File No: PLC/185

February 2001

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Z-39

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Director
Chemicals Notification and Assessment

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1. APPLICANT

Lubrizol International, Inc. (ACN 002 747 944) of 28 River Street, SILVERWATER, NSW 2128 has submitted a notification statement in support of their application for an assessment certificate for the synthetic polymer of low concern (PLC) Z-39.

2. IDENTITY OF POLYMER

Trade names:

OS136157 or PAG-20.

Reactive functional groups:

One low concern functional group per molecule.

Molecular weight (MW):

Number-average MW	Weight-average MW	% MW < 1000	% MW < 500	Method
> 1 000	> 1 000	< 5%	< 5%	*GPC*

Structural identification method (e.g. IR, NMR): Infrared, ultraviolet and nuclear magnetic resonance (^{1}H and ^{13}C) spectra were provided.

3. POLYMER COMPOSITION AND PURITY

Purity (%): 100%

Hazardous impurities (other than residual monomers and reactants): None.

Non-hazardous impurities at 1% by weight or more: None.

Additives/adjuvants: None.

4. PLC JUSTIFICATION

The notified polymer meets the criteria for a Synthetic Polymer of Low Concern.

5. PHYSICAL AND CHEMICAL PROPERTIES

Property	Result	Comments
Appearance	Yellow, slightly viscous liquid	
Melting point	The polymer is a liquid at room temperature.	
Density	0.963 at 20.0±0.5°C	
Water solubility	< 1.86 x 10^{-4} g/L at 20.0 ± 0.5°C	
Hydrolysis	Expected to be stable to hydrolytic degradation.	See notes below.
Dissociation constant	Will not dissociate.	See notes below.
Particle size	Not applicable.	Z-39 is a viscous liquid.
Flammability	Not measured.	
Autoignition temperature	Not measured.	A thermogravimetric analysis showed a big weight loss at 327.5°C.
Explosive properties		Not expected to have explosive properties and in handling has not demonstrated any explosive properties.
Stability/reactivity	Not an oxidiser and is thermally stable under normal conditions.	
Flash point	128°C	

Comments on physical and chemical properties

The water solubility was determined using the shake flask method of EEC directive A6. The pH of the aqueous phases was 4.9-5.5 which indicates that the material has no significant acidic or basic impurities.

The polymer contains no groups susceptible to hydrolysis.

No data on log P_{ow} were provided. The notified polymer contains a large aliphatic hydrocarbon moiety expected to have high compatibility with oil, and a large polybutoxy component expected to have some affinity for water. Consequently, it has a classic amphiphilic structure, and may have surfactant properties in aqueous environments. If released to the water compartment, the polymer is expected to associate with organic material in sediments.

The polymer does not contain any acidic or basic functionalities, and would not dissociate or become protonated under usual environmental conditions (pH 4 – 9).

6. USE, VOLUME AND FORMULATION

Use:

Z-39 is used as a component of fuel additives. It is a precursor of the chemical submitted in an accompanying notification Z-38 (NA/842), and is present in Z-38 at approximately 20%. The treatment rate for Z-39 in gasoline is approximately 20 – 50 parts per million (ppm).

Manufacture/Import volume:

Less than 100 tonnes per year for the first 5 years.

Formulation details:

The notified polymer is imported as a minor component (approximately 10%) of a fuel additive package such as Lubrizol 9566.

7. OCCUPATIONAL EXPOSURE

Import, Transport and Storage

The notified polymer will be imported in ISO containers (capacity: approximately 19 000 – 38 000 L) and transferred to customer depots or terminals by road or rail. Occupational exposure of dockside or transport workers is not expected except in the event of a spill. No repackaging of ISO containers is required as they are delivered directly to the customer sites.

Refinery/Terminal Facilities

One or 2 workers at each site are involved in addition of the notified polymer to fuel. The fuel additive package containing the notified polymer is transferred from the isotainer directly to the customer's storage tank. It is then automatically metered into gasoline as the gasoline is pumped into a tank truck. Despite the use of automated processes and dedicated delivery lines, worker exposure may occur during transfer of the additive from containers to a storage tank and during the transfer of the additive package from storage to fuel in tankers. Exposure is expected to be confined to dermal contamination with drips and spills during the connection and disconnection of transfer lines and equipment. Protective aprons, nitrile or neoprene gloves and boots are recommended by the notifier for workers when handling the additive package and the worker environment is expected to be well ventilated. A respirator is suggested when control measures are inadequate.

