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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in 465-712

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (Cwlth) (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the Department of Health and Ageing, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of the Environment, Water, Heritage and the Arts.

For the purposes of subsection 78(1) of the Act, this Full Public Report may be inspected at our NICNAS office by appointment only at 334-336 Illawarra Road, Marrickville NSW 2204.

This Full Public Report is also available for viewing and downloading from the NICNAS website or available on request, free of charge, by contacting NICNAS. For requests and enquiries please contact the NICNAS Administration Coordinator at:

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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)
4 Steel Street
Blacktown NSW 2148

NOTIFICATION CATEGORY
Limited: Synthetic polymer with Mn ≥ 1000 Da.

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication:
Chemical name; Other names; Molecular formula; Structural formula; Molecular weight; Polymer constituents; Spectral data; Methods of detection and determination; Impurities/residual monomers; Additives and adjuvants; Manufacture volume; Details of use; Identity of manufacturer/recipients.

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

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
None

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
465-712 (containing approximately 60% of the notified polymer)

MOLECULAR WEIGHT
Mn >1000 Da

ANALYTICAL DATA
Reference IR and GPC spectra were provided.

3. COMPOSITION

DEGREE OF PURITY >95%

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20°C AND 101.3 kPa: Viscous liquid

Property	Value	Data Source/Justification
Melting Point	Estimated to be <20 °C	The notified polymer is a liquid at room temperature.
Boiling Point	Not expected to boil	Based on its high molecular weight. It is likely

		to decompose at high temperatures (>200°C).
Density	Likely to be ~1.03	See Discussion below
Vapour Pressure	Estimated to be < $1.3x10^{-9}$ kPa	Based on the molecular weight of > 1000 Da (USEPA, 2007).
Water Solubility	< 0.5 g/L at 20°C	Measured, but likely to be much lower based on structural considerations.
Hydrolysis as a Function of pH	Not expected to hydrolyse at pH range of 4-9	See Discussion below
Partition Coefficient (n-octanol/water)	Expected to become associated with the octanol phase	Based on its low water solubility.
Adsorption/Desorption	Expected to be immobile in soil and associated with soil and sediment	Based on its low water solubility.
Dissociation Constant	Not determined	The notified polymer does not contain any functional groups ionisable in the environmental pH range (4-9).
Particle Size	Not applicable	The notified polymer is not isolated from solution following its manufacture.
Flash Point	Estimated to be >300°C	The notifier has stated that the notified polymer is expected to decompose prior to reaching its flash point.
Flammability	Not expected to be flammable	Based on statement from the notifier.
Autoignition Temperature	Estimated to be >300°C	The notifier has stated that the notified polymer is expected to decompose prior to autoignition.
Explosive Properties	Not expected to be explosive	Based on oxygen balance calculations giving values of <-200%.

DISCUSSION OF PROPERTIES

For full details of tests on physical and chemical properties, please refer to Appendix A.

Loss of Monomers, Other Reactants, Additives, Impurities

Stable under normal conditions of use.

Degradation Products

None under normal conditions of use.

Density

The notified polymer is not isolated from solution throughout its anticipated use in Australia. The specific gravity of the manufactured resin solution containing ~60% of the notified polymer is 1.03. The specific gravity of the solvent portion of the resin solution (~40%) is 0.8 – 0.9.

Hydrolysis as a Function of pH

The notified polymer contains two groups capable of undergoing hydrolysis. One is expected to undergo hydrolysis in acidic conditions; and although the other group is susceptible to hydrolysis, this is not expected to occur in normal environmental conditions. Poor water solubility is expected to limit these reactions.

Reactivity

The notified polymer is expected to be stable under normal storage and handling conditions.

5. INTRODUCTION AND USE INFORMATION

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

The notified polymer will be manufactured in Australia as a resin solution containing ~60% of the notified polymer.

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

Year	*1*	*2*	*3*	*4*	*5*

Tonnes	10-30	10-30	10-30	10-30	10-30

IDENTITY OF MANUFACTURER/RECIPIENTS
Wattyl Australia Pty Ltd

TRANSPORTATION AND PACKAGING
The notified polymer will be distributed by road or rail from the notifier's manufacturing site to customer sites as a resin solution (packaged in 200L drums) or as a finished coating product (packaged in 1 or 4L cans).

