

File No SAPLC/70

19 September 2007

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

FULL PUBLIC REPORT

Polymer in DCA-247

This Self Assessment has been compiled by the applicant and adopted by NICNAS 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), administered by the Department of Health and Ageing and the Department of the Environment and Water Resources has screened this assessment report. The data supporting this assessment will be subject to audit by NICNAS.

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
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TABLE OF CONTENTS

| | |
|---|---|
| FULL PUBLIC REPORT..... | 3 |
| 1. APPLICANT AND NOTIFICATION DETAILS | 3 |
| 2. IDENTITY OF CHEMICAL | 3 |
| 3. PLC CRITERIA JUSTIFICATION | 3 |
| 4. PHYSICAL AND CHEMICAL PROPERTIES | 4 |
| 5. INTRODUCTION AND USE INFORMATION..... | 4 |
| 6. HUMAN HEALTH IMPLICATIONS..... | 5 |
| 6.1. Exposure Assessment | 5 |
| 6.2. Toxicological Hazard Characterisation | 5 |
| 6.3. Human Health Risk Assessment..... | 5 |
| 7. ENVIRONMENTAL IMPLICATIONS | 6 |
| 7.1. Exposure Assessment | 6 |
| 7.2. Environmental Hazard Characterisation | 7 |
| 7.3. Environmental Risk Assessment | 7 |
| 8. CONCLUSIONS..... | 7 |
| 8.1. Level of Concern for Occupational Health and Safety..... | 7 |
| 8.2. Level of Concern for Public Health | 7 |
| 8.3. Level of Concern for the Environment..... | 8 |
| 9. MATERIAL SAFETY DATA SHEET..... | 8 |
| 9.1. Material Safety Data Sheet | 8 |
| 10. RECOMMENDATIONS | 8 |
| 11. REGULATORY OBLIGATIONS | 8 |
| 12. BIBLIOGRAPHY | 9 |

FULL PUBLIC REPORT**Polymer in DCA-247****1. APPLICANT AND NOTIFICATION DETAILS**

APPLICANT

GE Betz Pty Ltd (ABN: 84 001 221 941)
69-77 Williamson Road
INGLEBURN NSW 2565

NOTIFICATION CATEGORY

Self Assessment: 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, Import Volume and Reformulation Site.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None

NOTIFICATION IN OTHER COUNTRIES

USA (2006)
Canada (Schedule 9, 2007)

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)

DCA – 247 (Solution containing the notified polymer)

MOLECULAR WEIGHT (MW)

Number Average Molecular Weight (NAMW) >1000

REACTIVE FUNCTIONAL GROUPS

The notified polymer contains only low concern functional groups.

3. PLC CRITERIA JUSTIFICATION

| <i>Criterion</i> | <i>Criterion met</i> |
|--|----------------------|
| 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 | Amber liquid with a mild odour |
| Boiling Point | 104°C |
| Freezing Point | 7°C |
| Density | 1227 kg/m ³ at 21°C |
| Water Solubility | Soluble in water (ionized throughout the environmental pH range of 4-9) |
| Reactivity | Stable under normal environmental conditions |
| Degradation Products | None under normal conditions of use |
| Comments | The pH of the solution is 5.2 and the vapour pressure is 18 mm Hg. The partition coefficient is estimated to be log Kow approximately -1. The flashpoint is >101°C. |

5. INTRODUCTION AND USE INFORMATION

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

| <i>Year</i> | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> |
|---------------|----------|----------|----------|----------|----------|
| <i>Tonnes</i> | 30-100 | 30-100 | 30-100 | 30-100 | 30-100 |

USE AND MODE OF INTRODUCTION AND DISPOSAL

Mode of Introduction

The notified polymer will be used as a scale control agent for water treatment in industrial cooling water circuits, including re-circulated and flow through systems.

The notified polymer will be imported as a 40-60 % aqueous polymer dispersion in 205 L steel drums or 1500 L intermediate bulk containers (IBC) from the United States of America. It will be transported from the dockside to the reformulation/repackaging site, where it will be stored in a bonded chemical warehouse.

The notified polymer will be reformulated and/or repackaged of into various scale inhibiting products at this site. The notified polymer may also be distributed directly to the customers in the original import containers.

Repackaging and Reformulation Processes

Repackaging

During repackaging the 205 L drums of dispersion containing the notified polymer are decanted into purpose built 1200 L double skinned semi-bulk containers (SBC). The drums and SBC are transferred from storage sites to the fully bonded blending room by forklift. Blending operators open the drums and connect the pump and transfer lines between the 205 L drum and 1200 L SBC. Once the transfer is complete the pumping equipment is removed and reconnected to the next drum. At the end of the process the SBC is sealed and prepared for transport to the end use site. The pumping equipment, transfer lines and empty drums are rinsed out by the blending operator.

