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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in EC6433A

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Telephone: (61) (02) 9577 9514
Facsimile: (61) (02) 9577 9465

Director
Chemicals Notification and Assessment

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FULL PUBLIC REPORT**Polymer in EC6433A****1. APPLICANT**

Nalco/Exxon Energy Chemicals Australia Pty Ltd of 226 York St, SALE, VIC 3850 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for Polymer in EC6433A.

2. IDENTITY OF THE CHEMICAL

Trade Name: Polymer in EC6433A

Other Name: EC6174A, maleic anhydride copolymer

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

2.1 Characterisation as a Synthetic Polymer of Low Concern

**Number-Average
Molecular Weight (NAMW):** >1000

**Maximum Percentage of Low
Molecular Weight Species**

Molecular Weight < 500: 5 %

Molecular Weight < 1 000: 9 %

Polymer Stability: The polymer is expected to be stable

Reactivity: The polymer does not contain any reactive functional groups

Particle Size: The polymer will be a waxy solid at room temperature

Charge Density: The polymer will not be charged under normal environmental conditions

Water Solubility: The polymer is stated to have negligible water solubility

Method of Detection and Determination:	The polymer is characterised by GPC and identified by IR spectroscopy. A reference spectrum has been provided.
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3 PHYSICAL AND CHEMICAL PROPERTIES

The specific gravity, vapour pressure and flash point are for a solution of the notified polymer in xylene (< 5 %) and aromatic hydrocarbon (> 60 %).

Appearance at 20°C and 101.3 kPa:	pale yellow to white waxy solid
Melting Point:	0°C pour point
Specific Gravity:	0.898 at 60°C
Vapour Pressure:	1.5 kPa at 38°C
Water Solubility:	stated to be negligible (see comments below)
Partition Co-efficient (n-octanol/water):	not determined (see comments below)
Hydrolysis as a Function of pH:	not determined (see comments below)
Adsorption/Desorption:	not determined (see comments below)
Dissociation Constant:	no dissociable groups are present
Flash Point:	62°C
Explosive Properties:	not expected to be explosive
Reactivity/Stability:	expected to be stable under normal environmental conditions

3.1 Comments on Physico-Chemical Properties

A water solubility study was not submitted. The notifier claims that the notified polymer is estimated to have water solubility very much less than 1 mg/L. Considering the molecular weight and very hydrophobic nature of the polymer, the estimate appears appropriate.

Data on the n-octanol/water partition coefficient is not required for assessment of Polymers of Low Concern, but the high hydrocarbon content and low expected water solubility indicate that Log K_{ow} would be very high. Consequently, the polymer is expected to have a high affinity for the oil phase, and could also be expected to bind strongly to the organic

component of soils and sediments.

The new polymer contains pendant ester linkages, and these are inherently susceptible to hydrolytic cleavage. However, the polymer has a very high content of hydrocarbon, and this will preclude intimate contact between water and these susceptible linkages. Consequently, hydrolytic cleavage of these groups is considered unlikely.

4. PURITY OF THE CHEMICAL

Degree of Purity: 10 % in aromatic hydrocarbon/xylene solution, as imported

Toxic or Hazardous Impurities: none

Maximum Content of Residual Monomers: The polymer is stated to have a total residual monomer concentration of < 1 %.

Additives/Adjuvants:

Chemical name: xylene
CAS No.: 1330-20-7
Weight percentage: up to 5 % in polymer resin solution
Toxic properties: R20/21 Harmful by inhalation and in contact with skin
R38 Irritating to skin
NOHSC exposure standard 80 ppm TWA, 150 ppm STEL

Chemical name: solvent naphtha, petroleum, light aromatic
Synonyms: aromatic hydrocarbon
CAS No.: 64742-95-6
Weight percentage: > 60 %
Toxic properties: On the *List of Designated Hazardous Substances* (National Occupational Health and Safety Commission, 1999b)
T cutoff 0.1 %
R45(2) 'May cause cancer'
R65 'May cause lung damage if swallowed'
kidney damage and kidney or liver tumours were seen in studies on rats
the R45(2) notation does not apply if the solvent contains less than 0.1 % benzene

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as a pour point depressant for assisting new flow in old crude oil wells. It will be injected through an umbilical to the subsea wellhead where it will mix with the crude oil to give a concentration of up to 500 ppm in the crude oil.

The notified polymer will not be manufactured in Australia. It will be imported at a concentration of 10 % in aromatic hydrocarbon/xylene solution in 20000 L isotanks, and will not be reformulated prior to its end use.

The product containing the notified polymer will be imported at a volume of approximately 960 kL per year, equating to approximately 96 tonnes of notified polymer per year.

