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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

PUBLIC REPORT

Z-158

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 Department of Health, and conducts the risk assessment for public health and occupational health and safety. The assessment of environmental risk is conducted by the Department of the Environment.

This Public Report is 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
NICNAS

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SUMMARY

The following details will be published in the NICNAS *Chemical Gazette:*

ASSESSMENT REFERENCE	APPLICANT(S)	CHEMICAL OR TRADE NAME	HAZARDOUS CHEMICAL	INTRODUCTION VOLUME	USE
LTD/1887	Lubrizol International Inc	Z-158	ND*	< 100 tonnes per annum	Component of engine oils

*ND = not determined

CONCLUSIONS AND REGULATORY OBLIGATIONS

Hazard classification

As no toxicity data were provided, the notified polymer is not recommended for classification according to the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS), as adopted for industrial chemicals in Australia, or the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

The environmental hazard classification according to the *Globally Harmonised System of Classification and Labelling of Chemicals* (GHS) is presented below. Environmental classification under the GHS is not mandated in Australia and carries no legal status but is presented for information purposes.

Hazard classification	*Hazard statement*
Acute Category 3	H402 – Harmful to aquatic life
Chronic Category 3	H412 – Harmful to aquatic life with long lasting effects

Human health risk assessment
Under the conditions of the occupational settings described, the notified polymer is not considered to pose an unreasonable risk to the health of workers.

When used in the proposed manner, the notified polymer is not considered to pose an unreasonable risk to public health.

Environmental risk assessment
On the basis of the PEC/PNEC ratio and the reported use pattern, the notified polymer is not considered to pose an unreasonable risk to the environment.

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 (M)SDS should be easily accessible to employees.

- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)*

as adopted for industrial chemical s in Australia, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation should be in operation.

Disposal

- Where reuse or recycling are not appropriate, dispose of the notified polymer in an environmentally sound manner in accordance with relevant Commonwealth, state, territory and local government legislation.

Emergency procedures

- Spills or accidental release of the notified polymer should be handled by containment, physical collection and subsequent safe disposal.

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 notified polymer 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 polymer, have post-assessment regulatory obligations to notify NICNAS when any of these circumstances change. These obligations apply even when the notified polymer 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(2) of the Act; if
  - the function or use of the polymer has changed from a component of engine oils, or is likely to change significantly;
  - the amount of polymer being introduced has increased, or is likely to increase, significantly;
  - the polymer has begun to be manufactured in Australia;
  - additional information has become available to the person as to an adverse effect of the polymer 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.

(Material) Safety Data Sheet
The (M)SDS of the notified polymer provided by the notifier was reviewed by NICNAS. The accuracy of the information on the (M)SDS remains the responsibility of the applicant.

ASSESSMENT DETAILS

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT
Lubrizol International Inc (ABN: 52 073 495 603)
28 River Street
SILVERWATER NSW 2128

NOTIFICATION CATEGORY
Limited: Synthetic polymer with Mn ≥ 1,000 Da.

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, analytical data, degree of purity, polymer constituents, residual monomers, impurities and import volume.

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)
None

NOTIFICATION IN OTHER COUNTRIES
USA

2. IDENTITY OF CHEMICAL

MARKETING NAME
Z-158

ANALYTICAL DATA
Reference NMR, IR, GPC, UV spectra were provided.

3. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AT 20 °C AND 101.3 kPa: Pale yellow, viscous liquid.

