

File No: NA/591

April 1998

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION  
AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**Metalated Polymer in HiTEC<sup>®</sup> 6643**

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 Worksafe Australia 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 Family Services.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, Worksafe Australia, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

|                    |                   |
|--------------------|-------------------|
| Monday - Wednesday | 8.30 am - 5.00 pm |
| Thursday           | 8.30 am - 8.00 pm |
| Friday             | 8.30 am - 5.00 pm |

Copies of this full public report may also be requested, free of charge, by contacting the Administration Coordinator on the fax number below.

For enquiries please contact the Administration Coordinator at:

**Street Address:** 92 Parramatta Rd Camperdown, NSW 2050, AUSTRALIA

**Postal Address:** GPO Box 58, Sydney 2001, AUSTRALIA

**Telephone:** (61) (02) 9577-9466 **FAX** (61) (02) 9577-9465

Director  
Chemicals Notification and Assessment

**FULL PUBLIC REPORT****Metalated Polymer in HiTEC<sup>®</sup> 6643****1. APPLICANT**

Ethyl Asia Pacific Company of 20 Berry Street Level 12 NORTH SYDNEY NSW 2060 has submitted a limited notification statement in support of their application for an assessment certificate for 'Polymer in HiTEC<sup>®</sup> 6643'.

**2. IDENTITY OF THE CHEMICAL**

The notified polymer is a metalated reaction product of a carbonic acid compound of an aminated base with succinic anhydride, polyalkenyl derivatives. It is considered not to be hazardous based on the nature of the chemical and the data provided. The chemical name, molecular and structural formulae, molecular weight, details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

**Chemical Name:** metalated reaction product of a carbonic acid compound of aminated base with succinic anhydride, polyalkenyl derivatives

**Chemical Abstracts Service (CAS) Registry No.:** not assigned

**Trade Name:** HiTEC<sup>®</sup> 6643

**Method of Detection and Determination:** gel permeation chromatography (GPC)

**Number-Average Molecular Weight (NAMW):** < 5 000

**Weight-Average Molecular Weight:** < 5 000

**Maximum Percentage of Low Molecular Weight Species**

**Molecular Weight < 500:** not determined due to co-elution of other components

**Molecular Weight < 1 000:** 4 %

### 3. PHYSICAL AND CHEMICAL PROPERTIES

|  |                                     |
|--|-------------------------------------|
| <b>Appearance at 20°C and 101.3 kPa:</b>         | dark amber viscous liquid           |
| <b>Boiling Point:</b>                            | not determined                      |
| <b>Specific Gravity:</b>                         | 0.92                                |
| <b>Vapour Pressure:</b>                          | < 1 kPa at 20°C                     |
| <b>Water Solubility:</b>                         | < 10 mg.L <sup>-1</sup> at 20°C     |
| <b>Partition Co-efficient (n-octanol/water):</b> | not determined (see comments below) |
| <b>Hydrolysis as a Function of pH:</b>           | not determined (see comments below) |
| <b>Adsorption/Desorption:</b>                    | not determined (see comments below) |
| <b>Dissociation Constant:</b>                    | not determined (see comments below) |
| <b>Flash Point:</b>                              | > 200°C                             |
| <b>Flammability Limits:</b>                      | not determined                      |
| <b>Autoignition Temperature:</b>                 | not determined                      |
| <b>Explosive Properties:</b>                     | not explosive                       |
| <b>Reactivity/Stability:</b>                     | unreactive                          |

#### Comments on Physico-Chemical Properties

Tests were performed at facilities following Principles of Good Laboratory Practice. The water solubility test was conducted using the OECD 105 Column Elution Water Solubility Guideline and solubility was found to be less than 10 mg.L<sup>-1</sup>, the limit of detection at 20°C.

Hydrolysis data could not be generated because of the relatively low water solubility. The organic moiety is unlikely to hydrolyse under normal environmental pH conditions but the metal complex moiety may hydrolyse to a simple metal salt if released into the water compartment.

