File No PLC/666

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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Aqualoc HS-1

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Director
NICNAS

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1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Grace Australia Pty Ltd (41 080 660 117)
1126 Sydney Road
Fawkner VIC 3060

NOTIFICATION CATEGORY
Polymer of Low Concern

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication:

Chemical Name
Other Names
CAS Number,
Molecular and Structural Formulae
Molecular Weight
Polymer Constituents
Residual Monomers/Impurities
Use Details
Manufacture/Import Volume
Sites of Reformulation

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows:

Melting point
Dissociation constant

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
No

NOTIFICATION IN OTHER COUNTRIES
Yes
Japan, China, Korea, USA

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
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3. PLC CRITERIA JUSTIFICATION

Criterion	*Criterion met (yes/no/not applicable)*
Molecular Weight Requirements	Yes
Functional Group Equivalent Weight (FGEW) Requirements	Yes
Low Charge Density	Yes
Approved Elements Only	Yes
Stable Under Normal Conditions of Use	Yes
Not Water Absorbing	Yes
Not a Hazard Substance or Dangerous Good	Yes

The notified polymer meets the PLC criteria.

4. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa	White solid
Melting Point/Glass Transition Temp	>200 °C based on an analogue polymer.
Density	1100 kg/m^3 at 20°C value for imported polymer solution
Water Solubility	≥ 2 g/L at 25 ± 2°C. Duplicate analyses of the test substance were conducted over 24 hour period by stirring at 35 - 40°C and equilibrating at 25 ± 2°C. (Include a brief description of the test, including the method used)
Dissociation Constant	pKa ~ 5. Not measured, but contains anionic groups, which are expected to show typical acidity.
Particle Size	Not applicable. Polymer will only be imported as a solution.
Reactivity	Stable under normal environmental conditions. Tests were conducted at pH range of 1.2, 4.0, 7.0 & 9.0 at 40 ± 2°C. Some minor changes were evident from the infra red (IR) and Gel permeation chromatography (GPC), when comparing the initial polymer with the polymer subjected to hydrolysis. Although these tests can only be considered indicative of changes to the polymer, they showed that the polymer did not hydrolyse to any great extent.
Degradation Products	None under normal conditions of use.

5. INTRODUCTION AND USE INFORMATION

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	100-300	100-300	100-300	300-1000	300-1000

USE AND MODE OF INTRODUCTION AND DISPOSAL

Mode of Introduction

The notified polymer will be imported as a 45% solution in water contained in 1100 kg IBC packages. It will be imported into Sydney, Melbourne and Brisbane harbours and it will be transported by road to the notifier's plant for storage and reformulation.

Reformulation/manufacture processes

Reformulation will occur at the notifier site. The 45% solution of the notified polymer will be mixed with other ingredients resulting in final product containing 20% of the notified polymer. The reformulation product will be packed in either IBC 1100 kg boxes or 205L drums to the customer's site.

At the customer site the product will be added to concrete to final concentration of 0.03%

Use

Concrete additive

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

OCCUPATIONAL EXPOSURE

Workers involved in reformulation of the imported mixture containing 45% of the notified polymer may have dermal and ocular exposure to the notified polymer. However, significant exposure to the notified polymer will be limited given the use of engineering controls and personal protective equipment by workers.

Dermal and ocular exposure may also occur during certain processes such as mixing of the aqueous solution (20%) of the notified polymer with the concrete involving the notified polymer. Inhalation exposure is possible if aerosols are formed. However exposure to significant amounts of the notified polymer is not expected because personal protective equipment, overalls, gloves and protective footwear, is worn while mixing is performed.
The final concentration of the notified polymer in the concrete mixture is low (0.03%), so no significant exposure is expected for workers applying the concrete mixture.

PUBLIC EXPOSURE

The notified polymer is intended only for use in industry and as such public exposure to the notified chemical is not expected. In addition, most of the notified polymer will be incorporated into the matrix of the concrete. Therefore the public is not expected to be exposed to the notified polymer except in the case of accidental spillage during transport.

6.2. Toxicological Hazard Characterisation

The notified polymer meets the PLC criteria and can therefore be considered to be of low hazard. This is supported by toxicological endpoints observed in testing conducted on 46% aqueous solution of the notified polymer:

Endpoint	*Result*	*Classified?*	*Effects Observed?*	*Test Guideline*
1. Rat, acute oral	LD50>2000 mg/kg bw	no	yes[a]	OECD TG 423
2. Rat, acute dermal	LD50>2000 mg/kg bw	no	no	OECD TG 402
3. Rabbit, skin irritation	non-irritating	no	no	OECD TG 404
4. Rabbit, eye irritation	slightly irritating	no	yes[b]	OECD TG 405
5. Genotoxicity - bacterial reverse mutation	non mutagenic	no	no	Japanese standards for Toxicity investigations;1999

[a] Congestion of the lungs was observed in 3/3 treated animals
[b] Slight to moderate reddening of the conjunctiva was observed in all animals at the 1h and 24h reading. Slight chemosis of the conjunctiva was observed in 2/3 animals at the 1h reading. Slight to moderate reddening of the sclera was observed in all animals at the 1h and 24h reading.

All results were indicative of low hazard except for the lung congestion in the acute oral study. Since application of the test material was by oral gavage, the cause of the congestion that was detected at necropsy is not clear. No clinical signs were detected.
High molecular weight polymers can cause lung damage (USEPA) but this is less likely in the case of this polymer as it is water-soluble. In addition, considering the oral route of exposure is less likely that the observed congestion is a consequence of inhalation exposure to the notified polymer.

