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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in AQUALOC LA-100

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Street Address:	334 - 336 Illawarra Road MARRICKVILLE NSW 2204, AUSTRALIA.
Postal Address:	GPO Box 58, SYDNEY NSW 2001, AUSTRALIA.
TEL:	+ 61 2 8577 8800
FAX	+ 61 2 8577 8888.
Website:	www.nicnas.gov.au

Director
NICNAS

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1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Degussa Construction Chemicals Australia Pty Ltd (ABN 46 000 450 288)
11 Stanton Road
Seven Hills, NSW 2147

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, and Import Volume.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
Variation to the schedule of data requirements is claimed as follows:
melting point and dissociation constant.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
None

NOTIFICATION IN OTHER COUNTRIES
Japan CSCL in 2000
China SEPA in 2004
U.S.EPA TSCA in 2005

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
AQUALOC LA-100 (imported aqueous polymer solution)

MOLECULAR WEIGHT (MW)
Number Average Molecular Weight (Mn) >10000

REACTIVE FUNCTIONAL GROUPS
The notified polymer contains only low concern functional groups.

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	Not determined. An analogous polymer was found to have a melting point > 200ºC.
Density	1090 kg/m^3 at 20ºC (AQUALOC LA-100)
Water Solubility	Solubilities of the notified polymer were tested at 200 and 2000 mg/L water in duplicate. The solution were stirred at 35-40ºC and equilibrated at 25ºC for a period of 24 h. The notified polymer is considered to be highly soluble in water.
Dissociation Constant	Not determined. The polymer contains anionic groups which are expected to display a typical acidity. A similar polymer (polyacrylic acid) has a pKa of 6.8.
Reactivity	Stable under normal environmental conditions
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	<1000	<1000	<1000	<1000	<1000

USE AND MODE OF INTRODUCTION AND DISPOSAL

Mode of Introduction

The notified polymer will be imported as an aqueous solution (30-60%) in 1000 L bulk boxes. The boxes will be delivered to customer sites by truck.

Reformulation/manufacture processes

Bulk boxes of AQUALOC LA-100 are stored in a bunded storage area and connected to a manufacturing pumping system via flexible hoses and cam-lock fittings. The AQUALOC LA-100 is pumped directly into the appropriate, enclosed mixing vessels and blended with water and other chemicals to produce the finished admixture. The admixture intended for initial formulation will contain between 10% and 30% of the notified polymer solution (3% -18% active polymer).

Once mixed the admixture containing the polymer is transferred to bulk storage tanks or 1000L bulk boxes. The formulated admixture is then delivered either by bulk road tanker or in 1000L bulk boxes to premixed concrete plants.

Use

The notified polymer solution is used as a dispersing agent in the concrete industry. At the concrete plant the admixture containing the notified polymer is dispensed via an enclosed, automatic system directly into the back of the concrete transit mixer along with water, sand, gravel and cement for the manufacture of pre-mixed concrete. At the construction site the pre-mixed concrete containing the notified polymer is discharged either directly into concrete forms or holes in the ground or into a pump for transfer over heights or difficult areas that cannot be reached directly by the truck.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

OCCUPATIONAL EXPOSURE

Estimated annual exposure frequency and duration of workers

Category of Worker	*Number*	*Exposure Duration (hours per day)*	*Exposure Frequency (days per year)*
Admixture blenders	2	2	180
Delivery truck drivers	2	1	72
Dispenser technicians	1	2	4
Concrete truck drivers	5	4	72
Concrete placers	20	4	72

Reformulators

At the reformulation site the aqueous polymer solution (30-60%) is pumped via flexible hose from the bulk boxes to enclosed mixing vessels. After formulation the admixture (3-18% polymer) is transferred to storage containers. Due to the enclosed nature of the processes minimal exposure is expected during reformulation. Dermal and ocular exposure may occur due to spills and drips when coupling and uncoupling hoses to bulk boxes of the notified polymer solution, and when packing off the finished admixture. The MSDS indicates that overalls, impermeable gloves and eye protection should be worn.