The notifier indicated that the formulation EC 6433A would be added to the crude oil at approximately 500 ppm (equivalent to around 50 ppm of the new polymer). However, it was also indicated that this figure could change, depending on experience gained with optimisation of dose rates. A small to medium sized well may produce up to 30000 barrels of oil each day (4.8×10^6 L/day). Assuming a concentration of 500 ppm, around 2500 kg of the formulation would be injected into the well each day. Since the EC 6433A formulation contains approximately 10 % of the polymer, this equates to a daily use of the new polymer of around 250 kg for each oil well.

6. OCCUPATIONAL EXPOSURE

Transport

The solution containing the notified polymer will be unloaded from ships and transported to a storage site in the 20000 L isotanks in which it is imported. The product is transferred to 5000 L tanks for delivery to customers, by road to a dock yard, then by ship to offshore oil platforms. The notifier estimates that 4 to 8 workers will be involved in these activities, for 3 to 4 hours per day, 10 to 15 days per year.

The road transport and waterside workers are unlikely to be exposed to the notified polymer except in the case of a spill.

Storage Facility

At the storage site, the imported solution will be transferred from the 20000 L isotanks to 45000 L holding tanks, and, upon receipt of a customer order, it will be transferred into 5000 L tanks for transport. The transfer will involve pumping the solution through hoses within bunded areas to contain spills. A quality control worker will sample the solution during the loading and unloading operations.

There is potential for dermal exposure to drips and spills of the solution containing the notified polymer during the transfer operations, particularly during quality control sampling and connection and disconnection of transfer hoses.

The notifier estimates that up to 7 workers will be involved in the transfer operations, for 8 hours per day, 25 to 30 days per year. The workers will be required to wear personal protective equipment comprising coveralls, safety glasses, gloves and safety boots.

Application Operators

The final product will be used on offshore oil platforms. The solution of the notified polymer will be pumped from the tanks through an umbilical connector to the undersea wellhead using an automatic dispensing system. Exposure would only be expected during the connection and disconnection of hoses to tanks. Spills would be contained in a bunded area, and most likely returned to the storage tank for reuse. Local ventilation will be used in the region of the storage tank.

The notifier does not provide an estimate of the number of workers involved in these procedures. The workers are potentially exposed to the notified polymer for up to 10 hours per day, 360 days per year, but the frequency of procedures where actual exposure is likely to occur is expected to be very much lower. The workers will be required to wear personal protective equipment comprising coveralls, safety glasses, gloves and safety boots.

Many workers are likely to be exposed to the notified polymer in crude oil, before refining, but the concentration of notified polymer will be a maximum of 500 ppm, among the many hazardous components of crude oil. Exposure to the notified polymer is expected to be negligible because of the low concentration, and because of the engineering controls necessitated by the hazardous nature of crude oil.

7. PUBLIC EXPOSURE

The notifier has stated that the notified polymer will not be sold to the public but will be applied by industrial customers only. The polymer will be totally consumed in the crude oil and will comprise a maximum of 500 ppm of the crude oil. The polymer in crude oil may undergo further dilution by mixing with other crude oil streams and during refining and further chemical processing to create the products which will enter the public domain. Therefore the public exposure is expected to be slight.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

Storage Facility

The notifier indicated that up to 0.5 % of the EC 6433A formulation could be released as a result of accidents and spills during transfer operations from the various tanks in which the formulation is stored and transported. This represents an annual release of approximately 480 L of the new polymer. The company indicated that this would be contained within bunded areas then collected in drums and disposed of by a licensed waste contractor.

Drilling Platforms

No indication of losses arising as a result of use on board the oil drilling platform, or during transfer of the oil to the refinery were provided. However, these are presumed to be low since the processes are associated with maximising recovery of the valuable oil. Any ruptures of the pipeline from the drilling platform to land would be of major consequence, and could be expected to be addressed rapidly by the company. Details were not provided by the notifier. In the event of accidental release of the product containing the notified polymer, for example as a result of transport accident on the land, the Material Safety Data Sheet (MSDS) gives

adequate instructions for cleaning up such spills.

Refineries

Most of the new polymer will be transferred with the crude oil to refineries, where it would be removed from the oil, or destroyed as a result of the refining process. Consequently, there is no further possibility for direct release of the new polymer to the environment.

8.2 Fate

Polymer spilt during transfer operations would be collected by a waste disposal contractor. It is expected that the waste polymer would be destroyed by incineration, producing water vapour and carbon oxides. Most of the polymer will become a component of the crude oil, which is refined into a variety of petroleum products. It is expected that during this process the polymer would be degraded into small oligomers and become incorporated into the petroleum products, or removed in the various waste streams generated during the refining operations. In the latter case, it is probable that the degradation products would be burnt with other wastes, and destroyed as indicated above.