6.3. Human Health Risk Assessment

OCCUPATIONAL HEALTH AND SAFETY

Although dermal and ocular exposure to the notified polymer could occur during mixing of the aqueous solution of the notified polymer with the concrete, the risk to workers is considered to be low due to the intrinsic low hazard of the notified polymer.

Inhalation exposure is also possible in if aerosols are formed. However since the notified polymer has Mw >1000 no significant systemic exposure is expected.

Overall, considering the exposure patterns and the low toxicity of the notified polymer no special controls are required related to the use of notified polymer unless aerosols are formed. However, use of PPE for work with other materials that will be mixed with the notified polymer should be used as appropriate.

PUBLIC HEALTH

The notified polymer will not be available to the public. Members of the public may make dermal contact with products containing the notified polymer, when it is incorporated into the matrix of the concrete. Therefore the public is not expected to be exposed to the notified polymer except in the case of accident spillage during transport.

Considering this low likelihood of exposure and the low toxicity, there is a negligible risk for the public from the use of the notified polymer.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Exposure Assessment

ENVIRONMENTAL RELEASE

The notified polymer is imported into Australia in aqueous solution. It is then reformulated by mixing the components at the notifier's facilities located in each state in Australia. Residue in empty import containers will be rinsed into a recycling pit and used in the next batch. Similarly after rinsing of the mixing tank the water is recycled and used in the next batch.

The reformulated material is then transported to the customers' concrete plants in 1000 L totes. After pumping the reformulated product into a holding tank, the totes are expected to be rinsed at the notifier's facilities with the rinse water being sent to the recycling pit for use in the next batch.

Concrete trucks are usually rinsed at the end of the day after several batches. Approximately 1-4% (Abdol Chini and Mbwambo, 1996) of the concrete adheres to the inside of the drums. If four batches are assumed between rinses then the amount of notified polymer in the excess concrete and water amounts to less than 1% (<10 tonnes per annum). These washings from delivery trucks on return to batch plant are expected to be contained in a wash water system, which is recycled for future concrete manufacture to the extent practicable. Some of the wastewater may be associated with the waste concrete and be allowed to evaporate as the concrete cures, with the notified polymer becoming associated with the waste concrete. Any excess concrete is expected to be transferred to dumpsters where the concrete is allowed to cure with subsequent disposal in authorised landfill.

ENVIRONMENTAL FATE

The vast majority of the notified polymer will be bound in the concrete matrix and will not be released to the environment in any significant quantity. At the end of the concrete's useful life, it is likely to be landfilled or used as low-grade construction material such as road base. It is therefore expected that the notified polymer will eventually degrade by biotic and abiotic processes to oxides of carbon, water vapour and sodium salts.

7.2. Environmental Hazard Characterisation

No ecotoxicological data were submitted. However, anionic polymers are known to be moderately toxic to algae. The mode of toxic action is overchelation of nutrient elements needed by algae for growth. The highest toxicity is when the acid is on alternating carbons of the polymer backbone. This could apply to the notified polymer. The notified polymer's toxicity to algae is also likely to be reduced due to the presence of calcium ions, which will bind to the functional groups.

7.3. Environmental Risk Assessment

Although most water during reformulation and use in concrete batching will be recycled, small amounts (<0.1%) of the notified polymer (<1000 kg per annum) may be released to sewer from concrete batching and polymer admixture plants. This will result in a worst-case predicted environmental concentration (PEC) of 0.94 µg/L at sewage outfall. (1000 kg per annum ÷ (20.5 million persons × 200 L per day per person × 260 working days).

A predicted no effect concentration (PNEC) cannot be calculated, as no ecotoxicity data are available.

Although the notified polymer may show moderate toxicity to algae, the majority of it will be used in environments where calcium ions will be present in vast excess. During use, it is expected to bond strongly to these calcium ions. It is therefore unlikely that it will chelate further calcium ions in the environment, thus greatly reducing the risk to the aquatic environment. Furthermore, the notified polymer is unlikely to be released from the matrix of set concrete. Accordingly, exposure of the notified polymer to the aquatic environment is expected to be minimal. The notified polymer is unlikely to pose an unacceptable risk to the environment.

8. CONCLUSIONS

8.1. Level of Concern for Occupational Health and Safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

8.2. Level of Concern for Public Health

There is Negligible Concern to public health when used in the proposed manner.

8.3. Level of Concern for the Environment

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

9. MATERIAL SAFETY DATA SHEET

9.1. Material Safety Data Sheet

The notifier has provided MSDS as part of the notification statement. The accuracy of the information on the MSDS remains the responsibility of the applicant.

10. 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 as described.
- If aerosols are formed during the use of the notified polymer, engineering and PPE controls should be used to prevent inhalation exposure.
- Specific engineering controls, work practices or personal protective equipment may be required and should be selected on the basis of all ingredients in the formulation containing the notified polymer.

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 polymer 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

Disposal

- The notified polymer should be disposed of by authorised landfill.

Emergency procedures

- Spills and/or accidental release of the notified polymer should be handled by physical containment, with subsequent adsorption onto inert material such as sand (not sawdust). Collect for disposal. Do not flush to sewer.

10.1. 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 subsection 64(1) of the Act; if
  - the notified polymer is introduced in a chemical form that does not meet the PLC criteria.

The Director will then decide whether secondary notification is required.

11. BIBLIOGRAPHY

S. Abdol Chini and William J. Mbwambo, *Environmentally Friendly Solutions for the Disposal of Concrete Wash Water from Ready Mixed Concrete Operations*, CIB W89 Beijing International Conference, 21-24 October, 1996.