USE
The notified polymer is intended for use in metal coatings of substrates such as the exteriors of railcars and tanks, and general engineering metal, including a small proportion (<1%) of use on bridges.

OPERATION DESCRIPTION
Manufacture
The enclosed manufacturing vessel will be charged with most of the raw materials through an automated metering system. Alternatively, a spike with an air pump that suctions the raw material into a weighing tank, from which it will then be charged to the vessel, may also be used. The notified polymer is formed by agitation of the monomeric mixture. Simple aliphatic solvents will then be added to form the resin solution of which the notified polymer constitutes approximately 60%. Quality control personnel may, at this stage, extract samples from the vessel via taps for analysis.

The resin solution will remain in the vessel until ready for packaging. The resin solution may be filled and packaged into 200 L drums via pipes from the manufacturing vessel. The drums will be stored onsite before being further formulated on site or distributed to other formulator sites (~50% of the resin solution may be sold to other paint formulators). The manufacturing vessel will be cleaned in an enclosed system using solvent that will remain within the vessel for incorporation into the next batch.

Reformulation
At the formulation sites, the resin solution will be blended into one part of the final coating product (B pack). Ingredients will usually be added manually to a mixing vessel, which is fitted with extraction, and may be closed or open, depending on the nature of the materials to be added. Typical B pack coating products could contain 45-55% notified polymer. The B pack coating product will then be transferred under local exhaust ventilation into 1 and 4 L steel cans ready for customer distribution. The equipment will be cleaned with solvent that will be reused in the manufacture of the next batch of the product.

End use
The B pack coating product will be used either as formulated or with the addition of paint thinners. Prior to application, the separate A and B packs will be mixed together, usually by mechanical agitation, in a ratio of 3.5:1 – 4.5:1 (A pack : B pack) to form the final coating product. The concentration of the notified polymer in the final coating product is likely to be 5-25%.

The final coating product will be applied to the metal substrates by spray (approximately 99%) or roller (approximately 1%). Spray application will predominantly take place in spray booths, where local exhaust ventilation will be employed, and automatic mechanical (robotic) devices used when possible. The majority of overspray will be collected onto craft paper or similar material and disposed of after curing.

In some cases, the coating may be applied outdoors to large metal structures for refurbishment, such as bridges. Such operations involve manual pouring of the coating product into the spray gun reservoir, and plastic covers will be used to collect any overspray.

For roller application, the coating will be manually decanted into paint trays and applied manually. Following application to the metal substrate, the coating will then be dried (expected to be touch-dry within two hours after application).

6. HUMAN HEALTH IMPLICATIONS

6.1 Exposure assessment

6.1.1 Occupational exposure

NUMBER AND CATEGORY OF WORKERS

Category of Worker	*Number*	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Storage and transport personnel	30	5	150
Manufacturing personnel	50	6	200
Reformulation personnel	1-2	8	12
Quality Assurance personnel	10	3	100
Coating applicators	50	6	200

EXPOSURE DETAILS

Manufacture

During manufacturing processes there will be potential for dermal and ocular exposure to the notified polymer, mainly as a result of drips and splashes during the connection or disconnection of transfer lines. Exposure from other sources is likely to be low, as the manufacturing processes will be enclosed and automated. In addition, an extraction hood will be used to capture materials that may escape and send them to a venting tank from which they will be collected and disposed of. Worker exposure will also be lowered by the use of PPE, including eye protection, safety shoes, coveralls and impermeable gloves.

Worker exposure to the notified polymer during quality control procedures may occur (dermal and ocular), however, it is likely to be low due to the small sample sizes involved, the low frequency and short duration at which the operations are performed, and the personal protective equipment worn by workers (eye protection, safety shoes, laboratory coats and impermeable gloves).

Reformulation

Dermal and ocular exposure of workers to the notified polymer may occur during reformulation processes, particularly during manual addition of the product containing ~60% of the notified polymer to the mixing vessel, during transfer of the final product to packaging, and cleaning of the mixing vessel. Such exposure should be lowered by the use of local exhaust ventilation on the vessel, the enclosed nature of the vessel (in some cases), and the wearing of PPE (gloves, safety shoes, overalls/coveralls, safety glasses, and perhaps a respirator).

