File No: LTD/1556

November 2011

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

PUBLIC REPORT

Polymer in Disperbyk 2022

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 Sustainability, Environment, Water, Population and Communities.

For the purposes of subsection 78(1) of the Act, this Public Report may be inspected at our NICNAS office by appointment only at Level 7, 260 Elizabeth Street, Surry Hills NSW 2010.

This 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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SUMMARY

The following details will be published in the NICNAS *Chemical Gazette:*

ASSESSMENT REFERENCE	APPLICANT(S)	CHEMICAL OR TRADE NAME	HAZARDOUS SUBSTANCE	INTRODUCTION VOLUME	USE
LTD/1556	Nuplex Industries (Aust) Pty Ltd	Polymer in Disperbyk 2022	ND*	≤ 15 tonnes per annum	Component of surface coatings and printing inks

*ND = not determined

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification
As no toxicity data were provided, the notified polymer cannot be classified according to 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 unreasonable risk to the health of workers.

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

Environmental risk assessment
On the basis of the PEC/PNEC ratio and the reported use pattern, the notified polymer is not considered to pose an unreasonable risk to the environment.

Recommendations
CONTROL MEASURES
Occupational Health and Safety

- No specific engineering controls, work practices or personal protective equipment are required for the safe use of the notified polymer itself. However, these should be selected on the basis of all ingredients in the formulation.

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

- Spray applications should be carried out in accordance with the Safe Work Australia *National Guidance Material for Spray Painting* [NOHSC (1999)] or relevant State and Territory Codes of Practice.

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

- If products and mixtures containing the notified polymer 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.

Disposal

- The notified polymer should be disposed of to landfill.

  Emergency procedures

- Spills or accidental release of the notified polymer should be handled by physical containment, collection and subsequent safe disposal.

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 polymer, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified polymer 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 polymer has changed from a component of surface coatings and printing inks, or is likely to change significantly;
- the amount of polymer being introduced has increased from 15 tonnes, or is likely to increase, significantly;
- the polymer has begun to be manufactured in Australia;
- additional information has become available to the person as to an adverse effect of the polymer 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.

Material Safety Data Sheet
The MSDS of a product 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.

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Nuplex Industries (Aust) Pty Ltd (ABN 25 000 045 572)
49-61 Stephen Road
BOTANY NSW 2019

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, Spectral Data, Methods of Detection and Determination, Introduction Volume, Details of Use and Residual Monomers.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed for all schedule data requirements.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
USA (2009)

2. IDENTITY OF CHEMICAL

MARKETING NAME
Disperbyk 2022 and Disperbyk 2002 WS (containing the notified polymer at approximately 60%)

MOLECULAR WEIGHT
Mn >1,000 Da.

ANALYTICAL DATA
Reference IR and GPC spectra were provided.

3. COMPOSITION

DEGREE OF PURITY >97%

NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS (>1% by weight) None

ADDITIVES/ADJUVANTS None

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
None

DEGRADATION PRODUCTS
None

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa*: Yellow-brown solid

Property	Value	Data Source/Justification
Melting Point/Freezing Point	> 20°C	MSDS. Solid at room temperature
Boiling Point	Expected to decompose at >200°C	Estimated
Density	1050 kg/m^3 at 20°C	MSDS
Vapour Pressure	< 1.3x10^{-9} kPa	Estimated based on high molecular weight (US EPA, 2010)
Water Solubility	Insoluble	MSDS. Based on structural considerations and experience in use.
Hydrolysis as a Function of pH	Not determined	Contains hydrolysable functionality, however, due to its limited water solubility, it is expected to hydrolyse very slowly in the environmental pH range (4-9) at ambient temperature
Partition Coefficient (n-octanol/water)	Not determined	Expected to partition from water to n-octanol on the basis of its hydrophobicity. However, the high molecular weight of the notified polymer indicates that it will not cross biological membranes.
Adsorption/Desorption	Not determined	Based on its ionic nature and presumed low water solubility, it is expected to adsorb strongly to soil, sediment and sludge and have low mobility in the environment.
Dissociation Constant	Not determined	Will be ionised in the environmental pH range (4-9) based on the presence of a basic functional group in the polymer structure.
Particle Size	Not determined	Will only be introduced in liquid form
Flash Point	> 100°C at 101.3 kPa	MSDS
Flammability	Not determined	Not expected to be flammable based on experience in use

Autoignition Temperature	> 200ºC	MSDS
Explosive Properties	Not determined	The structural formula contains no explosophores

DISCUSSION OF PROPERTIES

Dangerous Goods classification

Based on the submitted physical-chemical data in the above table the notified polymer is not classified according to the Australian Dangerous Goods Code (NTC, 2007). However, the data above do not address all Dangerous Goods endpoints. Therefore, consideration of all endpoints should be undertaken before a final decision on the Dangerous Goods classification is made by the introducer of the polymer.

