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May 2017

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME
(NICNAS)**

PUBLIC REPORT

Polymer in D 600 G

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act 1989* (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 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 and Energy.

This Public Report is 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 CHEMICAL	INTRODUCTION VOLUME	USE
LTD/1957	Solvay Interlox Pty Ltd and Schlumberger Australia Pty Ltd	Polymer in D 600 G	ND*	≤ 1 tonne per annum	Cement additive for oil/gas operations

*ND = not determined

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification

As no toxicity data were provided, the notified polymer cannot be classified according to the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS), as adopted for industrial chemicals in Australia.

The environmental hazard classification according to the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS) is presented below. Environmental classification under the GHS is not mandated in Australia and carries no legal status but is presented for information purposes.

<i>Hazard classification</i>	<i>Hazard statement</i>
Acute category 2	H401 – Toxic to aquatic life
Chronic category 2	H411 – Toxic to aquatic life with long lasting effects

Human health risk assessment

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

Environmental risk assessment

On the basis of its limited aquatic exposure and assessed use pattern, the notified polymer is not expected 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.

- A copy of the SDS should be easily accessible to employees.
- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS)

as adopted for industrial chemicals in Australia, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation should be in operation.

Disposal

- Where reuse or recycling are not appropriate, dispose of the notified polymer in an environmentally sound manner in accordance with relevant Commonwealth, state, territory and local government legislation.

Emergency procedures

- Spills or accidental release of the notified polymer should be handled by containment, physical 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 chemical, 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 1,000;
 - the polymer is intended to be used in oil/gas operations involving hydraulic fracturing;or
- (2) Under Section 64(2) of the Act; if
 - the function or use of the polymer has changed from a cement additive for oil/gas operations, or is likely to change significantly;
 - the amount of polymer being introduced has increased, 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.

Safety Data Sheet

The SDS of the products containing the notified polymer provided by the notifier were reviewed by NICNAS. The accuracy of the information on the SDS remains the responsibility of the applicant.

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANTS

Solvay Interlox Pty Ltd (ABN: 70 000 882 137)
20-22 McPherson Street
BANKSMEDOW NSW 2019

Schlumberger Australia Pty Ltd (ABN: 74 002 459 225)
Level 5, 256 St Georges Terrace
PERTH WA 6000

NOTIFICATION CATEGORY

Limited: Synthetic polymer with $M_n \geq 1,000$ Da.

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, analytical data, degree of purity, polymer constituents, residual monomers, impurities, additives/adjuvants, use details and import volume.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

Variation to the schedule of data requirements is claimed for all physico-chemical endpoints.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None

NOTIFICATION IN OTHER COUNTRIES

None

2. IDENTITY OF CHEMICAL

MARKETING NAME

D 600 G (aqueous solution containing $\leq 1\%$ notified polymer)

MOLECULAR WEIGHT

$M_n > 1,000$ Da

ANALYTICAL DATA

Reference IR spectrum was provided.

3. COMPOSITION

DEGREE OF PURITY

$> 94\%$

4. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: liquid (aqueous solution at $\leq 1\%$ concentration)

Property	Value	Data Source/Justification
Melting Point/Freezing Point	Not determined	Imported in aqueous solution
Boiling Point	Not determined	Imported in aqueous solution
Density*	1,070 kg/m ³	SDS
Vapour Pressure	Not determined	Expected to be low based on high molecular weight
Water Solubility	Miscible in water at 20 °C	SDS
Hydrolysis as a Function of pH	Not determined	Not expected as the notified polymer does not contain readily hydrolysable functionalities
Partition Coefficient	Not determined	Expected to be surface active and accumulate at

Property	Value	Data Source/Justification
(n-octanol/water)		the phase boundaries
Adsorption/Desorption	Not determined	Expected to be surface active and accumulate at soil surface
Dissociation Constant	Not determined	The notified polymer is a salt and will dissociate in water.
Flash Point	Not determined	Imported in aqueous solution
Flammability	Not flammable	Imported in aqueous solution
Autoignition Temperature	Not determined	Imported in aqueous solution
Explosive Properties	Not determined	Contains no functional groups that would imply explosive properties
Oxidising Properties	Not determined	Contains no functional groups that would imply oxidative properties

* For the notified polymer at $\leq 25\%$ concentration in aqueous solution

DISCUSSION OF PROPERTIES

Reactivity

The notified polymer is expected to be stable under normal conditions of use.