End use

Dermal and ocular exposure of workers to the notified polymer may occur during the addition of paint thinners and the mixing of the A and B packs together. This is likely to be reduced by the use of appropriate PPE.

Dermal, ocular and inhalation exposure of workers to the notified polymer (5-25%) may occur during spray application of the coating to metal substrates. Exposure during spray operations should be reduced by the predominant use within spray booths. Local exhaust ventilation will be employed and automatic mechanical sprays (i.e. robotic devices that apply the coatings in an enclosed room) will be used whenever possible. In addition, workers will wear, as a minimum, eye protection, safety shoes, coveralls, and impermeable gloves; if necessary an air respirator will also be worn. When applied outdoors to large existing metal structures by spraying, similar routes of exposure to the notified polymer are likely. In such cases, worker exposure will be reduced by the use of full PPE, including respiratory protection.

Dermal and ocular exposure of workers to the notified polymer may occur during roller applications, particularly during manual decanting and manual application. Exposure should be reduced by the wearing of PPE, including overalls, safety shoes, eye protection and impermeable gloves. In addition, the finished coating is expected to be touch-dry within two hours after application, minimising the potential exposure duration.

6.1.2. Public exposure

The public may become exposed to substrates coated with the notified polymer. At this stage the coating will be dried and cured to a thin film over the substrate. The notified polymer will be immobilised within the film and is unlikely to be available for exposure. Therefore, public exposure is expected to be negligible.

6.2. Human health effects assessment

No toxicity data were submitted.

The notified polymer is not likely to be absorbed dermally based on its high molecular weight and low water solubility.

Upon inhalation of the notified polymer, it is likely to diffuse into the mucus lining the respiratory tract (given that it is a liquid at room temperature). It may then be absorbed directly through the respiratory tract epithelium (based on its estimated partition coefficient), however, this may be limited by the low water solubility of the notified polymer (EC 2003).

The notified polymer contains epoxy functional groups that are structural alerts for cancer and reproductive effects (USEPA 2002). The USEPA specifies that structures with epoxy equivalent weights of ≥1,000 are presumed not to pose a hazard under any conditions. The health concerns are confined to species with molecular weights <1,000 or <500 if exposure is limited to the dermal route. In addition, epoxy species of low molecular weight (<1000) have a higher skin sensitising potential compared to epoxy oligomers of higher molecular weight (HSE, 2003). The epoxy functional group equivalent weight of the notified polymer is <1000, however, its high molecular weight (>1,000) and low percentage of low molecular weight species (less than 5% with Mn<1000, and less than 4% with Mn<500) should mitigate the health concerns of the notified polymer associated with this functional group.

The epoxy functional groups are also structural alerts for irritation/corrosion (Hulzebos 2003, 2005) and sensitisation (Barratt 1994). Skin irritation or corrosivity is not expected to occur based on the high molecular weight and low vapour pressure of the notified polymer (Hulzebos 2003, 2005, Walker 2005). Sensitisation effects are also unlikely given that dermal absorption is not expected to occur (Barratt 1994). However, some of the low molecular weight species may be absorbed, although the low levels of such species (<5% with Mn below 1,000) is likely to reduce the concern associated with any such absorption.

Classification
Due to the absence of data the notified polymer cannot be classified in accordance with the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

6.3. Human health risk characterisation

6.3.1. Occupational health and safety
Dermal and ocular exposure are the main routes of worker exposure to the notified polymer (up to ~60%) expected to occur during manufacture, quality control, reformulation processes, preparation of the paints for end use, and roller application of the final product. Inhalation exposure to the notified polymer may occur during end use spray operations (at concentrations of 5-25%), particularly when used outdoors. Exposure is expected to be reduced by various control measures, including engineering controls and the wearing of PPE. The toxicological properties of the notified polymer have not been investigated. However, it is expected to be of low hazard, given its high molecular weight, low percentage of low molecular weight species, low water solubility and low vapour pressure. Therefore, the occupational health and safety risk of the notified polymer is considered to be low.