Data for the partition co-efficient were not provided but the notifier has provided information to show that the notified substance is miscible with octanol at 37°C in varying proportions from 1:1 to 5:1 (octanol : notified substance). This, in conjunction with the low water solubility of the notified substance, suggests it would have a high log K<sub>ow</sub> value.

Adsorption/desorption and dissociation constants also could not be determined because of the relatively low water solubility but may be expected to bind to soils and sediments. However, under normal environmental pH conditions (pH 4-9) the basic amino group would be protonated giving a positive charge but the pendant carboxylic acid group would be dissociated giving a negative charge carboxylic group. Consequently the molecule would overall be neutral and probably exist in zwitterionic form.

#### **4. PURITY OF THE NOTIFIED POLYMER**

|  |   |
|--|---|
| <b>Degree of Purity:</b>                             | 100%  |
| <b>Toxic or Hazardous Impurities:</b>                | none specified  |
| <b>Non-hazardous Impurities (&gt; 1% by weight):</b> | none specified  |
| <b>Maximum Content of Residual Monomers:</b>         | in order to determine the levels of residual constituents the notifier claims that neat polymer would be required; as the synthetic processes preclude acquisition of neat polymer, such determinations are not possible. |
| <b>Additives/Adjuvants:</b>                          | none  |

#### **5. USE, VOLUME AND FORMULATION**

The notified polymer will be imported as a component (40%) of the oil additive product known as HiTEC<sup>®</sup> 6643. It is envisaged that less than 2 000 kg of the notified polymer will be imported in the first year, rising to 2 000 kg.annum<sup>-1</sup> in the remaining 4 years. The notified polymer as a component of the oil additive package will be blended by customers of Ethyl Asia Pacific into oils and fuels, with an expected concentration range of 0.01 to 8 wt% of notified polymer in formulated oil/fuel products.

## **6. OCCUPATIONAL EXPOSURE**

The product is imported in 205 litre drums, thus exposure to HiTEC<sup>®</sup> 6643 additive (containing the notified polymer) during unloading, transportation and storage is only likely in the event of an accident.

The additive containing the notified polymer is loaded into injector systems through closed pumping systems by workers in a control room that is isolated from the injector and pumping equipment. It is improbable that there will be any measurable exposure to the additive product in refinery operations. However, it is envisaged that workers involved in the disconnection of pumping lines may be intermittently exposed to the notified polymer.

Workers using formulated oils may come into dermal contact with the notified polymer during the changing of engine oils, but this is likely to be of short duration and intermittent occurrence.

## **7. PUBLIC EXPOSURE**

There is negligible potential for public exposure to the notified polymer in HiTEC<sup>®</sup> 6643 arising from blending as the process is completely enclosed and fully automated.

The finished products containing the notified polymer will enter the public domain as lubricant oils or fuels. A low to moderate amount of public contact will occur while adding fuels or finished oils to tanks, engines or crankcases. The most likely route of exposure to the notified polymer will be through the skin. However, the potential for exposure is expected to be low, because contact is likely to be brief and intermittent, and the concentration of the notified polymer in finished oil will be only 0.01-8%.

## **8. ENVIRONMENTAL EXPOSURE**

### **Release**

The notified substance will be present in concentrations ranging from 0.01 to 8% in the finished oils but due to the relatively low import volume it is expected to be in the lower end of this range. No release to the environment is expected during transport and storage except in the case of spills. The product containing the notified substance will be used in at least six blending facilities where lubricating oils are manufactured. Such facilities are highly automated and the product will be drawn directly into a closed system. The notifier estimates that in the production of 10 t of finished oil less than 3 kg of the notified polymer would be lost as slops or washings. Equipment or drums will be rinsed with base mineral oil which will then be used in further manufacturing. Empty drums will be sent to commercial drum reclaimers for cleaning and rinsate will be sent for appropriate disposal.