Property	Value	Data Source/Justification
Melting Point/Freezing Point	< -20 ± 3°C	Provided by the notifier
Boiling Point	260 °C at 101 kPa	Measured
Density	934 kg/m^3 at 20 ± 0.5°C	Measured
Vapour Pressure	2.59 × 10^{-5} kPa at 25 °C 1.42 × 10^{-4} kPa at 100 °C	Measured
Water Solubility	< 5.21 × 10^{-5} g/L at 20 °C < 5.32 x 10^{-4} % extractability at 20 °C	Measured
Hydrolysis as a Function of pH	Not determined	Not expected to hydrolyse under environmental conditions (pH 4-9)
Partition Coefficient (n-octanol/water)	log Pow > 10	Measured
Adsorption/Desorption	log K_{oc} > 5.63	Measured
Dissociation Constant	Not determined	Contains no dissociable functionalities
Flash Point	217 ± 2 °C at 103 kPa	Measured
Autoignition Temperature	416 ± 5 °C at 102 kPa	Measured
Explosive Properties	Predicted negative	Based on the structure of the notified polymer
Oxidising Properties	Predicted negative	Based on the structure of the notified polymer

DISCUSSION OF PROPERTIES
For full details of tests on physical and chemical properties, refer to Appendix A.

Reactivity
The notified polymer is expected to be stable under normal conditions of use.

Physical hazard classification
Based on the submitted physico-chemical data depicted in the above table, the notified polymer is not recommended for hazard classification according to the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS),* as adopted for industrial chemicals in Australia.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
The notified polymer will be imported into Australia in the neat form or as a component of lubricant additive packages at 2-3% concentration for reformulation.

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

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	< 100	< 100	< 100	< 100	< 100

PORT OF ENTRY
Western Australia, Queensland and Victoria

IDENTITY OF MANUFACTURER/RECIPIENTS
Lubrizol International Inc

TRANSPORTATION AND PACKAGING
The notified polymer will be imported in the neat form or as a component of lubricant additive packages at 2-3% concentration in isotainers, 1250 L IBC containers or 208 L drums. The notified polymer and products containing the notified polymer will then be transported by road to customers' facilities.

USE
The notified polymer will be used as a component of engine oils at < 4% concentration in industrial, commercial and Do-It-Yourself (DIY) applications.

OPERATION DESCRIPTION
The notified polymer will not be manufactured in Australia. The imported notified polymer and additive packages containing the notified polymer (at 2-3% concentration) will be reformulated after importation.

Reformulation
At the customers' facilities, it is expected that the notified polymer, or additive packages containing the notified polymer at 2-3% concentration, will be transferred into blending tanks using automated, enclosed and well-ventilated processes. After blending, it is expected that the end-use product containing the notified polymer at < 4% concentration will be packaged using automated processes. The resulting engine oil products may be supplied in bulk for industrial users or in smaller containers for use in commercial service applications or by DIY users.

End use
Engine oil products containing < 4% of the notified polymer will primarily be used by commercial automotive and industrial engine service outlets and to a lesser extent by DIY users. Use by DIY users will involve the engine oils being manually decanted into automobile engines, while at industrial sites the engine oils are expected to be pumped from the drums.

5. HUMAN HEALTH IMPLICATIONS

6.1. Exposure Assessment

6.1.1. Occupational Exposure

CATEGORY OF WORKERS

Category of Worker	*Exposure Duration (hours/day)*	*Exposure Frequency (days/year)*
Transport/storage	1-3	4-6
Plant Operator	< 1	50
Maintain/Clean	2-4	10-20
Plant Operator-sampling	< 1	100

EXPOSURE DETAILS
Transport and storage workers may come into contact with the imported products containing the notified polymer at ≤ 100% concentration only in the unlikely event of accidental rupture of containers.

Reformulation
Dermal and ocular exposure of workers to the notified polymer (at ≤ 100% concentration) may occur when connecting and disconnecting hoses and during sample testing. Exposure should be limited as the blending and packaging processes are expected to be automated and within a closed system.

Dermal and ocular exposure to workers should be further mitigated through the use of personal protective equipment (PPE) including protective clothing, impervious gloves and goggles, as anticipated by the notifier. Inhalation of vapour is unlikely given the polymer's low volatility. Although oil mists may be generated, exposure is expected to be limited due to the enclosed nature of the blending operation.

End-use
At automotive service centres, professional users such as mechanics may experience dermal or ocular exposure to the engine oil products containing the notified polymer at < 4% concentration when transferring engine oils to cars. The potential for dermal and ocular exposure may be mitigated through the use of PPE. Inhalation exposure is not expected given that aerosols are not likely to be generated and the notified polymer has a low vapour pressure.