5. INTRODUCTION AND USE INFORMATION

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

The notified polymer will be imported as a solvent solution at approximately 60%.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	< 10	< 10	< 15	< 15	< 15

PORT OF ENTRY

Sydney

IDENTITY OF RECIPIENTS

Nuplex Industries (Aust) Pty Ltd

TRANSPORTATION AND PACKAGING

The notified polymer in solvent solution will be imported by sea in sealed 25 kg or 200 kg drums, and transported to end use sites by rail or road.

USE

The notified polymer will be used as a wetting and dispersing additive at < 5% in solvent-borne paints, pigment concentrates or printing inks.

OPERATION DESCRIPTION

Pigment Treatment

At reformulation sites, solution containing the notified polymer will be manually weighed or metered directly from the storage drums into the processing vessel. The notified polymer will be mixed with other components such as, pigments, resin and solvents.

After reformulation, samples will be taken for quality control testing by laboratory technicians. The final product will then be filled into packages.

All reformulation and application equipment will be cleaned by rinsing with water.

Application of coatings

The coatings (< 5% notified polymer), namely wood and furniture coatings, automotive and general industrial coatings will be applied by spray (85%), brush (10%) or roller (5%). Prior to application, the paint will be manually stirred and poured into trays or into the spray guns. Spray applications are expected to be conducted in spray booths at industrial sites.

Application of inks

Ink products containing the notified polymer (< 5%) will be applied in industrial settings. A pipe or hose will be connected to containers of ink product containing the notified polymer and the ink will be transferred to inkjet printing machines and applied to paper substrates via an automated and enclosed process. Once the ink has been consumed, the empty ink container will be disconnected from the printer and will be replaced with a new container of ink.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

CATEGORY OF WORKERS

Category of Worker	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Transport	6 -8	2 -3
Reformulation	4	8
Laboratory	2	1
Application	100	6

EXPOSURE DETAILS

Transport

Exposure during transport and storage is not expected except in the case of an accident involving a breach of the containers.

Reformulation

During reformulation, dermal and ocular exposure of workers to the product containing the notified polymer (at approximately 60%) may occur when weighing and transferring to the mixing tank. It is expected that there will be a low potential for exposure during the fully automated and closed blending process. Workers involved in the reformulation process are expected to wear personal protective equipment (PPE) including impermeable gloves, goggles or face shield and protective clothing to minimise exposure. Exposure to the notified polymer at concentrations up to 5% during transfer of the formulated product to packaging is expected to be low due to the largely automated processes used.

Inhalation exposure is expected to be negligible given the very low estimated vapour pressure of the notified polymer. In addition, blending and packaging facilities are expected to be well ventilated and local exhaust ventilation will be employed.

Application of coatings

Dermal, ocular and inhalation exposure of workers to the notified polymer (< 5%) may occur during spray application of surface coatings to plastic or metal substrates, and when cleaning application equipment. Exposure during spray application should be reduced when conducted in spray booths at industrial sites. In addition, workers are expected to wear PPE such as, eye protection, coveralls, and impermeable gloves; if necessary an air respirator will also be worn. Dermal and ocular exposure of workers to the notified polymer (< 5%) may occur during brush and roller applications, particularly during manual decanting and manual application. Exposure should be reduced by the use of PPE, including protective clothing, eye protection and impermeable gloves.

Application of inks

Dermal and ocular exposure to the notified polymer (< 5%) in printing inks may occur during connection and disconnection of hoses to the ink bottles and replacement of ink bottles in the printing machine. However, exposure to the notified polymer should be limited by the proposed use of PPE (protective clothing, safety goggles and impermeable gloves) by these workers. Workers may make dermal contact with the notified polymer once the coating or ink formulation has dried to the substrate. However, once cured and dried, the notified polymer will be reacted into the polymer matrix and will not be bioavailable.

6.1.2. Public Exposure

The finished coating or ink products containing the notified polymer (< 5%) will not be sold to the public. The public may come into contact with the inks and coatings containing the notified polymer after application to substrates. However, once the inks and coatings are dried, the notified polymer will be reacted into the polymer matrix and will not be bioavailable.

6.2. Human Health Effects Assessment

No toxicity data were submitted.

