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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Polymer in Freevis/Scaleguard

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 National Occupational Health and Safety Commission which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Aged Care.

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Director

Chemicals Notification and Assessment

TABLE OF CONTENTS

FULL PUBLIC REPORT

Polymer in Freevis/Scaleguard

1. APPLICANT

Nalco Australia Pty Ltd of 2 Anderson Street, BOTANY, NSW 2019 (ACN 000 424 788) has submitted a limited notification statement in support of their application for an assessment certificate for Polymer in Freevis/Scaleguard.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition and details of exact import volume and customers have been exempted from publication in the Full Public Report and the Summary Report.

2.1 Marketing Name(s): Freevis / Scaleguard

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is manufactured as a 35% aqueous solution. Some of the properties listed below are for the solution.

Appearance at 20°C & 101.3 kPa:	Clear, amber liquid.
Melting Point:	Not available
Specific Gravity:	1.17–1.20 at 23°C (solution).
Vapour Pressure:	Not available- expected to be low due to high molecular weight
Water Solubility:	Completely miscible.
Partition Co-efficient (n-octanol/water):	Not available – expected to be low due to the high water solubility of the polymer.
Hydrolysis as a Function of pH:	Not available – while it contains amide functionality it is not expected to hydrolyse in the environmental pH range.
Adsorption/Desorption:	Not available – expected to adsorb to soils and sediments by complexing with calcium ions.

Dissociation Constant:	Not available – expected to remain fully dissociated in water in the environmental pH range of 4-9.
Particle size (distribution) / fibre length	Not applicable (notified substance is liquid)
Flash point	Not applicable (aqueous solution)
Flammability limits	Not flammable
Autoignition temperature	Not determined
Explosive properties	Not explosive
Reactivity	Not reactive

4. PURITY OF THE CHEMICAL

Degree of Purity:	Not applicable- polymer manufactured as 35% aqueous solution
Hazardous Impurities:	None known
Non-hazardous Impurities (> 1% by weight):	None known

Additives/Adjuvants:

Chemical name:	Sodium bisulfite
CAS No.:	7631-90-5
Weight percentage:	1.0
Toxic properties:	Skin, eye and respiratory irritant (ACGIH 1999)
NOHSC exposure standard	5 mg/m^3 TWA (NOHSC 1995)
Chemical name:	Ammonium sodium sulfate
CAS No.:	13863-45-1
Weight percentage:	6.0

5. USE, VOLUME AND FORMULATION

The notified polymer is used in the mineral processing industry to control slurry viscosity (Freevis formulation) and to control calcite, gypsum and silica scale (Scaleguard formulation). The two trade names are reported to represent the same formulation.

The notified polymer is manufactured and formulated at one site in Australia, the Nalco plant at Kwinana, WA. It is manufactured as a 35% active in the aqueous products. These products are packaged into 5000 L returnable containers or bulk containers. The notifier estimates that < 50 tonnes per annum of the notified polymer will be manufactured.

6. OCCUPATIONAL EXPOSURE

Manufacturing process
This will involve two operators. The reactor is charged with the monomers and catalysts. The manufacturing process is a semi-batch process and the final polymer is pumped to a bulk storage tank or intermediate bulk containers. At intermediate stages of manufacture, sampling is done for QC purposes and skin contact with the notified chemical may occur. The sample is withdrawn into 500 mL containers and analysed by one QC person. During the transfer and maintenance processes the plant operators may experience skin contact with the polymer. The reactor is cleaned with water (50L) infrequently and skin contact with the notified polymer may occur. Manufacturing will be limited to 10 days per year.

Operators wear goggles, gloves and overalls during transfer of the polymer solution to the containers for delivery. Laboratory personnel wear laboratory coat, gloves and safety gloves during sampling and analysis.

Dosing process
The dosing process at the customer's site is customised and is set up by the notifier's sales representatives. The polymer is transported to the site in Portafeed returnable containers (1,000 –5,000L), intermediate bulk containers (1,000L) or in bulk. At the customer site the product containing the polymer is pumped to the dosing system directly from the containers or into a storage tank on-site. It may be further diluted before being used. During the transfer and dosing operations, skin contact with the polymer solution may occur. Eye contact may also occur in the event of spills and splashes. Once the dosing system has been standardised, the customer's operators would do future dosing operations. The final dosing rates are 50-500 g/tonne for Freevis and 1-10 ppm for Scaleguard. The dosing package involves training of the customers for safe use.

Sales representatives and operators wear overalls, goggles and gloves when connecting containers to the feeding equipment or testing dosage levels.

7. PUBLIC EXPOSURE

The notified polymer will not be sold to the public and will only be used by the mining industry. However, exposure of the general public to the notified polymer may occur in the event of an accidental spill during transportation. Since the notified polymer will not be available to public, the risk of exposure of the general public to the notified polymer is considered low.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

The notifier claims that there is very little potential for release of the notified polymer during manufacture or formulation of the 35% products. The polymer will be manufactured in a semi-batch process in a central reactor vessel. The final product will then be pumped out and filled into containers and tankers for transport to the customers at various sites around Australia.