6.1.2. Public Exposure
Dermal and ocular exposure to the notified polymer at < 4% may occur to DIY users when topping up or changing engine oils. Given the low concentration of use (< 4%) and the fact that engine oil is topped up or changed infrequently, public exposure to the notified polymer is expected to be low.

6.2. Human Health Effects Assessment
No toxicity data were submitted. Given the high molecular weight (> 1,000 Da) and low water solubility of the notified polymer, absorption across biological membranes is not expected to be significant. However, the polymer contains a relatively high percentage of low molecular weight species (< 1,000 Da) that may be absorbed.

Health hazard classification
As no toxicity data were provided, the notified polymer cannot be classified according to the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS),* as adopted for industrial chemicals in Australia, or the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 2004).

6.3. Human Health Risk Characterisation

6.3.1. Occupational Health and Safety
There was no information provided on the toxicity of the notified polymer. However, systemic effects are expected to be limited by the predicted low absorption across biological membranes.

Exposure to workers during reformulation should be limited by enclosed and automated/semi-automated processes, and by the stated use of personal protective equipment including protective aprons, impervious gloves, goggles and boots.

Workers handling engine oil products containing the notified polymer at < 4 % concentration may not use PPE during engine servicing. However, their exposure is expected to be limited by the likely low frequency of accidental ocular/skin exposure and the lower concentration of the notified polymer in the products.

Given the low end-use concentration and stated controls in place to minimise exposure during reformulation, the risk to the health of workers is not considered unreasonable.

6.3.2. Public Health

The public (DIY users) may have accidental ocular and/or skin exposure to products containing the notified polymer at < 4 % concentration. However, given the infrequent use of the products containing the notified polymer by the public and the low concentration of the notified polymer in the products, the risk to the general public is not considered to be unreasonable.

7. ENVIRONMENTAL IMPLICATIONS

7.1. Environmental Exposure & Fate Assessment

7.1.1. Environmental Exposure

RELEASE OF CHEMICAL AT SITE

The notified polymer will be imported into Australia neat, or as a component of lubricant additive packages for reformulation into engine oils. No significant release of the notified polymer is expected from transportation and storage except in the unlikely event of accidental spills or leaks.

Local blending and repackaging of the additive containing the notified polymer into engine oils is expected to occur within enclosed automated systems. Blending tanks and equipment are expected to be cleaned with mineral oil, which is expected to be recycled during subsequent blending. Accidental spills and leaks during normal blending and packaging procedures will be contained and collected for recycling where appropriate, or disposed of in accordance with local government regulations, most likely to landfill.

RELEASE OF CHEMICAL FROM USE

The finished products containing the notified polymer will be used as a component of automotive engine oils. Release during use may arise from spills when pouring lubricants into engines or from engine leaks, and is expected to be very low.

RELEASE OF CHEMICAL FROM DISPOSAL

After reformulation, empty import drums containing residues of the notified polymer (estimated to be 0.1% of the total import volume, or 100 kg) are expected to be sent to a container recycling facility for reconditioning. Empty drums will be washed with mineral oil and the wastes containing the notified polymer collected for disposal in accordance with local government regulations, most likely to landfill. Therefore, the release of the notified polymer to surface waters from the cleaning of empty drums is expected to be limited.

The major release of the notified polymer to the environment will come from inappropriate disposal of waste or used oils. Oil products containing the notified polymer will be poured into engines at automotive service centres or by Do-It-Yourself (DIY) consumers. A survey by the Australian Institute of Petroleum (AIP, 1995) indicates that of the annual sales of engine oils in Australia, 60% of oils are potentially recoverable (i.e. 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 is disposed of responsibly (e.g. oil recycling). Assuming this is the case, negligible release of the notified polymer should result from these professional activities. The remaining 14% of oil is used by DIY consumers. In these cases, some of the used oil would either be left at transfer stations where it is likely to be recycled, or deposited into landfill.