Transport and delivery personnel

Transport and delivery personnel at the reformulation site and concrete plant may be exposed to spills and splashes of the notified polymer solution (30-60%) or the admixture containing the polymer (3-18%) during the process of connecting and disconnecting hoses for automated transfer of the solutions. This will be primarily dermal or ocular exposure, and can be minimised by the use of personal protective equipment such as impervious gloves and eye protection.

Dermal exposure to the concrete containing the blended admixture can also occur during delivery. However, exposure to the notified polymer is minimal as the concentration of notified polymer in the concrete is very low (0.003-0.065%).

Dispensing technicians at concrete plant

At the concrete plant there is no contact with the admixture by site personnel, except in the case of equipment maintenance or breakdown. The admixture containing the polymer is dispensed via an enclosed, automatic system directly into the back of the concrete transit mixer. The dose rate for addition of the admixture containing the polymer is in the region of 0.9 and 3.6L per 1000L of concrete. The concentration of the notified polymer in the concrete containing the polymer will be between 0.003% and 0.065%.

Construction

At the construction site, the concrete placers use a variety of equipment to move the concrete into position. Direct contact with the concrete is usually kept to a minimum, however the concrete placers may have hand and leg contact with the concrete containing the notified polymer (0.003-0.065%) during placing and finishing. Once the final concrete mix has hardened the polymer will not be separately available for exposure or absorption.

PUBLIC EXPOSURE

The notified polymer as introduced is only used at the manufacturing site where public access is strictly controlled. Concrete containing admixture made with the polymer is usually only handled on construction sites closed to the public or by skilled contractors in private premises.

There is likely to be a high level of public exposure arising from dermal contact with finished concrete structures containing the notified polymer at 0.003-0.065%. However, the majority of the polymer will be bound within the matrix of the concrete and once hardened will remain immobile. Therefore it is unlikely the public will be exposed.

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 an aqueous solution of the notified polymer (30-60%).

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

***** Only two bacterial strains were tested: *Salmonella typhimurium* TA98 and TA100.

All results were indicative of low hazard.

In the skin irritation study, very slight to well-defined erythema was observed in all animals 1 hour after removal of the dressing and this persisted in one animal up to 72 hours after treatment. Slight erythema was observed in a second animal at the 24-hour reading, and in the third animal up to the 48-hour reading. Very slight swelling was observed in one animal 1 to 24 hours after treatment, and in a second animal 1 hour after treatment. In addition, slight scaling of the skin was evident in one animal at the 72-hour observation. All skin reactions were clear 7 days after treatment.

In the eye irritation study, slight reddening of the conjunctivae was observed in all animals 1 hour after application, and persisted in one animal up to the 24-hour reading. In addition, slight swelling of the conjunctivae and slight reddening of the sclera were observed in one animal 1 hour after application.

6.3. Human Health Risk Assessment

OCCUPATIONAL HEALTH AND SAFETY

The OHS risk presented by the notified polymer is expected to be low, based on the minimal exposure to workers and the low intrinsic hazard of the polymer. However, as the notified polymer is a slight skin/eye irritant, workers involved in the transfer of the aqueous polymer solution (30-60%) should wear impervious gloves and eye protection to minimise risk of an irritant response.

PUBLIC HEALTH

As there will be no exposure of the public to the notified polymer (or products containing the notified polymer) the risk to the public is considered to be negligible.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Exposure Assessment

ENVIRONMENTAL RELEASE

At the Manufacturing Site: All bulk tanks and pallecons are stored in approved bund areas so even if there was a rupture the material would essentially be captured and the release to the environment would probably be < 100 kg. All spills and drips etc from the admixture blending area and the filling and despatch areas, are contained in a bund and pumped to a waste treatment plant, which is an in-line dosing system. The system has automatic pH control and effluent will be pumped up to a clarifier-solids separator where the solids are separated, concentrated and then mixed with cement to form a solid waste. This solid waste is then disposed of in an approved land fill. The chemical treatment system consists of the addition of a flocculant followed by adjusting to a pH around 7 and finally by the addition of a polymer to bind up the floc created by the flocculant. The treated water is passed to the sewer system which is monitored by Sydney Water. Similarly, wash water used for cleaning tanks between batches is transferred directly to the waste treatment plant.