Some release is likely during transfer of the lubricants from containers to engine

blocks but the amounts involved are expected to be small. Assuming a 1% loss during such operations, less than 20 kg of the notified substance would be released in this manner. Most spills are likely to be adsorbed onto sawdust and incinerated or disposed of to landfill, while residuals left in containers would be disposed of in similar fashion. Irresponsible work practices could lead to spilt oil entering stormwater systems, but this is expected to be a minor occurrence.

A recent survey by the Australian Institute of Petroleum [1] indicates that of the annual sales of automotive engine oils (around 182 megalitres) in Australia, some 60% (ie 109 megalitres) are potentially recoverable (ie not burnt in the engines during use). This report also indicates that around 86% of oil changes take place in specialised automotive service centres, where old oil drained from crankcases could be expected to be disposed of responsibly, either to oil recycling or incineration plants. The notified polymer will be part of heavy duty diesel lubricating oils; the majority of such oils will most probably be used in industrial, mining or transport situations. These users are known to reuse most of their used oil [1] as fuel or for other purposes.

The remaining 14% (15 megalitres) are removed by do it yourself (DIY) enthusiasts, and in these cases some of the old oil would be either incinerated, left at transfer stations where it is again likely to be recycled, or deposited into landfill. Recent survey data tracing the fate of used lubricating oil in Australia [2] indicates that only around 20% of old oil removed by DIY enthusiasts is collected for recycling, while about 25% is buried or tipped into landfill, 5% is disposed of into stormwater drains and the remaining 40% is used in treating fence posts, killing grass and weeds or disposed of in other ways. However, as the notified substance will only be present in heavy duty diesel lubricating oils, significant use in the DIY market is not anticipated.

Consequently, if it is assumed that the majority of used oil containing the notified substance will be removed by professional mechanics and reused appropriately or sent for recycling or incineration. Low environmental release of the notified substance should result from these activities.

Since the use of the lubricating oils will occur throughout Australia, all releases resulting from use or disposal of old oil will be very diffuse, and release of the notified material in high concentrations is very unlikely except as a result of transport accidents.

### **Fate**

The notified substance will be used in heavy duty diesel lubricating oils, and will share their fate. The majority of such oils will most probably be used in industrial, mining or transport situations. These users are known to reuse most of their used oil [1] as fuel or for other purposes. Therefore, most spent oil will be recycled, re-refined or combusted (if used for fuel value). Incineration products are expected to include oxides of carbon, nitrogen, and boron.

A minor amount of the notified substance may be released to the environment from

spills and leaks, but this would be widely dispersed. If the notified substance was washed from road surfaces, it would be expected to adsorb to soils or sediments adjacent the road. In the event of oil containing the notified substance being disposed of to landfill (for example if adsorbed into sawdust after accidental spills, or dumped irresponsibly) the material would be slowly degraded through the slow biological and abiotic processes operating in these facilities. Leaching from a landfill would be slow, and the high anticipated  $K_{ow}$  (see comments on physico-chemical properties above) indicates that the material would not be mobile, but would adsorb into and become associated with the organic component of soils and sediments. Similarly, in the event of accidental or deliberate release of small quantities into the water compartment, it is likely to become associated with suspended organic material, and eventually be incorporated into sediments.

The potential for bioaccumulation was not determined. However, this is not a scheduled requirement for polymers of number average molecular weight (NAMW) exceeding 1000 and bioaccumulation of the notified substance is not expected due to the polymer's high NAMW [3].

## 9. EVALUATION OF TOXICOLOGICAL DATA

According to the *Industrial Chemicals (Notification and Assessment) Act*, 1989, toxicological data are not required for polymers with a NAMW greater than 1000. However the notifier has provided the following toxicological data. The tests were performed in accordance with OECD Test Methods.