End Use - Service Stations

At service stations, the final fuel will be transferred to underground tanks. Exposure of transport drivers, service station personnel and mechanics to very low concentrations of the notified polymer in the final fuel may occur due to spillage. Exposure is expected to be confined to dermal contamination with drips and spills during the connection and disconnection of transfer lines and dipping of tanks.

Estimated numbers of workers were provided only for blending operations and duration of exposure was not stated for any operation.

8. PUBLIC EXPOSURE

The notified polymer will be available to the public only after it has been mixed with gasoline at the refinery. Exposure will only occur at the time of filling a motor vehicle fuel tank or where treated gasoline is used for the cleaning of equipment or parts by a home mechanic. Given the low concentration and the minimal direct contact with fuel under normal circumstances, public exposure to Z-39 will be minimal.

9. ENVIRONMENTAL EXPOSURE

Release

Formulation into petrol

The notifier indicates that the blending operations are to be performed at specially constructed sites (around 5 in Australia), owned and operated by petroleum companies. Due to the automated and self contained nature of the pumping and transfer equipment used, it is anticipated that very little of the additive package (containing approximately 10% of the notified polymer) will be released during transfer to the storage containers, and an estimate of 50 grams per unload is realistic. Import and unloading of approximately 20 ISO tanks per annum equates to an annual release of 1 kg additive, or 0.10 kg of the notified polymer. All transfer operations from the storage facility to the (closed) blending equipment (typically in line mixers) would be under automatic control, and any spills during blending would be contained within concrete bunds and reclaimed or sent with other waste material to the on-site waste water treatment facilities at the refinery. Refineries employ treatment technologies such as oil/water separation, induced air flotation, sand filtration and possibly biological treatment. Treated water is discharged to either municipal sewage or receiving waters. Most of the hydrocarbon material (including the notified polymer) would be recovered into waste sludge, incinerated, or placed into landfill.

The notifier estimated that a maximum of 1% of the additive package may remain in the emptied iso containers. Assuming a maximum importation of less than 100 tonnes per annum, this equates to a total maximum release of 1 000 kg of residual polymer each year. The empty containers are steam cleaned at a reconditioning facility, and the waste condensate containing the residue is treated to remove the hydrophobic material in equipment similar to that used at refineries. Waste sludge containing notified polymer residue would be either placed into landfill or incinerated.

End use release

Finished petrol is transported to service stations by bulk rail or road tankers, and distributed to the general public from bowsers. Total losses of petrol through transport and transfer operations are estimated at a maximum of 1%. If it is assumed this is all spilt onto the concrete driveways of service stations, then following evaporation of the volatile hydrocarbons, up to 1 000 kg per annum of the notified polymer could be left on the service station driveways. This would be washed into stormwater systems or sewers where it would be expected to associate with sediments because of the anticipated high affinity of the polymer for organic material.

Fate

The majority of the notified polymer will be burnt with the petrol with evolution of water vapour and oxides of carbon. Similarly, any spilt material recovered into waste sludge is also likely to be incinerated. The notifier indicates that use of the new polymer as an additive for non-leaded fuels will not adversely effect the levels of hydrocarbon, CO, CO_2 or NO_x emissions in exhaust emissions, and claims that use of the new material will reduce these emissions through improved engine performance.

No information on biodegradation was provided. Material released to the soil or water compartments through accidental spills or leaks from storage tanks would associate with the organic component of soils and sediments, and is expected to undergo slow degradation through bacterial action with production of water, oxides of carbon and under anaerobic conditions, methane.

The polymer is not expected to cross biological membranes, due to the low water solubility and high molecular weight (Connell, 1989).

Effects of notified polymer on vehicle exhaust emissions

Future Commonwealth fuel quality legislation will require motor fuels to meet certain standards for vehicle exhaust emissions, and the notifier was asked to provide documentation of the effects of the notified polymer on these emissions. The notifier provided a summary report (Dudek, 2000) on comparative tests conducted on a small vehicle with petrol containing an additive package similar to Lubrizol 9566.

