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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Polymer in Rezosol 8223 Special

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Director
Chemicals Notification and Assessment

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Polymer in Rezosol 8223 Special

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
BetzDearborn Australia Pty Ltd (ABN 84 001 221 941) of 69-77 Williamson Road, Ingleburn, NEW SOUTH WALES, 2565.

NOTIFICATION CATEGORY
Limited: Polymer with NAMW ≥ 1000 (greater than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
Data items and details claimed exempt from publication: chemical identity, polymer composition, customer name, concentration of polymer in end use product.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
No.

NOTIFICATION IN OTHER COUNTRIES
USA.

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)
Rezosol 8223SP or Rezosol 8223 Special (contains < 50% polymer).

MOLECULAR WEIGHT

MOLECULAR WEIGHT (MW)

Number Average Molecular Weight (Mn)	1719
Weight Average Molecular Weight (Mw)	214270
Polydispersity Index (Mw/Mn)	124.63
% of Low MW Species < 1000	18.85
% of Low MW Species < 500	9.13

SPECTRAL DATA

ANALYTICAL METHOD: Infrared spectroscopy.

METHODS OF DETECTION AND DETERMINATION

ANALYTICAL METHOD: The notified polymer can be detected using GPC and identified using infra-red spectroscopy.

3. COMPOSITION

DEGREE OF PURITY
> 99%

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

ADDITIVES/ADJUVANTS
None.

DEGRADATION PRODUCTS
The polymer may combust to form oxides of carbon, nitrogen and chlorine.

LOSS OF MONOMERS, OTHER REACTANTS, ADDITIVES, IMPURITIES
Unknown.

4. INTRODUCTION AND USE INFORMATION

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	≤ 50	≤ 50	≤ 50	≤ 50	≤ 50

The notifier has clarified that the most likely import volume will be 20 tonnes per annum.

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified chemical will be imported by sea in 205 L drums or 1000 L and 1500 L intermediate bulk containers (IBC).

USE
The notified polymer is a processing aid in the production of tissue and towelling paper products. The polymer enhances the adhesion of the paper to the heated drying cylinder in the production process.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, Transport and Storage

PORT OF ENTRY
Sydney.

IDENTITY OF MANUFACTURER/RECIPIENTS
Not specified

TRANSPORTATION AND PACKAGING
The notified polymer will be imported by sea in 205 L drums or 1000 L and 1500 L IBC. From the dock it will be transported by road to the notifier's Ingleburn site for reformulation/repackaging. The reformulated product containing the notified polymer will be repackaged into 205 L drums or 1000 L and 1500 L IBC for distribution by road to user sites.

5.2. Operation Description

The notified polymer may be used as imported or reformulated into specialty blended products. At the notifier's Ingleburn site, the notified polymer will be transferred to mixing tanks where other ingredients may be added prior to blending, repackaging and distribution to customer sites.

At the customer site, the solution containing the notified polymer will be connected to an automatic dosing system. This system pumps the solution from the import/reformulation drums/tanks into a dilution tank and then on to spray equipment that applies the notified polymer to material in the drying cylinder.

5.3. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*
Transport and storage	5 – 9	2 – 3 hours/day	10 – 15 days/year
Reformulator	6 – 10	8 hours/day	100 days/year
Plant operator	15	1 – 2 hours/day	350 days/year

Exposure Details

Exposure to the notified polymer will be mainly dermal and ocular with potential for inhalation exposure to mists during mixing operations. Exposure during transport and storage should only occur in the event of an accident.

Formulated products may be produced at the notifier's site by pumping the imported product to mixing tanks via an automated system. Alternatively, the imported formulation may be pumped from shipping containers to containers more suitable for local distribution. The formulation is then be drummed off into 205 L drums and 1000 L or 1500 L IBCs. Local exhaust ventilation is used to extract mists or vapours. Exposure to drips and spills may be possible when connecting and disconnecting lines.