### 9.1 Acute Toxicity

#### Summary of the acute toxicity of HiTEC 6643

| <b>Test</b>         | <b>Species</b> | <b>Outcome</b>                       | <b>Reference</b> |
|---------------------|----------------|--------------------------------------|------------------|
| acute oral toxicity | rat            | $LD_{50} > 2\,020\text{ mg.kg}^{-1}$ | [4]              |

#### 9.1.1 Oral Toxicity [4]

|                                  |  |
|----------------------------------|--|
| <i>Species/strain:</i>           | rat/Sprague Dawley   |
| <i>Number/sex of animals:</i>    | 5/sex  |
| <i>Observation period:</i>       | 14 days  |
| <i>Method of administration:</i> | a single dose of $2\,020\text{ mg.kg}^{-1}$ ( $5.1\text{ mL.kg}^{-1}$ ) of the test article was administered orally by gavage  |
| <i>Clinical observations:</i>    | soft stools, yellow brown discolouration of hair, watery faeces, abnormal gait, abnormal stance, decreased activity, decreased |

|                                |   |
|--------------------------------|---|
|                                | muscle tone and a red stained nostril; all animals were normal by day 8 |
| <i>Mortality:</i>              | nil   |
| <i>Morphological findings:</i> | none  |
| <i>Test method:</i>            | similar to OECD guidelines [5]  |
| <i>LD<sub>50</sub>:</i>        | > 2 020 mg.kg <sup>-1</sup>   |
| <i>Result:</i>                 | the notified chemical was of low acute oral toxicity in rats            |

## 9.2 Overall assessment of Toxicological Data

An acute oral toxicity study provided by the notifier shows that the LD<sub>50</sub> for the notified chemical is greater than 2 000 mg.kg<sup>-1</sup>. Although no other toxicological data were submitted, the high number average-molecular weight of the notified polymer should preclude transportation across biological membranes. This in combination with the low percentage of species with NAMW less than 1 000 (ie < 4%) and the types of monomers/reactants in the polymer suggests that the notified polymer is unlikely to have adverse health effects on individuals.

## 10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Toxicity data were provided for the fathead minnow (*Pimephales promelas*) obtained from experiments conducted according to good laboratory practice [6]. Acute toxicity was tested using a 96-hour static “dispersion limit” test using vessels incorporating a small plastic propeller to continually mix the test substance and the dilution water. Only one nominal test solution 2 200 mg.L<sup>-1</sup> was tested and some insoluble material was observed on the surface of the test media during the test. No adverse effects were observed and the No Observed Effect Concentration (NOEC) was the nominal test concentration of 2 200 mg.L<sup>-1</sup>. Therefore, the notified substance is not toxic to fish up to the limits of solubility. As the notified substance contains a quaternary ammonium functionality it may be more toxic to algae but no data for algal toxicity were available.

## 11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notified chemical is a minor component of diesel engine lubricating oils and will be present in concentrations ranging from 0.01 to 8%. Given the relatively small volume imported it would appear that concentrations are likely to be closer to the lower end of these quoted concentrations.

Leaks or spillages during formulation should be retained within formulation plants. The majority of oils containing the notified substance will most probably be used in industrial, mining or transport situations. These users are known to re-use most



of their used oil [1] as fuel or for other purposes. Therefore, most spent oil will be recycled, re-refined or combusted (if used for fuel value). Incineration products are expected to include oxides of carbon, nitrogen, sulfur, boron and phosphorous.

If not reused and disposed of to landfill, used oil would be slowly degraded through the slow biological and abiotic processes operating in these facilities. Leaching from a landfill would be slow, and the high anticipated  $K_{ow}$  indicates that the material would not be mobile, but would adsorb into and become associated with the organic component of soils and sediments. A minor amount of the notified substance may be released to the environment from spills and leaks, but this would be widely dispersed. If the notified substance was washed from road surfaces, it would be expected to adsorb to soils or sediments adjacent the road. Similarly, in the event of accidental release into the water compartment, it is not expected to be toxic to fish and is likely to become associated with suspended organic material and eventually be incorporated into sediments.