In the tests, a single light passenger vehicle (Honda Accord) was run using base fuel alone, and base fuel amended with approximately 200 ppm of an additive known as OS148467, reportedly similar to the notified polymer. Emission levels of CO, NO_x and hydrocarbons were measured and compared for both fuels. Although test details such as cleanliness of engine fuel intake port components and other parameters were not provided in the summary report, the stated conclusions were that the presence of the additive in the fuel resulted in no significant increase (or decrease) in exhaust levels of CO, NO_x or emissions of hydrocarbons. A number of studies have examined the positive effects of similar additives (not necessarily containing the notified polymer) on aspects of vehicle exhaust emissions. Although the information contained within the studies made no specific reference to the notified polymer, the benefits accruing from the effects of these additives should be generic and not confined to the notified polymer alone. Available evidence suggests use of the notified polymer as a fuel additive is beneficial in respect of exhaust emissions (hydrocarbon, CO and NOx). It is relevant that these additives also have significant positive impact on engine efficiency.

10. EVALUATION OF HEALTH EFFECTS DATA

No toxicological data were submitted. The overseas supplier's Material Safety Data Sheet (MSDS) for the notified chemical states that the oral LD_{50} for male rats is greater than 5 000 mg/kg and the dermal LD_{50} for female rabbits is greater than 2 000 mg/kg. Original reports for these studies were not provided for assessment.

11. EVALUATION OF ENVIRONMENTAL EFFECTS

No reports on the ecotoxicity of the new polymer against aquatic organisms were submitted.

12. ENVIRONMENTAL RISK ASSSESSMENT

The environmental hazard from the notified polymer is low when it is blended into petrol and used in the manner indicated by the notifier.

There is little potential for significant release of the material during the blending operations which will be performed at dedicated petrochemical facilities. A maximum of 1 000 kg of the polymer may be released each year as a result of cleaning the iso containers. Most of this is expected to be recovered into waste sludge and would be either incinerated or placed into landfill.

Some release will inevitably occur as a result of petrol spills during distribution to motorists, but this is estimated as a maximum of 1 000 kg per annum, and release will be widespread and very diffuse.

Although no specific information is available, it is probable that the notified polymer is ultimately biodegradable. It has low water solubility and due to the high hydrocarbon content is expected to have high affinity for the organic component of soils and sediments.

Any material released to the soil compartment (eg. from petrol spills or waste sludge from refineries) would associate with the organic component of the soil, and slowly mineralise to water and oxides of carbon through biological processes.

The notified polymer will be used as a component of fuel additives for non leaded petrol, and there is considerable evidence that modern motor vehicles running on fuel containing such additives show significant improvements in exhaust emission of hydrocarbons, CO and NOx over those of vehicles using un-supplemented fuel. The available evidence indicates that the use of the notified polymer as a fuel additive has no significant deleterious effects on the quality or quantity of noxious or toxic vehicular exhaust emissions, and overall use of the polymer as intended is probably beneficial and is not considered to pose a hazard to the environment.

The majority of the imported polymer is expected to be completely destroyed by combustion within the engine, forming oxides of carbon and hydrogen.

No ecotoxicity data were provided. Except in the case of transport accident very little of the polymer is likely to enter the water compartment. In the water compartment it would associate with aquatic sediments and slowly mineralise through biological processes. The polymer is not expected to have high potential for bioaccumulation.

13. HEALTH AND SAFETY RISK ASSESSMENT

Hazard assessment

The notified polymer fulfils the criteria for a synthetic polymer of low concern and can be considered not to be a health hazard. Limited toxicological data support this conclusion in that the polymer exhibits very low acute oral toxicity in rats and low acute dermal toxicity in rabbits. The MSDS for the polymer states that it may be an eye irritant based on data from similar substances. The notifier has indicated that Lubrizol 9566, a typical additive package in which the notified polymer may be imported, contains up to 50% petroleum naphtha including up to 20% trimethylbenzene isomers. According to NOHSC *List of Designated Hazardous Substances* (National Occupational Health and Safety Commission, 1999), the additive package is harmful if inhaled and irritating to eyes, respiratory and skin as a result of the trimethylbenzene isomer content. The additive package also should be considered flammable as a result of the trimethylbenzene isomer content.