Any washings from the reactor, tanks and scrubber are recycled and used in the manufacture of the next batch. The only release to the environment may be from spills which will be soaked up with absorbent material and disposed to landfill. The notifier has not estimated the amount of polymer that may be lost due to spills but it is expected to be up to 0.1% of the total volume of the product (<50 kg polymer/annum).

The two products containing the notified polymer will be added to mineral slurries during processing. The mixing water will be discharged into tailings dams at the end of the process and recycled back into the process. Very little release is expected during the mineral processing and no release should occur from the transport containers as these are dedicated and not washed in between uses. Spills have not been estimated by the notifier but will be cleaned up with absorbent material and disposed to landfill. It may be likely that another 0.1% of the product may be released in this way.

8.2 Fate

The very small amount of waste polymer produced during the manufacturing and mineral processing should be disposed of to landfill. A small amount of polymer leaching is possible but most will become bound to the soils and sediments until it is gradually decomposed by biotic and abiotic processes to simple nitrogen, sulfur and carbon compounds.

The polymer released to the tailings dams during the mineral processing applications should remain in the dam either in the water compartment and recycled into the process or by slowly adsorbing to the dam soil and sediments as it gradually drops out of solution. The polymer should gradually sediment out by complexing with calcium salts or by flocculation.

The polymer is not expected to cross biological membranes due to its high molecular weight and should not bioaccumulate (Connell, 1990). Also, the expected low log Pow and high water solubility will limit the bioavailability and bioaccumulation potential.

9. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided. Polymers of this class are of concern to green algae exhibiting moderate toxicity through their ability to chelate nutrient elements (Nabholz et al, 1993) particularly if on alternate carbon atoms of the chain. However, the notified polymer is a random copolymer, only possessing some sections available for chelation. Also, toxicity of polymers of this class has been shown to be mitigated 13 times by the addition of one equivalent of Ca^{2+}(Nabholz et al, 1993). Therefore, once the notified polymer is exposed to the natural aquatic environment, the toxicity should be significantly mitigated.

10. ASSESSMENT OF ENVIRONMENTAL HAZARD

Very little waste containing the notified polymer (up to 100 kg polymer/annum) will be generated during the manufacture and use of the mineral processing products. Waste will be disposed of to landfill and, although a small amount may leach a short distance due to miscibility in water, it should soon become immobile within the sediments. Once bound to the sediments it will gradually decompose by biotic and abiotic processes to simple nitrogen, sulfur and carbon compounds.

The polymer released to the tailings dams during the mineral processing applications should remain in the dam until recycled or slowly adsorb to the soil and sediments by formation of calcium complexes.

The polymer is not expected to cross biological membranes and should not bioaccumulate. The low log Pow and high water solubility will also limit its bioaccumulation potential.

Based on the supplied information, the polymer is expected to enter the environment at very low concentrations and subsequently should not produce any significant negative effects. Therefore, the environmental hazard through the described use of the products Freevis/Scaleguard, containing the notified polymer, is expected to be low.

11. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Hazard assessment

No toxicology data were provided for the notified polymer. Due to its high molecular weight, it will not cross the biological membranes and is unlikely to be a hazardous substance in accordance with *NOHSC Approved Criteria for Classifying Hazardous Substances* (NOHSC 1999).

According to the MSDS provided for Freevis/Scaleguard, the potential hazards are irritation of the mucous membranes, skin irritation with prolonged contact and mild eye irritation. Ingestion of large quantities of the product may also be harmful. These effects are due to the additives, such as ammonia and sodium bisulfite, in the product rather than the notified polymer.

Occupational Health and Safety

Manufacture
The notified polymer is manufactured in batch process. Occupational exposure to the 35% notified polymer solution may occur during transfer, quality control sampling and testing, filling operations and maintenance and clean up procedures of containers. Inhalation exposure is expected to be insignificant since the notified polymer has low volatility and is not expected to form alcohols.

Skin and eye contact will be the main routes of exposure. Significant dermal absorption of the notified polymer through intact skin is not expected. Despite the anticipated non-hazardous nature of the notified polymer, the potential for mild skin/eye irritation exists for workers exposed to the product. Workers will need to wear coveralls, chemical resistant

gloves and chemical splash goggles.

Dosing
Minimal dermal or ocular exposure to spills may also occur while connecting/disconnecting the dosing/feeding equipment and testing the dosage level. The notifier states that workers will wear similar personal protective equipment to that described above.

Transport and Storage
Exposure to the notified polymer is not expected during transport or storage as long as the packaging remains intact. Recommended practices for spillage clean up are given in the MSDS supplied by the notifier. The risk of adverse health effects for transport and storage workers is considered low.

Risk of adverse health effects due to the notified polymer is low due its expected low toxicity and low exposure. However, due to the presence of other components in the formulated products control measures are required to minimize skin and eye contact.

Public Health

The notified polymer is not available for sale to the public. Based on anticipated low public exposure, the notified polymer will not pose a significant risk to public health when used in the proposed manner.