According to a survey tracing the fate of used lubricating oil in Australia (Snow, 1997), approximately 20% of oil used by DIY consumers is collected for recycling, approximately 25% is buried or disposed of to landfill, 5% is disposed of into stormwater drains, and the remaining 50% is used in treating fence posts, killing grass and weeds or disposed of in other ways. In a worst case scenario involving the 14% of oil used by DIY consumers,

up to 0.7% (14% × 5% stormwater disposal) of the total import volume of the notified polymer (or 700 kg) may enter the aquatic environment via disposal to stormwater drains. Since the use of the engine oils will occur throughout Australia, all releases resulting from use or disposal of used oil will be very diffuse, and release of the notified polymer in neat concentrations is unlikely except as a result of transport accidents.

7.1.2. Environmental Fate

Based on the results of a biodegradability study reported in the submitted SDS (carried out in accordance with OECD 301 C test guidelines), the notified polymer is not expected to be biodegradable (1% in 28 days). However, as the full study report for this data has not been submitted, these results should be treated with caution. Based on its high molecular weight and low water solubility, the notified polymer is not expected to cross biological membranes, and is therefore unlikely to be bioaccumulative.

The majority of the notified polymer will be thermally decomposed during use, collected for recycling, or re-refined. Up to 0.7% of annual import volume of the notified polymer (or 700 kg) may be released to stormwater drains from incorrect disposal of wastes and used engine oils by DIY consumers. In surface waters, up to 90% of the notified polymer is expected to partition to soil and sediment due to its high molecular weight, non-ionic properties (Boethling and Nabholz, 1997), and high adsorption/desorption coefficient (log K_{OC} > 5.63). In landfill and in soil and sediment, the notified polymer is expected to eventually degrade by biotic and abiotic processes to form water and oxides of carbon.

7.1.3. Predicted Environmental Concentration (PEC)

For the worst case scenario, the percentage of the imported quantity of notified polymer inappropriately disposed to stormwater drains is estimated to be 0.7%. That is, 14% (fraction collected by DIY users) × 5% (fraction disposed to stormwater). The release of the notified polymer may be up to 700 kg/year (= 100 tonnes/year × 0.7%). In this worst case scenario, it is assumed that the release goes into stormwater drains in a single metropolitan area with a geographical footprint of 500 km^2 and an average annual rainfall of 500 mm, all of which drains to stormwater. With a maximum annual release into this localised stormwater system of 700 kg and the annual volume of water drained from this region estimated to be 250×10^6 m^3, the calculated PEC will be up to 2.80 µg/L. This result reflects a worst-case scenario upper limit, as in reality releases of the notified polymer will be distributed over multiple regions and it will be further diluted if it reaches the ocean.

7.2. Environmental Effects Assessment

The results from ecotoxicological investigations conducted on the notified polymer and reported in the submitted SDS are summarised in the table below. However, as the full study reports have not been provided, these results should be treated with caution.

Endpoint	*Result*	*Assessment Conclusion*
Fish Toxicity	96 h LC50 = 33 mg/L	Harmful to fish
Daphnia Toxicity	48 h EC50 = 20.3 mg/L	Harmful to *Daphnia*
Inhibition of Bacterial Respiration	3 h IC50 = 850 mg/L	Not inhibitory to microbial respiration

Based on the above ecotoxicological endpoints, the notified polymer is expected to be harmful to fish and aquatic invertebrates. Therefore, under the *Globally Harmonised System of Classification and Labelling of Chemicals (GHS)* (United Nations, 2009), the notified polymer is formally classified as "Acute Category 3; Harmful to aquatic life". Based on its lack of biodegradability and acute toxicity, the notified polymer is formally classified as "Chronic Category 3; Harmful to aquatic life with long lasting effects" under the GHS.

7.2.1. Predicted No-Effect Concentration

The predicted no-effects concentration (PNEC) has been calculated from the most sensitive endpoint for daphnia. A safety factor of 1000 was used given acute endpoints for only two trophic levels are available.