Reformulation

During reformulation the drums are moved from the warehouse to the production facility and contents of the import containers are pumped into a mixing vessel. The solution is diluted with water to the required concentration and blended. The majority of the blended products will contain less than 20% of the notified polymer. Manual handling is avoided, with the blended product is dispensed directly into either 15 L polypropylene pails or back into the import containers. The blending and dispensing of the product is carried out using metered dose pumping equipment and it is operated in a purpose built area, which is fully bonded with local exhaust ventilation.

The products containing the notified polymer are transported by road by a licensed contractor to the customer site. Products are stored at the customer site in fully bunded warehouses until required. An assessment is then made as to how much of the material needs to be feed into the water circuit. For small scale applications i.e. <15L, the product is decanted from the pails using hand pumps, into holding or dilution tanks of the dosing equipment. Larger operations involve attaching semi-bulk containers directly to dosing equipment, via fully enclosed pumping equipment.

Use

The notified polymer will be used as scale control agent in water treatment.

The systems are treated typically at less than 30 ppm with the majority being less than 15 ppm. The system can be either shot-fed or fed continuously.

6. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

OCCUPATIONAL EXPOSURE

Transport and warehousing workers may come into dermal and ocular contact with the notified polymer through accidental leaks and spillages of the drums and containers.

Significant exposure to the notified polymer will be limited due to the workplace practices and personal protective equipment used during all processes. The transfer and blending processes that occur during repackaging and reformulation of the notified polymer are automated. Ocular and dermal exposure may occur as a result of drips and spills during the connection and disconnection of pumps and lines. Dermal and ocular exposure may also occur during the maintenance and cleaning processes. Workers will wear impermeable gloves, eye protection, protective footwear and coveralls during the repackaging, reformulation and maintenance activities.

The engineering controls, work practices and the use of personal protective equipment used during application of the scale inhibitor products ensure exposure is minimal. The application process is carried out by trained technicians. Technical operators wear suitable protective clothing, gloves and safety goggles or glasses. Operators may be exposed to the notified polymer during transfer operations, cleaning and maintenance of application equipment or through accidental spillage.

PUBLIC EXPOSURE

The notified polymer is intended only for use in industry and as such public exposure to the notified polymer is not expected.

6.2. Toxicological Hazard Characterisation

No toxicological data were submitted. The notified polymer meets the PLC criteria and can therefore be considered to be of low hazard.

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.

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 from exposure to the notified polymer is considered to be negligible.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Exposure Assessment

ENVIRONMENTAL RELEASE

Release at Reformulation Site

Environmental exposure may occur as the result of release during reformulation or repackaging at the notifier's site or during use as a scale control agent in cooling towers. Release from leaks and spills will be contained by bunding and soaked up by adsorbent material for disposal to landfill. Approximately 5000 kg of the notified polymer may be released to the environment from equipment cleaning and residues remaining in the containers.

Release from Use

It is expected that approximately 90% (90000 kg) of the notified polymer will be released, each year, to the environment as result of continuous discharge or short term manual blowdown or total shutdown and cleaning. The remaining 5% (5000 kg) of the notified polymer is expected to be released to environment as drift and fall in the immediate vicinity of the cooling towers.

A worst case scenario Predicted Environmental Concentration (PEC) for the aquatic environment was determined by assuming direct discharge of the notified polymer from water treatment systems. The calculated PEC is given below:

| | |
|---|-----------|
| Maximum Introduction Volume | 100000 kg |
| Proportion expected to be released to sewer | 100% |
| Days per year when release occurs | 365 |
| Daily chemical release (kg/day) | 274 |
| Water use (L/person/day) | 200 |
| Australian Population (millions) | 20.1 |
| Daily effluent production (ML) | 4020 |
| Removal with STP | 0 |
| PEC ($\mu\text{g/L}$) | 68.2 |
| River ($\mu\text{g/L}$) | 68.2 |
| Ocean ($\mu\text{g/L}$) | 6.82 |

In calculating the PEC the following assumption was made:

Daily release assumes the 100% of introduction volume is released from the cooling tower during blow down or total shutdown and cleaning.

