessment

No toxicological data were supplied on the notified polymer. Its stated low level of residual monomers and estimated number average molecular weight of > 1000 would reduce absorption, however it is estimated to contain a significant proportion of low molecular weight species of < 1000 (15%)and < 500 molecular weight (10%).

Amine hardeners are in general known to be irritating or corrosive, potentially affecting the eyes, skin and respiratory tract. They are also considered to be potent sensitisers (DermNet NZ 2005). Epoxy amine adducts such as the notified polymer are expected to be less irritating and sensitising than lower molecular weight amines (HSE, 2003). The notifier has classified the notified polymer as a skin and eye irritant and identified it as a likely skin sensitiser. In the absence of toxicological data, other acute and chronic health effects cannot be ruled out.

Based on the available data on substances with similar functional groups, the notified chemical would be classified as a hazardous substance in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC 2004).

9.2.4. Occupational health and safety – risk characterisation

There is potential exposure to workers to the notified polymer via dermal contact during manufacture, repacking and end-use as a coating component. In addition, there is the potential for inhalation / ingestion exposure during end-use by spray application of the coating.

Based on similar substances, the expected toxicological characteristics of the notified polymer would include skin, eye and respiratory irritation and sensitisation. These characteristics may be lessened because the number average molecular weight is > 1000, however a significant proportion of low molecular weight species are present.

At the manufacture / repacking site, engineering and PPE controls, in conjunction with appropriate safe work practices, are expected to limit dermal exposure.

The highest risk is likely to occur at end-use sites, where the coating component containing the notified polymer is measured and mixed with another component, before being applied to ship hulls by brush, roller or airless sprayer. At these sites, PPE is available to reduce dermal exposure. Only natural ventilation is available during spray application. Organic respirators will be used, but these may not provide sufficient protection. Inhalation or dermal contact with dust from overspray may also produce irritation or sensitisation, as curing of the coating may not occur immediately (DermNet NZ 2005).

The notified polymer is manufactured and supplied in solution with other hazardous chemicals, and the precautions against exposure to these chemicals, may reduce exposure and risk from the notified polymer.

Overall the risk to workers can only be considered low if appropriate controls are in place at all workplaces where the notified polymer is handled or used, especially where spray application occurs.

9.2.5. Public health – risk characterisation

The notified polymer is expected to be a hazardous substance, with irritation and sensitisation characteristics. However, public exposure is only likely to occur to cured coatings containing the polymer, where it would not be bioavailable. Overall the risk to the public is considered low.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.1. Hazard classification

Based on the available data on the notified polymer itself, it cannot be classified under the NOHSC *Approved Criteria for Classifying Hazardous Substances*.

Based on the characteristics of chemicals with similar functional groups, the notified polymer is expected to be irritating to skin, eyes and the respiratory tract and to have sensitising properties.

10.2. Environmental risk assessment

The chemical is not considered to pose a risk to the environment based on its reported use pattern.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is Moderate Concern to occupational health and safety under the conditions of the occupational settings described, due to the risk of sensitisation and irritation. This risk will be reduced by the implementation of appropriate controls at the coating application sites.

10.3.2. Public health

There is Negligible Concern to public health when used as a component of a coating for boat hulls.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS of the product containing the notified chemical provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC 2003). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

NICNAS has recommended that the MSDS be revised in accordance with the recommended hazard classification, and that editorial changes be made to improve clarity.

11.2. Label

The label for the product containing the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC 1994). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

REGULATORY CONTROLS
Hazard Classification and Labelling

- Based on the characteristics of similar substances, the notifier should apply the following health hazard classification for the notified polymer:
  - Xi: R36/37/38 Irritating to eyes, respiratory system and skin.
  - Xi: R43 May cause sensitisation by skin contact

- Use the following risk phrases for products/mixtures containing the notified chemical:
  - Conc $\geq$ 20%: R36/37/38, R43
  - 1% $\geq$ conc < 20% R43

Health Surveillance

- As the notified chemical is expected to be a sensitiser, employers should carry out health surveillance for any worker who has been identified in the workplace risk assessment as having a significant risk of dermatitis or respiratory allergy.
- Sensitised workers should be advised not to handle the notified polymer further.

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following isolation and engineering controls to minimise occupational exposure to the notified chemical during manufacture, packing and end-use:
  - Isolation of spray working areas where possible;
  - Handling to be carried out under mechanical ventilation where possible.

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer during manufacture, packing, cleaning and end-use:
  - Avoid skin and eye contact;
  - Avoid breathing spray;
  - Avoid spills and splashes, and clean up any spilt material promptly;
  - Collect and dispose of over-spray waste without exposing workers to dust;
  - Avoid skin contact with uncured coating when removing personal protective equipment; and
  - Application of the coating should be according to the NOHSC National Guidance for Spray Painting (1999).

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified chemical during manufacture, packing, cleaning and end-use:
  - Protective clothing and equipment to prevent dermal exposure during all processes;
  - Appropriate respiratory protection where there is potential exposure to spray or dust during end-use (for vapour or for dust). This should meet the requirements set

out under the NOHSC National Guidance for Spray Painting (1999) for epoxy resins.
– Eye protection.

Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- The MSDS should be revised according to the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 2003) to reflect the recommended health hazard classification.

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

- If products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

- The following control measures should be implemented by end users to minimise environmental exposure during use of the notified chemical:
  Do not allow material or contaminated packaging to enter drains, sewers or water courses.

Disposal

- The notified polymer should be disposed of by incineration or to landfill in accordance with State/Territory waste disposal regulations.

Emergency procedures

- Spills/release of the notified polymer should be handled by absorbing onto an inert material, scooping up and placing in marked containers for disposal.

12.1. Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(1) of the Act; if
– the notified polymer is made available to the public.

or

(2) Under Section 64(2) of the Act:
– if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

13. BIBLIOGRAPHY

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