Predicted No-Effect Concentration (PNEC) for the Aquatic Compartment		
EC50 (*Daphnia*, 48 h)	20.3	mg/L
Assessment Factor	1000	
Mitigation Factor	1.00	
PNEC:	20.3	µg/L

7.3. Environmental Risk Assessment

The Risk Quotient (Q = PEC/PNEC) has been calculated based on the predicted PEC and PNEC.

Risk Assessment	PEC µg/L	PNEC µg/L	Q
Q - River	2.80	20.3	**0.138**
Q - Ocean	0.28	20.3	**0.014**

The Risk Quotients (RQ = PEC/PNEC) have been calculated for both the river and ocean compartments, and indicate that the notified polymer is unlikely to reach ecotoxicologically significant concentrations in surface waters, based on its maximum annual importation quantity and reported use pattern. Whilst the notified polymer is not biodegradable, based on its high molecular weight it is not expected to bioaccumulate. On the basis of the PEC/PNEC ratio, maximum annual importation volume and assessed use pattern in engine oils, the notified polymer is not expected to pose an unreasonable risk to the environment.

APPENDIX A: PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point Decomposes from ~260 °C at 101 kPa

Method	OECD TG 103 Boiling Point. EC Council Regulation No 440/2008 A.2 Boiling Temperature.
Remarks	Determined by differential scanning calorimetry
Test Facility	Harlan (2015a)

Density 934 kg/m^3 at 20 ± 0.5 °C

Method	OECD TG 109 Density of Liquids and Solids. EC Council Regulation No 440/2008 A.3 Relative Density.
Remarks	Determined by pycnometer
Test Facility	Harlan (2015a)

Vapour Pressure 2.59×10^{-5} kPa at 25 °C and 1.42×10^{-4} at 100 °C

Method	OECD TG 104 Vapour Pressure. EC Council Regulation No 440/2008 A.4 Vapour Pressure.
Remarks	Determined by vapour pressure balance
Test Facility	Harlan (2015b)

Water Solubility $< 5.21 \times 10^{-5}$ g/L at 20 °C

Method	OECD TG 105 Water Solubility. EC Council Regulation No 440/2008 A.6 Water Solubility.
Remarks	Flask Method/Column Elution Method
Test Facility	Harlan (2015a)

Water Solubility $< 5.32 \times 10^{-4}$ % extractability at 20 °C

Method	OECD TG 120 Water Extractability of Polymers.
Remarks	Flask Method
Test Facility	Harlan (2015a)

Partition Coefficient (n-octanol/water) log Pow > 10

Method	OECD TG 117 Partition Coefficient (n-octanol/water). EC Council Regulation No 440/2008 A.8 Partition Coefficient.
Remarks	HPLC Method/Flask Method
Test Facility	Harlan (2015a)

Adsorption/Desorption log K_{oc} > 5.63

Method	OECD TG 121 Estimation of the Adsorption Coefficient (KOC) on Soil and on Sewage Sludge using High Performance Liquid Chromatography (HPLC).
Remarks	HPLC screening method
Test Facility	Harlan (2015c)

Flash Point 217 ± 2 °C at 103 kPa

Method	EC Council Regulation No 440/2008 A.9 Flash Point.
Remarks	Determined by closed cup equilibrium method
Test Facility	Harlan (2015d)

Autoignition Temperature 416 ± 5 °C at 102 kPa

Method EC Council Regulation No 440/2008 A.15 Auto-Ignition Temperature (Liquids and Gases).
Test Facility Harlan (2015d)

Explosive Properties Predicted negative

Method EC Council Regulation No 440/2008 A.14 Explosive Properties.
Remarks Based on the idealised chemical structure of the test item
Test Facility Harlan (2015d)

Oxidizing Properties Predicted negative

Method EC Council Regulation No 440/2008 A.21 Oxidizing Properties (Liquids).
Remarks Based on the idealised chemical structure of the test item
Test Facility Harlan (2015d)

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