Physical hazard classification

Based on the submitted physico-chemical data depicted in the above table, the notified polymer is not recommended for hazard classification according to the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)*, as adopted for industrial chemicals in Australia.

5. INTRODUCTION AND USE INFORMATION

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

The notified polymer will not be manufactured in Australia. It will be imported in an aqueous solution at a concentration $\leq 1\%$. The neat form of the notified polymer will not be imported.

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

Year	1	2	3	4	5
Tonnes	0.5-1	0.5-1	0.5-1	0.5-1	0.5-1

PORT OF ENTRY

Sydney, Fremantle and Port Hedland

TRANSPORTATION AND PACKAGING

The notified polymer will be imported in an aqueous solution and transported in 1,000 L IBCs by sea to off-shore operation sites.

USE

The aqueous solution containing the notified polymer at $\leq 1\%$ concentration will be used as a cement additive in off-shore oil/gas operations. The final concentration of the notified polymer in the end use cement slurry will be $\leq 0.01\%$. The notified polymer will not be used in oil/gas operations involving hydraulic fracturing.

OPERATION DESCRIPTION

No reformulation or repackaging of the product containing the notified polymer will occur in Australia. The aqueous solution containing the polymer will be shipped to offshore oil/gas platforms in the imported 1,000 L IBCs. The IBCs will be opened in a bunded area and pumping equipment will be attached for transferring. The aqueous solution containing the notified polymer will be blended on site with cement slurry and pumped downhole between the outside of the steel pipe and the rock formation for casing. The empty IBCs will be rinsed with water and the rinsate will be beaded to the cement slurry. The washed empty IBCs will be returned to shore for disposal.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

CATEGORY OF WORKERS

<i>Category of Worker</i>	<i>Exposure Duration (hours/day)</i>	<i>Exposure Frequency (days/year)</i>
Transport and warehousing	2-8	12
Oil and gas platform workers	1-4	2-10

EXPOSURE DETAILS

Transport and storage workers may come into contact with the notified polymer at $\leq 1\%$ concentration, only in the event of accidental breach of the containers.

Oil/gas platform workers will use the imported aqueous solution containing the notified polymer on the off-shore operation sites. Dermal and ocular exposure to the notified polymer at up to 1% concentration from spills and splashes may occur during mixing the cement mixture, sampling for quality control and cleaning the equipment. Dermal and ocular exposure to the cement slurry containing up to 0.01% of the notified polymer may also occur during pumping the cement slurry into wells. Inhalation exposure is not expected under normal use conditions unless aerosols or mists are formed during the use. Exposure to the notified polymer is expected to be minimised by the use of personal protective equipment (PPE) such as coveralls, gloves, respiratory protection and/or safety glasses. The product containing the notified polymer will be used in open areas at off-shore oil/gas platforms where accumulation of aerosols or mists is not expected to be significant.

6.1.2. Public Exposure

The product containing the notified polymer will not be used by the public. It will only be used for industrial applications at off-shore oil/gas platforms where public access will be very limited. Therefore direct public exposure to the notified polymer is not expected under normal use conditions.

6.2. Human Health Effects Assessment

No toxicity data for the notified polymer were submitted.

Given the ionic character and high molecular weight of the notified polymer, significant dermal absorption of the polymer is not expected.

The notified polymer is similar in structure to the anionic surfactants known as alcohol ethoxysulphates (AES). AES are of low acute and repeated dose toxicity, non-sensitising, non-genotoxic and are not reproductive or developmental toxicants (HERA, 2003). AES have been shown to be moderately to severely irritating to the eyes and skin, however AES solutions below 1% were virtually non-irritating (HERA, 2003).

Based on the toxicological properties of the AES, the notified polymer is expected to be irritating to the skin and eyes. This is expected given its surfactant properties.

Health hazard classification

As no toxicity data were provided, the notified polymer cannot be classified according to the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)*, as adopted for industrial chemicals in Australia.

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety

Based on the toxicological properties of a similar class of chemicals, the notified polymer is likely to present as a skin and eye irritant. Workers may be exposed to the notified polymer at concentrations $\leq 1\%$. At such low use concentrations, significant irritation effects are not expected. Therefore, when used as proposed, the notified polymer is not considered to pose an unreasonable risk to the health of workers.