The notified chemical is unlikely to present a significant hazard to the environment from its proposed use due to the expected low environmental exposure.

## **12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS**

Only an acute oral toxicity report was supplied by the notifier. This study indicates that the notified polymer is of low acute oral toxicity in rats with the  $LD_{50}$  exceeding  $2\,000\text{ mg.kg}^{-1}$ . The notified polymer is of high number-average molecular weight (NAMW), with a low concentration of both low molecular weight species and residual monomers. In addition the constituents of the polymer (including the metal-based counter ion) are considered to be relatively innocuous. The limited information available does not suggest that the notified polymer would cause adverse health effects in humans.

Workers involved with the reformulation of the oil additive into oil products have the potential to be exposed to the greatest concentration of notified polymer (ca 40% notified polymer). In particular, those workers involved in the disconnection of pumping lines attached to the drums of oil additive. Given the short duration and intermittence of these operations, it is unlikely that adverse health effects will occur in this category of workers should exposure occur. All other workers involved in reformulation face negligible risk of adverse health effects since operations are carried out by workers in an isolated control room.

Automotive maintenance workers are likely to experience dermal exposure, however, the risk to health is low because contact is likely to be brief and intermittent, and the concentration of the notified polymer in finished oil will be in the range of 0.01 to 8%.

The potential for public exposure is expected to be low because contact is likely to be brief and intermittent, and the concentration of the notified oil will be only 0.01 to 8%. Hence the risk to public health is considered to be negligible.

### 13. RECOMMENDATIONS

To minimise occupational exposure to the notified polymer in HiTEC<sup>®</sup> 6643 the following guidelines and precautions should be observed:

- Industrial clothing should conform to the specifications detailed in AS 2919 [7];
- Impermeable gloves or mittens should conform to AS 2161 [8];
- All occupational footwear should conform to AS/NZS 2210 [9];
- 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 oil additive package containing the notified polymer was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* [10].

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.

Secondary notification under Section 64 of the Act will be required if the method of use changes in such a way as to greatly increase the environmental exposure of the notified polymer, or if additional information becomes available on adverse environmental effects of the polymer.

## 16. REFERENCES

1. *AIP Survey of Used Oil*, 1995, Australian Institute of Petroleum Ltd.
2. Snow, R. *Used Oil Management*. in *The Used Oil Management Conference*. 1997. Brisbane: Queensland Department of Environment.
3. Connell, D.W., *General characteristics of organic compounds which exhibit bioaccumulation*, in *Bioaccumulation of Xenobiotic Compounds*, D.W. Connell, Editor. 1989, CRC Press: Boca Raton.
4. Mallory VT, *Acute Exposure Oral Toxicity for HiTEC 6643 Additive Dialysate*, . 1997, Pharmakon Research International: Waverly, Pennsylvania.
5. Organisation for Economic Co-operation and Development, *OECD Guidelines for the Testing of Chemicals on CD-Rom*. 1995-1996, Paris: OECD.
6. Ward TJ Magazu JP and Boeri RL, *Acute Toxicity of HiTEC 6643 to the Fathead Minnow (Pimaphales promelas) - Results of Dispersion Limit Toxicity Test*, . 1997, T R Wilbury Laboratories: Marblehead, Massachusetts.
7. Standards Australia, *Australian Standard 2919-1987, Industrial Clothing*. 1987, Sydney: Standards Association of Australia.
8. Standards Australia, *Australian Standard 2161-1978, Industrial Safety Gloves and Mittens (excluding electrical and medical gloves)*. 1978, Sydney: Standards Association of Australia.
9. Standards Australia/Standards New Zealand, *Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear*. 1994, Sydney/Wellington: Standards Association of Australia/Standards Association of New Zealand.
10. National Occupational Health and Safety Commission, *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*. 1994, Canberra: Australian Government Publishing Service.