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February 1999

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

CP-505

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**CP-505****1. APPLICANT**

Lubrizol International Inc. of 28 River St SILVERWATER NSW 2128 has submitted a limited notification statement in support of their application for an assessment certificate for CP-505.

2. IDENTITY OF THE CHEMICAL

The following requests for exempt information were accepted:

chemical name,
CAS No.,
molecular and structural formulae,
molecular weight,
purity,
identity of toxic or hazardous impurities,
non-hazardous impurities,
low molecular weight species,
polymer constituents,
spectral data,
detailed use information,
exact import volume, and
identity of manufacturing sites.

Other Name: CP-505

**Method of Detection
and Determination:** gel permeation chromatography, UV/visible, infrared
and nuclear magnetic resonance spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance at 20°C
and 101.3 kPa:** amber, extremely viscous liquid

Pour Point:	36°C
Boiling Point:	>182°C
Specific Gravity:	1.0 at 20°C
Vapour Pressure:	< 8.2 x 10 ⁻⁸ kPa at 25°C
Water Solubility:	0.0853 mg/L at 20°C
Partition Co-efficient (n-octanol/water):	log P _{ow} > 8 (calculated, see comments below)
Hydrolysis as a Function of pH:	not performed (see comments below)
Adsorption/Desorption:	not performed (see comments below)
Dissociation Constant:	not performed (see comments below)
Flash Point:	212°C
Flammability Limits:	not flammable
Autoignition Temperature:	386°C
Explosive Properties:	not expected to be explosive
Reactivity/Stability:	not an oxidising agent; not reactive to water

Comments on Physico-Chemical Properties

Tests were performed according to EEC/OECD test guidelines at facilities complying with OECD Principles of Good Laboratory Practice. Full test reports were submitted.

The polymer does not boil, but begins to decompose at temperatures above 182°C. The water solubility was determined as 0.0853 mg/L using the flask method whereby a quantity of the test material considerably in excess of that readily soluble was shaken in flasks with distilled water at 30°C for a period of at least 24 hours. The flasks were then allowed to equilibrate at 20°C for at least 24 hours, with the contents then filtered and analysed for the polymer. The analytical procedure consisted of extraction of polymer from the aqueous phase with dichloromethane, evaporating to dryness, redissolving in tetrahydrofuran and analysing quantitatively by High Performance Liquid Chromatography (HPLC).

No data on hydrolytic degradation was provided. The notifier indicated that no suitable test methods were available for the new chemical due to the low water solubility. Although the pendant ester linkages are potentially susceptible to hydrolysis, the very hydrophobic nature of the material (see further below) will preclude intimate contact between these susceptible groups and water. Consequently hydrolytic cleavage of these bonds is expected to be very slow under normal environmental conditions.

The partition coefficient was determined to be greater than $10^{4.69}$ (ie $\log P_{OW} > 4.69$) using the shake flask method, where a stock solution of the notified material prepared in water saturated n-octanol was shaken in a flask with various volumes of distilled water for five minutes. The phases were then separated and analysed for polymer content using HPLC. The determination was performed with six replicate samples. Due to limitations of the detection equipment, it was not possible to accurately determine the solubility of polymer in the aqueous phase, however it was always less than 3.86 mg/L, and consequently $\log P_{OW}$ was determined as greater than 4.69. A calculated estimate for $\log P_{ow}$ of greater than 8.0 was obtained using a dedicated software package (KOWWIN, Syracuse Research Corp, version 1.57). The high estimated values for $\log P_{OW}$ obtained both experimentally and through calculation are consistent with the polymer's hydrophobic nature.

The very high estimated value of $\log P_{ow}$ precluded determination of $\log K_{oc}$ using the HPLC method. However, the high hydrocarbon content of the polymer and associated $\log P_{ow}$ indicate the polymer will have a high affinity for the organic component of soils and sediments and will be immobile in these media.

The polymer does not contain any dissociable groups, so dissociation constant data are not relevant for this substance.

4. PURITY OF THE CHEMICAL

Degree of Purity: exempt information

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified chemical will be used as an additive to engine oils, automatic transmission fluids and gear oils. It will be imported as part of a fully formulated additive package at a concentration of 40 – 60% by weight at a rate of less than 10 tonnes per year for the first five years. Typically, a lubricant additive package contains anti-oxidants, corrosion inhibitors, antiwear agents, detergents, dispersants and viscosity modifiers.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be imported in 200 L steel drums or iso containers and transported by rail or truck to blending facilities. Exposure to waterside, transport or storage workers should only occur in the event of accidental spillage.