The aqueous solution of the notified polymer is pumped from product containers to a 10 L mixing tank where it is diluted with water and pumped to an enclosed spray system. The processing area is bunded and provided with local and general ventilation. Some exposure to drips and spills of the polymer solution can be expected.

5.4. Release

RELEASE OF CHEMICAL AT SITE

During the reformulation/repackaging of the solution containing the notified polymer, the notifier estimates that up to 850 kg per annum of waste will be generated. This will be derived from:

Spills:	$\leq$ 100 kg/annum
Residues in the import containers:	$\leq$ 250 kg/annum
Equipment cleaning:	$\leq$ 500 kg/annum

It is expected that spills of the notified polymer solution will be contained and disposed of to sewer. Wastes resulting from import drum washings and equipment cleaning will either be recycled into subsequent batches of the polymer formulation or disposed of to sewer. Intermediate bulk containers (ICB) will presumably be reused and 205 L import drums will either be recycled or disposed of to landfill.

The remainder of the notified polymer will be incorporated into a processing aid used in the production of tissue and towelling paper products at one paper production facility in South Australia.

RELEASE OF CHEMICAL FROM USE

At the user site, the solution containing the notified polymer will be sprayed onto material on the drying cylinder. It is expected that waste water containing the notified polymer will then be fed into the mill's on site waste water treatment plant. The notifier claims that approximately 60% of the notified substance will adsorb to the paper fibres and thus be removed from the waste water stream. Previous experience of this manufacturing facility indicates that wastes entering the water treatment plant pass through a clarifier and a series of aerobic treatment ponds. The average residence time in the ponds is around 10 days and the flow rate through the ponds is approximately 41 ML/day. After treatment water is released into Lake Bonney via an eleven kilometre drain.

Therefore, the majority of the notified polymer will follow the fate of the paper to which it is bound. Used facial tissues will be disposed of to domestic landfill while toilet tissue will be disposed of to sewer.

5.5. Disposal

The notified polymer will be disposed of to sewer.

5.6. Public exposure

The notified polymer will not be sold to the public. The public may come in contact with the notified polymer through the use of tissue and paper products containing it but the notified polymer is present at a low level and is expected to be tightly bound to paper fibres so that exposure should be minimal.

6. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa Yellow liquid.

Boiling Point 100°C at 101.3 kPa

Density 1080 kg/m^3

Vapour Pressure 2.4 kPa at 20°C.

Remarks The vapour pressure provided in the submission can be attributed to water. The vapour pressure of the notified polymer is likely to be relatively low considering the high molecular weight of the polymer.

Water Solubility Not determined.

Remarks The notifier indicates that the notifier polymer has a high water solubility.

Hydrolysis as a Function of pH Not determined.

Remarks The notified polymer contains amide linkages that could be expected to undergo hydrolysis under extreme pH conditions. However, in the environmental pH range of 4 to 9, significant hydrolysis of these is unlikely to occur.

Partition Coefficient (n-octanol/water) log Pow = -4.22

Remarks The partition coefficient for the notified polymer has not been determined. However, the notifier indicates the partition coefficient of the neutral repeating unit has been calculated using ACD software. While the translation of the above value to the notified polymer should be treated with caution, its expected high water solubility and likely hydrophilic nature are indicative of partitioning into the aqueous phase.

Adsorption/Desorption Not determined.

Remarks The notifier indicates that based on the notified polymer's expected high water solubility and estimated partition coefficient, it will have little affinity for organic matter in the soil and will, as a consequence, be mobile in both terrestrial and aquatic compartments.

Dissociation Constant Not determined.

Remarks The notifier indicates that the notifier polymer contains primary and secondary amine groups and terminal carboxylic acid groups. These are expected to have dissociation constants between 9-11 and 2-5, respectively.

Particle Size Not applicable.

Flash Point > 93°C

Flammability Limits Aqueous solution.

Autoignition Temperature	Aqueous solution.
Explosive Properties	Not explosive.
Reactivity	Not reactive.

7. TOXICOLOGICAL INVESTIGATIONS

No toxicity data were submitted.