6.3.2. Public health
Members of the public will only occasionally come into contact with substrates coated with the notified polymer on which the notified polymer has been cured. As such, the risk to public health is considered to be negligible.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1 Environmental Exposure

RELEASE OF CHEMICAL AT SITE
During manufacture of the resin solution, an estimated 1% (< 300 kg per annum) of the total production volume of the notified polymer may be regarded as spilt wastes. Spillages will be readily contained and collected for disposal to landfill or possibly incinerated.

Approximately 50% of the manufactured resin containing the notified polymer will be used on site, with the remaining 50% being drummed and sent to other paint manufacturers.

At most, 1% of the notified polymer sent to other paint manufactures is anticipated to remain in storage containers as residues. This equates to 0.5% (< 150 kg per annum) of the total production amount.

A further approximately 1% (< 300 kg per annum) of the total production volume of the notified polymer may be spilled or wasted during the reformulation of the resin into the B pack coating product. Spillages will be readily contained and collected for disposal to landfill or possibly incinerated.

Loss of the notified polymer from cleaning of the manufacturing equipment would be minimal due to the reuse of solvent flushes. Therefore a predicted 0.1% (< 30 kg per annum) of the annual production volume of the notified polymer is estimated to be lost from manufacturing equipment. This is similarly expected to be disposed of to landfill.

RELEASE OF CHEMICAL FROM USE

The coating applications are designated for industrial use, to be performed by professional painters with 99% (< 29.7 tonne per annum) of this expected to be performed by spraying and 1% (< 300 kg per annum) by rollers. When coating products containing the notified polymer are applied by spray techniques, it is anticipated that approximately 15% - 20% (4.5-5 tonne per annum) of the coating product will form overspray and be collected as waste material. The application of the finished coating product is conducted at industrial sites predominantly in designated spray booths with any overspray being captured in the spray booth on Kraft paper or similar materials. Used spray booth filters containing overspray are expected to be disposed of to landfill. The coating dries onto the Kraft paper and will be disposed of to landfill or possibly incinerated by licensed contractors. For larger spray applications that occur outdoors, any overspray droplets are likely to land on the immediate surrounding areas, which will be covered by a protective drop sheet. However, the droplets (<1%; < 300 kg per annum) may be carried by the wind and be dispersed throughout a wider area. As the coating droplets cure, the notified polymer is expected to react with the other components of the coating product. Any un-reacted polymer is expected to become immobilised.

For roller applications, cleaning of equipment is expected to generate a small amount of waste. Professional painters are likely to collect rinsings, allow them to solidify, and then dispose of the cured paint to landfill.

The coatings may be used on engineering structures such as bridges, where direct release to the aquatic environment may occur. However, the notifier indicates that the current formulation (containing the notified polymer) is unsuited to submerged applications. Accordingly, it is accepted that only a minor amount (< 1%; < 300 kg per annum) of coatings containing the notified polymer would be used on bridges. During such applications, spraying of the coating containing the notified polymer is expected to occur in full encapsulation with all overspray and waste captured, with no release to the environment.

RELEASE OF CHEMICAL FROM DISPOSAL

The vast majority of the notified polymer will be used for its intended purpose and the metal substrates coated with the notified polymer are likely to end up in landfill or enter metal recycling at the end of their useful lives. The life of many structures is likely to exceed the life of the coating. In these cases, the degraded coating is expected to be stripped from the metal structure and disposed of to landfill, to prepare the surface for recoating.

Residues of the notified polymer that remain in empty storage containers will ultimately be disposed of to landfill. Other wastes containing the notified polymer will be disposed of to landfill or possibly incinerated.

7.1.2 Environmental fate

Waste containing the notified polymer is expected to be landfilled; enter metal recycling; or possibly be incinerated. In landfill, leaching of the notified polymer from landfill is unlikely given the structural properties and low water solubility of the notified polymer. The notified polymer is expected to eventually be decomposed to landfill gases including methane, oxides of carbon; and water vapour. During metal recycling the notified polymer is expected to be combusted.

7.1.3 Predicted Environmental Concentration (PEC)

No aquatic release is expected. A PEC cannot be calculated, however, from the use pattern, the release to the environment is expected to be minimal.

7.2. Environmental effects assessment

No ecotoxicity data were submitted. Non-ionic polymers are of low concern to the aquatic environment.

7.2.1 Predicted No-Effect Concentration

A PNEC cannot be calculated as no ecotoxicity data were submitted.