6.3.2. Public Health

The product containing the notified polymer is intended for industrial use only and will not be available to the public. Direct public exposure to the notified polymer is not expected under normal use conditions. Therefore, when used as proposed, the notified polymer is not considered to pose an unreasonable risk to public health.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified polymer will be imported in an aqueous solution and transported to off-shore oil/gas operation sites. No reformulation or repackaging of the product containing the notified polymer will occur in Australia.

RELEASE OF CHEMICAL FROM USE

The notified polymer will be used in cementing applications in offshore oil and gas wells. The aqueous solution containing the notified polymer will be blended with cement slurry in a banded area to give a notified polymer concentration of 0.01% in cement.

The cement containing the notified polymer will be pumped downhole between the outside of the steel pipe and the rock formation for casing. During this process some excess cement may be displaced into the water and onto the seabed. This cement may remain liquid for several hours, during which time the release of chemicals into the ambient waters is considered negligible. After the cement has hardened, the chemical components of the cement are locked in the inert cement matrix (Thatcher *et al.*, 2005). Therefore no significant release of the notified polymer to the environment is expected from this source.

RELEASE OF CHEMICAL FROM DISPOSAL

As the notified polymer will be used in cement slurries in off-shore drilling operations, the majority of the notified polymer will be incorporated into the cement casings and have the same fate as the cured cement which is likely to remain permanently within the well structure. Any import container residue, spills, or waste generated from cementing operations of the product containing the notified polymer will be collected and disposed of in accordance with local government regulations.

7.1.2. Environmental Fate

No environmental fate data were submitted. The notified polymer is expected to be biodegradable based on its chemical structure.

Based on its use as cementing additive for off-shore drilling operations, the majority of the notified polymer will be bound into the matrix of hardened cement. It is expected that there will be minimal migration of the notified polymer from the hardened concrete, and thus no significant release to the environment from this source. The notified polymer is expected to remain at the bottom of the ocean in the concrete matrix or be disposed of to landfill. In both cases, it is expected to eventually degrade via abiotic and biotic pathways, forming water, oxides of carbon and sulphur, and inorganic salts.

Based on its high molecular weight and expected surface activity, the notified polymer is not expected to be bioaccumulative.

7.1.3. Predicted Environmental Concentration (PEC)

The predicted environmental concentration (PEC) has not been calculated, since no significant release of the notified polymer to the aquatic environment is expected from the reported use pattern.

7.2. Environmental Effects Assessment

The results from ecotoxicological investigations conducted on the notified polymer are summarised in the table below. Details of these studies can be found in Appendix A.

<i>Endpoint</i>	<i>Result</i>	<i>Assessment Conclusion</i>
Fish Toxicity	96 h LC50 = 85 mg/L	Harmful to fish
Daphnia Toxicity	48 h LC50 = 15.2 mg/L	Harmful to aquatic invertebrates
Algal Toxicity	72 h EC50 = 6.9 mg/L	Toxic to algae

Based on the above ecotoxicological endpoints, the notified polymer is considered to be acutely toxic to marine life under the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS) (United Nations, 2009). Therefore, the notified polymer is formally classified as “Acute Category 2, Toxic to aquatic life”.

Based on the acute toxicity and lack of biodegradability data, the notified polymer is formally classified as “Chronic category 2, Toxic to aquatic life with long lasting effects” under the GHS.

7.2.1. Predicted No-Effect Concentration

The predicted no-effects concentration (PNEC) has been calculated from the most sensitive endpoint for marine algae (EC50 = 6.9 mg/L). A safety factor of 100 was used because the measured endpoints are available for aquatic life representing three trophic levels.

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
EC50 (algae, 72h)	6.9	mg/L
Assessment Factor	100	
Mitigation Factor	1.00	
PNEC:	69	µg/L

7.3. Environmental Risk Assessment

The risk quotient ($Q = PEC/PNEC$) of the notified polymer has not been calculated because the PEC was not calculated due to negligible release of the notified polymer to the aquatic compartment. When used as a cementing additive, the notified polymer will be irreversibly bound within the inert cement matrix, and is not likely to be released into the aquatic environment. Additionally, the notified polymer is expected to have a low potential for bioaccumulation based on its high molecular weight and surface activity.