8. ENVIRONMENT

8.1. Environmental fate

No test reports were submitted.

8.2.1. Acute toxicity to fish

TEST SUBSTANCE — The notified polymer solution (contains < 50% notifier polymer).

METHOD
- Species: Flathead Minnow (*Pimephales promelas*)
- Exposure Period: 96 h
- Analytical Monitoring: Not conducted.

RESULTS

Concentration mg/L Nominal	*Number of Fish*	*% Mortality*			
		24 h	*48 h*	*72 h*	*96 h*
0	20 (10 X 2 reps)	0	0	0	0
0.78	20	0	0	0	0
1.6	20	0	0	0	0
3.1	20	0	25*	55	90
6.3	20	55	80*	95	100
12.5	20	100	100	100	100
25	20	100	100	100	100
50	20	100	100	100	100

* either dead or suffering sublethal effects.

- LC50: 2.4 mg/L at 96 hours (CI = 2.18-2.61 mg/L) for 15% solution.
  0.36 mg/L at 96 h for the notified polymer.
- NOEC (or LOEC): 1.6 mg/L at 96 hours (for 15% solution)
  0.24 mg/L at 96 h for the notified polymer.
- Remarks – Results: The tests on fish were performed using semi-static methodology and at a water temperature of 20ºC. Observations of toxic effects were performed at 24, 48, 72 and 96 hours. Ten fish (2 replicates per each loading rate) were exposed to nominal concentrations of Rezosol 8223 of 0.78, 1.6, 3.1, 6.3, 12.5, 25 and 50 mg/L. The results of the definitive study showed that no mortalities or sublethal effects were observed below a test substance concentration of 1.6 mg/L. After 96 h, between 90 and 100% mortality was observed above at test substance concentration of 3.1 mg/L as determined by Probit analysis.

CONCLUSION — The ecotoxicity data indicates the notified polymer is highly acutely toxic to fish (Mensink *et al* 1995).

TEST FACILITY — Hercules Inc. Aquatic Toxicology Laboratory, Pennsylvania, USA, (1999a).

8.2.2. Acute/chronic toxicity to aquatic invertebrates

TEST SUBSTANCE	The notified polymer solution (contains < 50% notifier polymer).
METHOD	OECD TG 202 Daphnia sp. Acute Immobilisation Test.
Species	*Daphnia magna*
Exposure Period	48 hours
Analytical Monitoring	Not conducted.

RESULTS

Concentration mg/L Nominal	*Number of D. magna*	*% Immobilised*	
		24 h	*48 h*
0	20	0	5
78.1	20	0	0
156	20	0	0
313	20	0	0
625	20	20	50
1250	20	90	100
2500	20	95	100
5000	20	100	100

LC50	625 mg/L at 48 hours (CI = 536-730 mg/L) for Rezosol 8223. 94 mg/L at 96 h for the notifier polymer.
NOEC (or LOEC)	313 mg/L at 48 hours. 47 mg/L at 48 h for the notifier polymer.
Remarks - Results	The immobilisation tests with *Daphnia* were performed in duplicate using 10 daphnids per flask with observations of toxicity effects performed at 24 and 48 hours. The tests were conducted using nominal test substance concentrations of 78.1, 156, 313, 625, 1250, and 5000 mg/L. No precipitates were observed to form either in the test or stock solutions. After 48 h, no immobilised daphnids were observed below concentrations of 313 mg/L, while 100% mortality was observed at the test concentrations above 1250 mg/L. In addition to mortality, sub-lethal effects were also observed at 625 mg/L and above. The 48-hour EC50 for the notified polymer to *Daphnia magna* was determined using statistical analysis.
CONCLUSION	The ecotoxicity data indicates the notified polymer is slightly toxic to daphnia.
TEST FACILITY	Hercules Inc. Aquatic Toxicology Laboratory, Pennsylvania, USA, (1999b).