Occupational health and safety

During import and transport of the notified polymer, worker exposure is unlikely except in the event of a spill. Exposure after a spill would be controlled by use of the recommended practices for spillage clean up outlined in the MSDS supplied by the notifier.

At refineries and terminals, the handling of fuel additive packages will not cause adverse health effects from exposure to the notified polymer. The solvent content can cause toxic effects via inhalation and eye, skin and respiratory irritation. However, workers at these sites are required to wear personal protective equipment to control exposure. The MSDS for Lubrizol 9566 suggests the use of nitrile rubber gloves, neoprene or nitrile rubber boots, chemical protective suit or apron if contact is likely, a full face respirator if NOHSC exposure standards may be exceeded and self-contained breathing apparatus for confined spaces, poorly ventilated areas or large spill clean-up sites. Components of Lubrizol 9566 have NOHSC exposure standards (National Occupational Health and Safety Commission, 1995). Trimethylbenzene has a NOHSC exposure standard of 25 ppm, ethylbenzene, 100 ppm, cumene, 50 ppm and xylene 80 ppm (TWA). Employers are responsible for maintaining workplace airborne concentrations below relevant exposure standards. Engineering controls and personal protective equipment for handling the solvent components of the additive package are sufficient to limit exposure to the notified polymer.

The use of automatic, dedicated transfer lines and enclosed, automated injection into fuel will reduce the likelihood of exposure to the additive package. Therefore, the health risk expected for refinery and terminal workers would be assessed as low.

Tanker drivers, service station workers and mechanics will receive negligible exposure to the notified polymer because of the very low concentration present in the final fuel. Therefore,

the risk of adverse health effects for these workers arising from exposure to the notified polymer is negligible.

Conclusion

The notified polymer is of low concern to human health and safety and no specific risk reduction measures are necessary.

Public health

Given the low acute toxicity and low concentration of the additive in gasoline, the notified polymer is not anticipated to pose a risk beyond that of the gasoline of which it is a component.

14. MSDS AND LABEL ASSESSMENT

MSDS

The MSDS for the notified polymer and an additive package containing the polymer provided by the notifier were in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994a). They are published here as part of the assessment report. The accuracy of the information on the MSDS remains the responsibility of the applicant.

Label

The label for the notified polymer and an additive package containing the polymer provided by the notifier were in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (National Occupational Health and Safety Commission, 1994b). The accuracy of the information on the labels remains the responsibility of the applicant.

15. RECOMMENDATIONS

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

- Spillage of the notified polymer should be avoided. Spillage should be cleaned up promptly with absorbents which should 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.

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

Employers should ensure that NOHSC exposure standards for all components of additive packages are not exceeded in the workplace.

The notified polymer will need to be tested to ensure that it will meet the criteria in the upcoming Australian Standard, *Evaluation of Devices and Additives which Claim to Improve Vehicle Performance*, to be AS 4430.2.

Safety goggles, chemical resistant industrial clothing and footwear and impermeable gloves should be used during occupational use of the additive packages containing the notified polymer; where engineering controls and work practices do not reduce vapour and particulate exposure to safe levels, an air fed respirator should also be used.

Guidance in selection of goggles 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, 1994a); for respirators, in AS/NZS 1715 (Standards Australia/ Standards New Zealand, 1994b) and AS/NZS 1716 (Standards Australia/ Standards New Zealand, 1994c) and other internationally accepted standards.

16. REQUIREMENTS FOR SECONDARY NOTIFICATION

Secondary notification may be required if:

(i) any of the circumstances stipulated under subsection 64(2) of the Act arise. If any importer or manufacturer of (the notified chemical) becomes aware of any of these circumstances, they must notify the Director within 28 days; or

(ii) the notified polymer is introduced in a chemical form that does not meet the PLC criteria.

17. REFERENCES

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

National Occupational Health and Safety Commission (1999b) 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 (1994a) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1715-1994, Use and Maintenance of Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand.

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Website Document Details

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INDEX and KEY WORDS

Chemical	Number	Use	H/ND	Date
Z-39	PLC/185	Fuel and Oil	not determined to be hazardous	15/2/01

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Subject	Z-39
Author	NICNAS
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