Given the high molecular weight (> 1000 Da.) and expected low water solubility of the notified polymer, absorption across biological membranes is not expected to be significant.

The notified polymer contains a functional group of concern for irritation with a functional group equivalent weight (FGEW) < 1000 Da. However, given the high molecular weight (NAMW > 1000 Da.), expected low water solubility and low proportion of low molecular weight species (< 1% < 500 Da.), the potential for irritation is expected to be reduced.

Health hazard classification
As no toxicity data were provided, the notified polymer cannot be classified according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety
The notified polymer is expected to be of low hazard. Furthermore, although exposure to the notified polymer may occur, all workers are expected to wear PPE to limit exposure, including a respirator during spray application. In addition, all spray applications are expected to be conducted within spray booths.

Overall, the risk to workers from use of the notified polymer is not expected to be unreasonable based on the expected low hazard and the occupational settings described where exposure is limited.

6.3.2. Public Health
The public may experience contact with articles coated with coatings or ink containing the notified polymer. However, once dried and cured, the notified polymer will be bound in a polymer matrix and will not be bioavailable. Therefore, when used in the proposed manner, the risk to public health is not considered to be unreasonable.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE
The notified polymer is not manufactured in Australia; therefore there is no release from this activity. The release of the notified polymer to the environment during importation, storage, and transport is unlikely. The most likely source of a release to the environment during these activities will be a transport accident. Releases that do occur as a result of accidents are expected to be physically contained, absorbed on inert material, and either reused or sent for safe disposal.

An estimated 1% of annual import volume of notified polymer may be lost as a result of spillages that occur during reformulation. The spillages are expected to be absorbed onto suitable materials and disposed of to landfill. Less than 1% of the notified polymer is estimated to remain as residues in import containers that will be collected by licensed waste contractors. The residues are expected to be cured prior to disposal to landfill. Equipment used to reformulate the notified polymer is washed with water and equipment washes are estimated to contain up to 1% of the notified polymer. These washes are expected to undergo a treatment whereby the notified polymer is removed and disposed of to landfill prior to release of the waste water to sewer.

RELEASE OF CHEMICAL FROM USE
Application of coatings

Approximately 90% of the notified polymer will be used in coating preparations which will be applied to a variety of substrates including wood and metal. When coating formulations containing the notified polymer are applied by spray techniques, it is anticipated that approximately 20-30% of the coating product will form overspray and be collected as waste material. As the application of coatings will be conducted at industrial sites in designated spray booths, the overspray will be captured in the spray booth and on kraft paper or newspaper and is expected to be disposed of to landfill. Equipment used to apply the coating formulations may be rinsed with water or other appropriate solvents. It is estimated that up to 1% of notified polymer used in coatings, may be released to sewers in equipment washings.

During industrial use of the notified polymer, it is estimated that < 1% of the notified polymer will be spilt.

These spills are expected to be contained and disposed to landfill. Less than 1% of the notified polymer may remain as residues in the end-use containers. These are expected to be disposed of to landfill.

Ink Preparations

Approximately 10% of the notified polymer will be used in ink preparations. During use of the ink products containing the notified polymer, some release is expected to occur during the printing process via cleaning and maintenance operations and small spills (< 0.5%). It is expected that these residues will be disposed of to landfill. The inks containing the notified polymer will be applied to a variety of substrates including paper using industrial inkjet printers. The applied notified polymer is expected to be trapped in the ink matrix with other components of the ink. It is assumed that all of the notified polymer in ink preparations will be applied to paper and that 50% of the paper is expected to be recycled. During the paper recycling processes, waste paper is repulped using a variety of chemical agents which, amongst other things, enhance detachment of ink from the fibres.

RELEASE OF CHEMICAL FROM DISPOSAL

Notified polymer in coatings is expected to share the fate of the substrate to which it has been applied and is predominantly expected to be disposed of to landfill. Notified polymer in coatings applied to metal articles may be thermally decomposed during metal reclamation processes at the end of the articles useful life. Notified polymer in inks applied to articles may be separated from the substrate during recycling processes, in which case the polymer is expected to partition to sludge and be disposed of to landfill.

7.1.2. Environmental Fate

No environmental fate data were submitted. The majority of the notified polymer is expected to be cured within an inert polymer matrix adhering to articles following its use in coating and ink applications. Notified polymer that is disposed of to landfill is expected to remain associated with the substrate to which it has been applied and in its cured form it is not expected to be bioavailable or biodegradable. Notified polymer in solid waste disposed of to landfill is not likely to be mobile due to its expected limited water solubility. An estimated maximum 7% of the annual import volume of the notified polymer may be disposed of to the sewer due to washing of reformulation and application equipment (2%) and paper recycling (5%). Notified polymer that may be released to sewers is expected to mainly partition to the solid phase due to its limited water solubility and high molecular weight, and be disposed of to landfill. The notified polymer will eventually degrade in landfill, or by thermal decomposition during metal reclamation processes, to form water, oxides of carbon and nitrogen.