8.2.3. Algal growth inhibition test

The toxicity of the notified polymer to algae has not been determined. However, the notifier concedes that the notified polymer may also be toxic to algae. It is known that many amine compounds have up to six times the toxicity towards algae as compared to other aquatic organisms in the laboratory, though this is reduced in the natural environment due to interaction with humic material (Nabholz, 1993).

Field Studies

Information supplied by Kimberley Clark (the end user of the notified polymer) indicated that the Millicent paper making facility discharges its effluent to Lake Bonney after biological treatment in aeration ponds. Because this facility uses a variety of polymers and chemical additives in processing, some of which are known to be toxic to aquatic organisms, toxicity monitoring of the effluent discharged to Lake Bonney is undertaken each quarter. The tests are apparently conducted against rainbow trout and daphnia, and a Microtox bacterial fluorescence test is also a

component of this test regime. The company previously submitted a summary of the effluent toxicity data (four samples) taken between January and December 2000, and this indicated that the effluent is not toxic. However, since the new polymer would not have been used during the period of these studies, these data provide no information on potential toxic effects of the polymer following its introduction. It should be noted that prior to 1993 the plant effluent exhibited significant toxicity, and in this year the effluent treatment plant was installed. After 1993 the effluent quality progressively improved till in 1997 the effluent exhibited no toxicity, and this situation has apparently continued.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

The majority of the notified polymer will follow the fate of the paper to which it is bound and will either be disposed of to sewer or into domestic landfill. In the sewer the notified polymer is expected to partition with the toilet tissue to the sewage sludge. Solid wastes from these treatment plants will be disposed of to landfill or incinerated. In landfill the notifier polymer should remain bound to the fibres of the facial tissue and slowly degrade through abiotic and biotic processes. Incineration of the notified polymer will result in its degradation to give water and oxides of carbon and nitrogen.

Assuming a worst case scenario, based on annual imports of 20 tonnes per annum and a 50% fixation onto paper, a maximum of 10 tonnes will be lost from the paper making process and sent to a water treatment plant prior to discharge to Lake Bonney. Although the waste treatment plant incorporates a stage of extended aeration in treatment ponds, the expected low rate of biodegradation indicates that it is unlikely that much of the chemical would be degraded in this plant. However, it is probable that the chemical would become associated with humic material in solid sludge at the bottom of the aeration lagoons. In a previous assessment, the company indicated that waste sludge from this plant is composted with bark and other materials and this would eventually be applied to land – probably forests.

The volume of waste water discharged from the paper plant is approximately 40 megalitres each day, so the maximum concentration of the chemical in the paper plant effluent is expected to be $10 \times 10^6/365$ grams/40×10^6 litres = 0.68 mg/L.

The waste treatment plant consists of a primary clarifier and a series of three aerobic degradation ponds, and the residence time in the plant is approximately 10 days. After treatment the effluent then passes into an 11 km drain before discharging into Lake Bonney.

Although biodegradation during the aeration stages is unlikely, it is probable that much of the chemical would adsorb to humic material in the lagoons and would eventually be assimilated into bottom sediments. If it is assumed that (as with the paper fibres) around 50% of the discharged chemical is removed into sediments, the worst case Predicted Environmental Concentration (PEC) of the chemical in the effluent discharged to Lake Bonney is estimated as 0.34 mg/L.

Lake Bonney is dune bound and the water level is managed in such a way as to minimise the need for marine discharge – release to the marine environment has occurred only twice in the last decade (LBMC, 1996), and so it appears that the total volume of water flowing into the lake is roughly in balance with the evaporation rate. Mixing in the lake is not efficient as evidenced by the measurement of faecal coliform levels around the drain (faecal coliforms are also discharged in paper mill effluent). The concentration of bacteria decreases rapidly with distance from the drain (LBMC, 1996). Consequently, for the purpose of making some estimate of the residual chemical concentration in the lake water, a dilution factor of 1:5 will be assumed, which gives the Predicted Environmental Concentrations (PECs) in the effluent stream and in Lake Bonney near to the drain discharge of approximately 68 μg/L.