At Premix Concrete Plant: Spills and drips from bulk tanks or 1000 L bulk boxes are contained within a bund. This would be removed by an authorised trade waste organisation and disposed of according to local regulations. Typically 20 kg of concrete (0.0007-0.004 kg of notified polymer) is retained within the delivery truck. Washings from delivery trucks on return to batch plant are contained in a wash water system, most of which is recycled for future concrete manufacture. Waste concrete is allowed to harden and disposed of in an approved landfill. Some may be disposed of directly to land.

Determination of the mass of notified polymer in 20 kg of concrete

Average cementitious material/m^3 of concrete	260 kg/m^3
Volume of the admixture used/100 kg of cementitious material	600 mL
The volume of the admixture/m^3 of concrete	260/100 X 600 mL = 1.56 L/m^3 of concrete
Relative density of the admixture	1.384
Mass of the admixture/m^3 of concrete	1.384 X 1.56 = 2.159 kg/m^3
% of notified polymer in the admixture	3-18%
Mass of notified polymer/m^3 of concrete	3% X 2.159 = 0.06477 kg/m^3; 18% X 2.159 = 0.3886 kg/m^3
Approximate concrete density	1895 kg/m^3
Volume of concrete for 20 kg of concrete	1895/20 = 0.01055 m^3
Mass of notified polymer in 20 kg of concrete	0.06477 X 0.01055 = 0.0007 kg 0.3886 X 0.01055 = 0.004 kg

ENVIRONMENTAL FATE

The notified polymer's high molecular weight suggests that it is unlikely to cross biological membranes and bioaccumulate. If released to water it would be expected to partition to the aqueous phase as the notified polymer is highly soluble in water.

Although the disposal quantity of the notified polymer is relatively large, the majority of the waste will be disposed of in landfill in a dispersed manner and in solid form. Waste water containing the notified polymer from cleaning of the application/manufacture equipment is treated at the waste treatment plant prior to discharge to sewer.

In landfill, once the concrete has cured and hardened, the admixture containing the polymer is locked within the cement and is not readily resoluble by water. The polymer will be immobile in the concrete and not leach into the aquatic compartment. Although the notified polymer contains hydrolysable ether groups, hydrolysis is unlikely to occur under environmental pH range.

7.2. Environmental Hazard Characterisation

No ecotoxicological data were submitted.

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 toxicity to algae is likely to be further reduced due to the presence of calcium ions, which will bind to the functional groups.

7.3. Environmental Risk Assessment

The products containing the notified polymer are likely to be used throughout Australia. The major environmental exposure is expected to be due to the disposal of solid waste from the premix concrete plant to landfill. As the majority of the notified polymer will be incorporated into matrix of the concrete and once the concrete is solidified, the notified polymer is expected to pose minimum risk to the environment. Spills and drips from bulk tanks or 1000 L bulk boxes are contained within a bund. This would be removed by an authorised trade waste organisation. Washing from delivery trucks on return to batch plant are contained and mostly recycled for future concrete manufacture. Thus exposure of the notified polymer to the aquatic compartment is likely to be low.

Given that the aquatic exposure is expected to be low there is unlikely to be an environmental risk in the aquatic compartment.

The majority of the notified polymer will remain cured in the matrix of the concrete which is destroyed at the end of its useful life.

Given the above, the overall environmental risk is expected to be acceptable.

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

- Employers should implement the following safe work practices to minimise occupational exposure during handling of the notified polymer as introduced in the product Aqualoc LA-100:
  - Avoid skin and eye contact

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure to the notified polymer as introduced in the product Aqualoc LA-100:
  - Chemical resistant gloves
  - Protective clothing
  - Safety goggles

  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

- Do not discharge into sewers or waterways. Process or wash down water should be sent to a waste treatment plant for processing.

Disposal

- The notified polymer should be disposed of by landfill.

Emergency procedures

- Spills or accidental release of the notified polymer should be handled by absorbing with dry inert filler (vermiculite, sand or soil), which can then be shovelled into appropriately labelled drums for disposal. Carefully dilute with water (fine spray or fog). Wash down area with excess water into a containment area or contain with inert filler for disposal.

- Spills in a contained area such as a bund can be removed by a commercial bulk liquid waste disposal organisation.

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.

or

(2) Under subsection 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.