7.1.3. Predicted Environmental Concentration (PEC)

The Predicted Environmental Concentration (PEC) was calculated assuming that 7% of the total import volume of polymer would be released to sewer annually due to washing of reformulation and application equipment (2%) and paper recycling (5%). It was assumed that 90% of the notified polymer partitions to sludge in STPs due to its net positive charge (Boethling and Nabholz, 1997) and the release of the notified polymer will occur over 260 days per annum into the total Australian effluent volume. This corresponds to release only on working days, based on a 5 day work week. The results of the calculation are shown in the table below.

Predicted Environmental Concentration (PEC) for the Aquatic Compartment		
Total Annual Import/Manufactured Volume	15,000	kg/year
Proportion expected to be released to sewer	7%	
Annual quantity of chemical released to sewer	1,050	kg/year
Days per year where release occurs	260	days/year
Daily chemical release:	4.04	kg/day
Water use	200.0	L/person/day
Population of Australia (Millions)	21.161	million
Removal within STP	90%	**Mitigation**
Daily effluent production:	4,232	ML
Dilution Factor - River	1.0	
Dilution Factor - Ocean	10.0	
PEC - River:	0.10	µg/L

PEC - Ocean:	0.01	µg/L

Partitioning to biosolids in STPs Australia-wide may result in an average biosolids concentration of 8.588 mg/kg (dry wt). Biosolids are applied to agricultural soils, with an assumed average rate of 10 t/ha/year. Assuming a soil bulk density of 1500 kg/m^3 and a soil-mixing zone of 10 cm, the concentration of the notified polymer may approximate 0.057 mg/kg in applied soil. This assumes that degradation of the notified polymer occurs in the soil within 1 year from application. Assuming accumulation of the notified polymer in soil for 5 and 10 years under repeated biosolids application, the concentration of notified polymer in the applied soil in 5 and 10 years may approximate 0.285 mg/kg and 0.57 mg/kg, respectively

7.2. Environmental Effects Assessment

No ecotoxicity data were submitted. Ecotoxicological endpoints for the notified polymer were calculated based on SAR equations assuming a worst case cation charge density for the polymer (Boethling and Nabholz, 1997). The endpoints are summarised in the table below and have been modified by mitigation factors to account for the anticipated binding of the polymer with organic carbon in surface waters.

Endpoint	*Result*	*Assessment Conclusion*
Fish Toxicity	LC50 (96 h) = 34.7 mg/L	Harmful
Daphnia Toxicity	EC50 (48 h) = 16.3 mg/L	Harmful
Algal Toxicity	EC50 (96 h) = 3.48 mg/L	Toxic

The notified polymer is potentially harmful or toxic to aquatic organisms in environmental waters with typical levels of total organic carbon. The SAR estimation procedure used to estimate ecotoxicity endpoints is a standard approach and is considered reliable to provide general indications of the likely environmental effects of the polymer. However, this method is not considered sufficient to formally classify the acute and long term hazard of the notified polymer to aquatic life under the Globally Harmonised System for the Classification and Labelling of Chemicals (United Nations, 2011).

7.2.1. Predicted No-Effect Concentration

The estimated hazard data for the notified polymer indicates that, after allowing for the mitigating effects of organic carbon in surface waters, the most sensitive ecotoxicological endpoint is for algae. The endpoint for algae was therefore selected for the calculation of the PNEC below. A conservative assessment factor of 1000 was applied since ecotoxicity endpoints were calculated using SAR equations based on groupings of broadly related polymers

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
Algae (EC50, 96 h)	3.48	mg/L
Assessment Factor	1000	
PNEC:	3.48	µg/L

7.3. Environmental Risk Assessment

Risk Assessment	PEC µg/L	PNEC µg/L	Q
Q - River	0.10	3.48	0.029
Q - Ocean	0.01	3.48	0.003

The risk quotient (Q = PEC/PNEC) for aquatic exposure is calculated to be < 1 based on the above calculated PEC and PNEC. The Q value of < 1 indicates the notified polymer is not expected to pose an unreasonable risk to the aquatic environment from its assessed use pattern at the proposed maximum import volume.

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