7.3. Environmental risk assessment

Although a PEC and PNEC cannot be calculated, the release to the environment is expected to be low. The risk is therefore also expected to be acceptable.

8. CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification
Based on the available data the notified polymer cannot be classified in accordance with the *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)]. .

Human health risk assessment
Under the conditions of the occupational settings described, the notified polymer is not considered to pose an unacceptable risk to the health of workers.

When used in the proposed manner, the notified polymer is not considered to pose an unacceptable risk to public health.

Environmental risk assessment
On the basis of the reported use pattern, the notified polymer is not considered to pose a risk to the environment.

Recommendations

REGULATORY CONTROLS

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the notified polymer during its manufacture and end use of products containing the notified polymer:
  - Prevent leaks and spills.
  - Spray booths during manual spray operations, when possible.

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer during its manufacture and end use of products containing the notified polymer:
  - Avoid contact with eyes and skin.

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer during its manufacture and end use of products containing the notified polymer:
  - Gloves, safety glasses, safety shoes, coveralls.
  - Respiratory protection during outdoor spray operations.

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

- 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 *Approved Criteria for Classifying Hazardous Substances* [NOHSC:1008(2004)] workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

- The notified polymer should be disposed of by authorised landfill, or licensed waste disposal.

- Spills or accidental release of the notified polymer should be handled by physically containing the spill using inert material (sand, earth, vermiculite) and preventing entry to drains or waterways. Absorb remaining material with inert material and collect residue. Place in suitable containers for disposal. Wipe or wash area, do not allow any run-off to enter drains.

Regulatory Obligations

Secondary Notification
This risk assessment is based on the information available at the time of notification. The Director may call for the reassessment of the chemical under secondary notification provisions based on changes in certain circumstances. Under Section 64 of the *Industrial Chemicals (Notification and Assessment) Act (1989)* the notifier, as well as any other importer or manufacturer of the notified chemical, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified chemical is listed on the Australian Inventory of Chemical Substances (AICS).

Therefore, the Director of NICNAS 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 polymer has a number-average molecular weight of less than 1000;

or

(2) Under Section 64(2) of the Act; if
  - the function or use of the chemical has changed from use in metal coatings for substrates, or is likely to change significantly;
  - the amount of chemical being introduced has increased from 30 tonnes per annum, or is likely to increase, significantly;
  - the method of manufacture of the chemical in Australia has changed, or is likely to change, in a way that may result in an increased risk of an adverse effect of the chemical on occupational health and safety, public health, or the environment;
  - additional information has become available to the person as to an adverse effect of the chemical on occupational health and safety, public health, or the environment.

The Director will then decide whether a reassessment (i.e. a secondary notification and assessment) is required.

No additional secondary notification conditions are stipulated.

Material Safety Data Sheet
The MSDS of products containing the notified polymer provided by the notifier was reviewed by NICNAS. The accuracy of the information on the MSDS remains the responsibility of the applicant.

APPENDIX A: PHYSICAL AND CHEMICAL PROPERTIES

Water Solubility < 0.5 g/L at 20ºC

Method The method for testing the notified polymer for water miscibility was as follows:

The notified polymer (0.1 g) was placed into each of 6 glass 200 mL medicine bottles containing 1 mL, 2 mL, 10 mL, 100 mL and 200 mL of water, respectively. The solvent was allowed to evaporate for 24 hours, then the caps were sealed and the mixture observed at intervals of 24 hours for 2 weeks. No changes after the initial 24 hour period were observed. A sixth sample was prepared at the same time in which the resin was previously allowed to solidify before being added to 200 mL water.

Remarks All of the samples precipitated out and were not miscible with water. This was based upon a visual assessment of the quantity of material that was originally added compared to the quantity present after 24 hours. Although only a qualitative test was carried out, it is clear that the notified polymer is relatively insoluble in water.

Test Facility Wattyl (test report was not cited)

Explosive Properties Not expected to be explosive.

Method EC Directive 92/69/EEC A.14 Explosive Properties.

Remarks Oxygen balance calculations performed on the notified polymer indicate an oxygen balance of <-200%. This indicates that the notified polymer is not classified as an explosive (GHS, 2003).

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