12. RECOMMENDATIONS

To minimise occupational exposure to the notified polymer, the following guidelines and precautions should be observed:

For manufacture and maintenance workers:

- Protective eyewear, chemical resistant industrial clothing and footwear and impermeable gloves should be used during manufacture of the notified polymer and products containing it;

For end-users of products containing the notified polymer:

- Protective eyewear and chemical resistant gloves should be worn during the use of products containing the notified polymer;

For all workers:

- Spillage of the notified polymer should be avoided. Spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal;

- A copy of the MSDS should be easily accessible to employees.

Guidance in selection of protective eyewear may be obtained from Australian Standard (AS) 1336 (Standards Australia, 1994) and Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); for industrial clothing, guidance may be

found in AS 3765.2 (Standards Australia, 1990); for impermeable gloves or mittens, in AS 2161.2 (Standards Australia/ Standards New Zealand, 1998); for occupational footwear, in AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994) or other internationally accepted standards.

If products containing the notified chemical are hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC 1999), workplace practices and control procedures consistent with State and Territory hazardous substances regulations must be in operation.

13. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC 1994).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

14. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under subsection 64(1) of the Act, should the notified polymer be proposed for use in situations, such as boilers, where a greater release to the aquatic environment may occur, the Director must be informed in writing within 28 days and secondary notification may be required.

The Director must be informed in writing within 28 days if any of the circumstances stipulated under subsection 64(2) the Act arise.

15. REFERENCES

ACGIH TLVs (1999) Sixth Edition Supplemental Documentation.

Connell D. W. (1990) General characteristics of organic compounds which exhibit bioaccumulation. In Connell D. W., (Ed) Bioaccumulation of Xenobiotic Compounds. CRC Press, Boca Raton, USA.

Nabholz, JV, Miller, P & Zeeman, M (1993). "Environmental Risk Assessment of New Substances under the Toxic Substances Control Act Section Five". In Landis WG, Hughes JS & Lewis, MA (Eds), *Environmental Toxicology and Risk Assessment*, American Society for Testing and Materials, ASTM STP 1179, Philadelphia. pp 40-55.

National Occupational Health and Safety Commission (1994) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC: 2011(1994)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1995) Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment, [NOHSC: 1003(1995)] Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999) Approved Criteria for Classifying Hazardous Substances [NOHSC: 1008 (1994)]. Australian Government Publishing Service, Canberra.

Standards Australia (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Standards Association of Australia.

Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Standards Association of Australia.

Standards Australia/Standards New Zealand (1992) Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications. Standards Association of Australia/ Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Standards Association of Australia/Standards Association of New Zealand.

Attachment 1

The Draize Scale (Draize, 1959) for evaluation of skin reactions is as follows:

Erythema Formation	*Rating*	*Oedema Formation*	*Rating*
No erythema	0	No oedema	0
Very slight erythema (barely perceptible)	1	Very slight oedema (barely perceptible)	1
Well-defined erythema	2	Slight oedema (edges of area well-defined by definite raising	2
Moderate to severe erythema	3	Moderate oedema (raised approx. 1 mm)	3
Severe erythema (beet redness)	4	Severe oedema (raised more than 1 mm and extending beyond area of exposure)	4

The Draize scale (Draize *et al*., 1944) for evaluation of eye reactions is as follows:

CORNEA

Opacity	*Rating*	*Area of Cornea involved*	*Rating*
No opacity	0 none	25% or less (not zero)	1
Diffuse area, details of iris clearly visible	1 slight	25% to 50%	2
Easily visible translucent areas, details of iris slightly obscure	2 mild	50% to 75%	3
Opalescent areas, no details of iris visible, size of pupil barely discernible	3 moderate	Greater than 75%	4
Opaque, iris invisible	4 severe		

CONJUNCTIVAE

Redness	*Rating*	*Chemosis*	*Rating*	*Discharge*	*Rating*
Vessels normal	0 none	No swelling	0 none	No discharge	0 none
Vessels definitely injected above normal	1 slight	Any swelling above normal	1 slight	Any amount different from normal	1 slight
More diffuse, deeper crimson red with individual vessels not easily discernible	2 mod.	Obvious swelling with partial eversion of lids	2 mild	Discharge with moistening of lids and adjacent hairs	2 mod.
Diffuse beefy red	3 severe	Swelling with lids half-closed	3 mod.	Discharge with moistening of lids and hairs and considerable area around eye	3 severe
		Swelling with lids half-closed to completely closed	4 severe		

IRIS

Values	*Rating*
Normal	0 none
Folds above normal, congestion, swelling, circumcorneal injection, iris reacts to light	1 slight
No reaction to light, haemorrhage, gross destruction	2 severe

Draize, J. H., Woodward, G., Calvery, H. O. (1944) Methods for the Study of Irritation and Toxicity of Substances Applied Topically to the Skin and Mucous Membranes, J. Pharmacol. Exp. Ther. 82 : 377-390.

Draize J. H. (1959) Appraisal of the Safety of Chemicals in Foods, Drugs and Cosmetics. Association of Food and Drug Officials of the US, 49: 2-56.