Residual chemical disposed of to landfill with empty containers or with residual solids derived from water treatment at the production facility is also expected to eventually adsorb to soil particles, and in this situation would slowly be destroyed by similar mechanisms to those

operating in sediments.

9.1.2. Environment – effects assessment

The results of the ecotoxicological data indicate the notified polymer is highly toxic to fish and is slightly toxic daphnia. No data were provided for algae. Thus the most sensitive species tested was fish, with a 48 hour LC50 of 0.36 mg/L and the NOEC was 0.24 mg/L.

A predicted no effect concentration (PNEC) can be determined by applying an assessment factor to the most sensitive aquatic species. In this case, only two trophic levels are available (fish, & invertebrates), so an assessment safety factor of 1000 is used based on OECD guidance. Therefore, using the most sensitive result, the PNEC for the notifier polymer is 0.36 μg/L.

9.1.3. Environment – risk characterisation

The PEC/PNEC ratio for the aquatic environment, assuming use at one site in South Australia and 50% removal of the notified polymer through association with paper fibres is 189. Once the chemical has entered the Lake Bonney water, some removal of the notified polymer from the aquatic compartment could occur through association with humic material, and some degradation through direct and indirect photolysis may also be possible. Nevertheless, the PEC/PNEC value is greater than 1, indicating there is an immediate exposure concern to the aquatic compartment from the use of the notifier polymer. Even if we assume 80% fixation to paper and 90% loss in the on-site treatment plant, the PEC/PNEC ratio is 13.1.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

Exposure to workers involved in transport and storage of import containers of the polymer solution is likely to be rare.

Workers involved in reformulation of the imported polymer solution may be exposed infrequently to drips and spills during transfer operations in a similar fashion to workers transferring polymer products to spraying machines and during cleaning and maintenance. However, the wearing of impervious gloves, overalls and chemical splash goggles should preclude even this low level exposure.

9.2.2. Public health – exposure assessment

Public exposure is expected to be minimal. The polymer is at a low level in the tissues to which the public are exposed and is tightly bound.

9.2.3. Human health - effects assessment

Based on the notified polymer's high molecular weight, low residual monomer content, low levels of low molecular weight species it is unlikely to present a human health hazard. However, the MSDS for the imported product suggests that the imported polymer solution may be slightly irritating to eyes and skin and mists may be irritating to the respiratory tract. This may be a result of reactive amine groups in the molecule.

9.2.4. Occupational health and safety – risk characterisation

Given the likely low hazard of the notified polymer, the fact that it is imported in a dilute aqueous solution and the infrequent exposure scenarios, the risk of adverse health effects to workers is considered to be low.

9.2.5. Public health – risk characterisation

Given the likely minimal exposure to the public together with the low hazard of the notified polymer, its introduction should not present a risk to public health.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.1. Hazard classification

Based on the available data the notified polymer is not classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances*.

10.2. Environmental risk assessment

On the basis of the PEC/PNEC ratio, the notified polymer poses a significant risk to aquatic organisms in the environment when released into Lake Bonney through the intended use pattern.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

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

10.3.2. Public health

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

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS for the imported product containing the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

11.2. Label

The label for the imported product containing the notified polymer provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994b). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- 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

- It is recommended that the quarterly monitoring of the treatment plant effluent, which is discharged into Lake Bonney be continued, and if any increase in the toxicity of the effluent noticed after introduction of the new polymer, this information should be immediately conveyed to NICNAS.

Emergency procedures

Spills/release of the notified polymer should be contained with absorbent material and placed in a waste disposal container for disposal in accordance with local or state regulations.

12.1. 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 Section 64(1) of the Act; if
– if use at other paper mills is proposed, then details of the on site and post site sewage treatment and volumes should be supplied to allow the calculation of the specific hazard. An algal test result as well as information on the likely extent of adsorption to soils and sediments should also be provided or

(2) Under Section 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.

13. BIBLIOGRAPHY

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