On the basis of its limited aquatic exposure and assessed use pattern, the notified polymer is not expected to pose an unreasonable risk to the environment.

APPENDIX A: ENVIRONMENTAL FATE AND ECOTOXICOLOGICAL INVESTIGATIONS

A.1. Ecotoxicological Investigations

A.1.1. Acute toxicity to fish

TEST SUBSTANCE	Notified polymer
METHOD	PARCOM Protocol on methods for the testing of chemicals in the offshore oil industry, part B: Protocol for a fish acute test, complied with OECD TG 203 Fish, Acute Toxicity Test – semi static
Species	Juvenile Turbot (<i>Scophthalmus maximus</i>)
Exposure Period	96 hours
Auxiliary Solvent	None
Water Hardness	The test was conducted in seawater with salinity of 28.9 S
Analytical Monitoring	Not reported
Remarks – Method	The total mass of test fish was 2.7 g/L, larger than the mass 1.0g/L as recommended by the test guideline. The salinity of the test medium was 28.9 S while the recommended salinity is 30-35 S. Oxygen saturation was below 70% on 4 occasions during the test. These deviations were evaluated to have no significant effects on the results of the test.

RESULTS

Concentration (mg/L) <i>Nominal</i>	Number of Fish	Mortality (%)			
		24 h	48 h	72 h	96 h
Control	7	0	0	0	0
10	7	0	0	0	0
18	7	0	0	0	0
32	7	0	0	0	0
56	7	0	0	0	0
100	7	29	58	71	71

LC50 85 mg/L at 96 hours.

NOEC 56 mg/L at 96 hours.

Remarks – Results The test results were based on nominal concentration. The actual concentration of the test substance in the test preparations was not determined. It was unclear whether the concentration of the test substance maintained $\geq 80\%$ of the nominal concentration.

No toxic effects on fish were observed at the test concentration of 56 mg/L or below.

CONCLUSION The notified polymer is harmful to fish.

TEST FACILITY NIWR (1999)

A.1.2. Acute toxicity to aquatic invertebrates

TEST SUBSTANCE	Notified polymer
METHOD	ISO ISO/FDIS 14669, Water-Quality-Determination of acute lethal toxicity to marine copepods (<i>Copepoda Crustacea</i>)
Species	<i>Acartia tonsa</i>
Exposure Period	48 hours
Auxiliary Solvent	None
Water Hardness	The test was conducted in seawater with salinity of 32 S.
Analytical Monitoring	Not reported
Remarks - Method	Only study summary was provided. It is not clear whether the test was conducted according to the test guideline.

RESULTS

<i>Concentration (mg/L)</i> <i>Nominal</i>	<i>Number of D. magna</i>	<i>Number Immobilised</i>	
		<i>24 h</i>	<i>48 h</i>
Control	22	0	2
3.2	24	0	3
5.6	24	0	3
10	22	0	6
18	24	7	15
32	26	25	25

EC50 15.2 mg/L at 48 hours

NOEC Not reported

Remarks - Results The validity of the test is undetermined as only the study summary was provided.

CONCLUSION The notified polymer is harmful to fish.

TEST FACILITY NIWR (1999)

A.1.3. Algal growth inhibition test

TEST SUBSTANCE Notified polymer

METHOD ISO 10253, Marine algal growth inhibition test

Species *Skeletonema costatum*

Exposure Period 72 hours

Concentration Range Nominal: Control, 0.32, 0.56, 1.0, 1.8, 3.2, 5.6 and 10 mg/L

Actual: Not determined

Auxiliary Solvent None

Water Hardness The test was conducted in seawater with salinity of 30.3 S.

Analytical Monitoring Not reported

Remarks - Method Only study summary was provided. It is not clear whether the test was conducted according to the test guideline.

RESULTS

<i>Biomass</i>		<i>Growth</i>	
<i>EC50</i> <i>mg/L at 72 h</i>	<i>NOEC</i> <i>At 72 mg/L</i>	<i>EC50</i> <i>mg/L at 72 h</i>	<i>NOEC</i> <i>At 72 mg/L</i>
Not reported	Not reported	6.9	3.2

Remarks - Results The validity of the test is undetermined as only the study summary was provided.

CONCLUSION The notified polymer is toxic to algae.

TEST FACILITY NIWR (1999)

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