ENVIRONMENTAL FATE

The notified polymer is water soluble, expected to be hydrolytically stable and is not readily biodegradable. The notified polymer should not hydrolyse (due to the lack of suitable functionality) but is expected to slowly degrade into oxides of carbon and water. The notified polymer's high molecular weight will preclude absorption across biological membranes and thus it is unlikely to bioaccumulate.

| <i>Endpoint</i> | <i>Results and Conclusion</i> | <i>Test Guideline (Choose or replace)</i> |
|------------------------|-------------------------------|---|
| Ready Biodegradability | Not readily biodegradable | OECD TG 301 D |

7.2. Environmental Hazard Characterisation

The notified polymer meets the PLC criteria and can therefore be considered to be of low hazard. This is supported by environmental endpoints observed in testing conducted on the notified or analogue polymer.

| <i>Endpoint</i> | <i>Result</i> | <i>Effects Observed?</i> | <i>Test Guideline (Choose one)</i> |
|------------------|-----------------|--------------------------|--|
| Fish Toxicity | EC50 >8000 mg/L | No | OECD TG 203 |
| Daphnia Toxicity | EC50 =2900 mg/L | No | OECD TG 202 |
| Algal Toxicity | EC50 = 44 mg/L | No | OECD TG 201 |

All results were indicative of low hazard.

After 72 hours the EC50 was 44 mg/L (95% confidence interval 40-48 mg/L). While classified as harmful to aquatic life, the results are most likely due to the sequestration of metal ions in the test media by the notified polymer.

After 28 days DCA-247 containing the notified polymer reached a maximum percent biodegradation of 6.2%, therefore DCA-247 cannot be classified as readily biodegradable.

7.3. Environmental Risk Assessment

The results of the algal toxicity test indicate that DCA – 247 containing the notified polymer is harmful to algae. It should be recognised that scale inhibitors prevent scale formation by adsorbing onto the crystal nuclei of chemical compounds such as calcium carbonate, calcium phosphate, and magnesium and silica. In doing so, the inhibitors prevent scale growth on the surface of equipment (Environmental Protection Group 1997 cited in NICNAS, 2002). Thus the effects observed in the algal study are most likely to due to the notified polymer sequestering critical micronutrients in the growth medium and not direct toxicity of the notified polymer. Schowanek et al (1996) suggest that the NOEC and EC50 values for strongly chelating agents given in algal inhibition growth inhibition test may be overestimated by at least one order of magnitude.

The PEC in rivers was calculated to be 68.2 µg/L with no removal by sewage treatment plants. The most sensitive organism identified was freshwater green algae with 72 hour EC50 of 44 mg/L. Thus the Predicted No Effect Concentration (PNEC) is 0.44 mg/L using an assessment factor of 100. The resultant PEC/PNEC ratio is $68.2/440 = 0.15$, which indicates a low hazard.

It is expected that the notified polymer that is released to the natural water will not limit the available nutrients in the environment as its chelating potential will be considerably reduced due to loading with ions scavenged from the water treatment system and sewage effluent. Any notified polymer which partitions into sludge at the sewage treatment plant will be disposed of in landfill as solid waste. In landfill it is expected to adsorb to soil and sediment and undergo slow abiotic and microbial degradation (NICNAS, 2002).

When the above is considered, the notified polymer is unlikely to pose any significant risk to aquatic organism, including algae when released 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 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 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 or liquid waste treatment facility by licensed waste contractors.

Storage

- The following precautions should be taken regarding storage of the notified polymer:
 - Keep containers closed when not in use
 - Store in a cool ventilated area away from oxidisers

Emergency procedures

- Spills/release of the notified polymer should be absorbed or contained with a suitable absorbent material (tissue, cloth, dry sand or vermiculite). Shovel into labelled sealable containers for subsequent safe disposal. Contaminated surfaces should be washed down with detergent solution and retained as waste.

11. 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 notified polymer is introduced in a chemical form that does not meet the PLC criteria.or
- (2) Under Section 64(2) of the Act; if
 - the function or use of the chemical has changed from a scale control agent in water treatment, or is likely to change significantly;
 - the amount of chemical being introduced has increased from 100 tonnes, or is likely to increase, significantly;
 - if the chemical has begun to be manufactured in Australia;
 - 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.

12. BIBLIOGRAPHY

Environment Protection Group, Environment Australia (1997) Water treatment industry chemical use and resulting environmental exposure levels. Sinclair Knights Merz, Malvern Victoria

National Industrial Chemical Notification and Assessment Scheme (2003) Full Public Report Polymer in Optidose 3100, (LTD/1011) March 2002, Marrickville New South Wales

Schowanek D, McAvoy D, Versteeg D and Hanstveit A (1996). Effects of nutrient trace metal speciation on algal growth in the presence of the chelator [S,S]-EDDS. *Aquatic Toxicology* 36:253-275.