The polymer has a high hydrocarbon content and low water solubility. Consequently, in the event of a spill, or release resulting from transport accident, the polymer would be expected to bind to and become associated with the organic component of soils and sediments. The low water solubility indicates that it would not be mobile in the soil. Although no biodegradation data accompanied the submission, it is expected that the polymer would be slowly degraded through bacterial action when associated with soil.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted, which is acceptable for a synthetic polymer of low concern with a NAMW > 1000 according to the *Industrial Chemicals (Notification and Assessment) Act*. The polymer is stable with low volatility. Polymers of high molecular weight do not readily cross biological membranes.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted, which is acceptable for a synthetic polymer of low concern with a NAMW > 1000 according to the *Industrial Chemicals (Notification and Assessment) Act*.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The environmental hazard associated with use of the new polymer as a viscosity modifier for crude oil is considered to be small.

Most of the polymer will become associated with the crude oil, pumped to shore and subsequently refined into petroleum products. During the refining process, the polymer is expected to degrade and either become incorporated into the products, or be destroyed by

incineration with other refinery waste products. Incineration will result in the formation of water vapour and carbon oxides.

An estimated 480 kg of polymer may be released per annum as a result of spills during transfer operations. This is expected to be collected and disposed of by incineration.

If any polymer was released as a result of transport accidents or breaks in pipelines, the hydrophobic nature of the material indicates that it would bind to and become associated with the organic component of soils and sediments. In this situation it would be immobile, and could also be expected to be slowly degraded through microbiological processes.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological information has been provided for the notified polymer and therefore the substance cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999a). The polymer solution, as imported, is a Class 3 dangerous good (flammable liquid) because of the solvent content (aromatic hydrocarbon and xylene). The MSDS for the polymer solution EC6433A lists a number of potential health effects, namely skin, eye and respiratory tract irritation, central nervous system effects such as headaches, dizziness, nausea and loss of consciousness, and liver damage. These relate mainly to the solvents, xylene and aromatic hydrocarbon, rather than the notified polymer. Due to its high molecular weight, lack of reactive functional groups and hydrophobic nature, the notified polymer is not expected to be hazardous to health when used as indicated.

The aromatic hydrocarbon listed as the main component in EC6433A is a Category 2 carcinogen, with a concentration cutoff of 0.1 %, unless the aromatic hydrocarbon is shown to satisfy the condition that it contains less than 0.1 % benzene. The notifier has provided information which shows that the condition is satisfied in this case, and accordingly classification will not be required. The product should carry the risk phrase R65 "May cause lung damage if swallowed", as the viscosity is below the cutoff where this risk phrase is no longer required.

Occupational Health and Safety

Occupational exposure to the notified polymer is expected to be confined to dermal contact with small quantities of the polymer present at 10 % in the form of drips and spills of the product EC6433A. Exposure to the product containing the notified polymer is likely to occur from dermal contact with drips and spills arising from connection and disconnection of hoses used for transfer of the product, both during storage and end use, and during quality control operations. Following mixing into the crude oil stream during end use, the notified polymer will be diluted to around 500 ppm.

The crude oil and the solvents containing the notified polymer in EC6433A would be expected to have a higher order of toxicity than the notified polymer, and the protective measures required to guard against the hazards associated with these chemicals would be expected to provide sufficient protection to minimise the hazards from the notified polymer. The risk to workers handling the crude oil from the notified polymer is expected to be negligible due to the low polymer concentration in the crude oil, and the high level of

engineering controls and personal protective equipment used in the oil refining industry.

There is a NOHSC exposure standard for xylene, identified as an ingredient in the polymer solution. The employer is responsible for ensuring that this exposure standard is not exceeded in the workplace.

Public Health

There is negligible potential for public exposure to the notified polymer arising from use as a crude oil additive. Therefore, based on its use pattern and physico-chemical characteristics, the notified polymer will not pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in EC6433A the following guidelines and precautions should be observed:

- Employers should ensure that the NOHSC exposure standard for xylene is not exceeded in the workplace;
- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990); impermeable gloves or mittens should conform to AS 2161 (Standards Australia/ Standards New Zealand, 1998). Disposable latex gloves should not be used;
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994b);
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 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.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16 REFERENCES

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 (1999a) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999b) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Australian Government Publishing Service, Canberra.

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. Standards Association of Australia, Sydney.

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, Sydney.

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

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, Sydney/Wellington.

Standards Australia/Standards New Zealand (1994a) Australian/New Zealand Standard 1715-1994, Selection, use and maintenance of respiratory protective devices. Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

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

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, Sydney/Wellington.