Typically, the additive package is pumped directly from the drum to a blend tank for immediate dilution with oil. Diluent oil is used to flush the tank or drum and the flushings are added to the blend. The blend operation lasts approximately 8-10 hours, supervised by 1-2 workers. The notifier states that the blend operation is expected to be a highly automated process using dedicated tanks and transfer lines where feasible. Losses during blending operations are also minimised by catch pans and appropriate ventilation. Therefore, exposure will most likely be limited to residues in lines and on couplings and occasionally from leaks and spills. The final products are typically filled into 1 L to 200 L containers on an automated filling line. Information on the MSDS indicates that neoprene or nitrile gloves and safety glasses are recommended and that long-sleeved clothing should be worn.

Motor oils and hydraulic fluids may be used in large and small facilities to top up reservoirs or, less frequently, as a complete lubricant change in engines, transmissions and differentials. Exposure of the hands may be significant as it is uncommon for gloves to be worn during addition of these products to machinery.

7. PUBLIC EXPOSURE

There will be negligible public exposure from transport, storage, reformulation and disposal of the notified chemical. Public exposure may occur by dermal contact from the use of consumer products; inhalation is unlikely to be a major route of exposure due the notified chemical's low vapour pressure.

The following exposure estimation is based on a substance contained in a non-volatile medium, used without dilution. Reference values such as surface area of exposed skin and thickness of film layer on the skin and body weight were adopted from the *Risk Assessment of Existing Substances: Technical Guidance Document (European Commission, 1994)* with slight modification for some parameters.

Lubricant with a maximum concentration of CP-505 would result in a dermal exposure of 420 mg/event or 6 mg/kg/day, based on the following assumptions.

specific gravity = 1 000 mg/cm³ at 15.6°C
surface area of exposed skin = 840 cm²
thickness of film layer on the skin = 0.01 cm
frequency of use = 1 hour per day, twice per year
body weight = 70 kg

In a worst case scenario, assuming that a person changes the engine, transmission, and

differential oil together, in their own car, twice a year, with products containing maximum amounts of CP-505, the total daily exposure would be 1260 mg/engine + transmission + differential oil change, or 18 mg/kg/day (ie. 3 times 6 mg/kg/day). The high molecular weight (at least 4 216) would suggest a limited ability to cross biological membranes, therefore considerably lessening systemic exposure.

8. ENVIRONMENTAL EXPOSURE

Release

During blending of the additive concentrate containing CP-505 into lubricant products there is little likelihood of release since these processes are conducted in purpose constructed facilities which are expected to be fully automated. While not specified in the notification, it is likely that during the blending operations performed at the facilities of the petrochemical companies (typical blend sizes are 1 000 to 2 000 kg) that the contents of the 200 L drums or iso containers of CP-505 are decanted into a storage vessel then pumped to a blend tank, or alternatively pumped directly to the blend tank from the drums or iso containers. Following the blending operations, the product is repacked into containers for distribution to customers. The notifier did not indicate the size or nature of the packages of the final lubricants, since this is the prerogative of the oil companies, but it was indicated that some of the polymer may enter the “do it yourself” market which implies that some of the new lubricant formulations would be packaged in 1 and 4 L containers and sold through retail outlets such as garages. Again, since the use of fully automated filling equipment is usual in purpose built facilities owned and operated by large oil companies, little release of lubricant containing the new polymer is expected during this phase of product manufacture. Any spills resulting from either the blending or repackaging operations would be contained within bunding, and would very likely be soaked up in earth or sand and sent to an approved industrial facility for appropriate disposal. This is expected to be either incineration or placement into landfill.

Residuals left in the drums are anticipated to be small. In typical operations involving transfer of drum contents to other vessels, approximately 1.0% of the drum contents may remain as residual. Since the additive package contains up to 60% of the notified polymer, this would account for a maximum annual release of around 60 kg of the notified polymer. The notifier indicated that these residuals would be either washed out with mineral oils and added into the lubricant blends or be removed during drum reconditioning. In the latter case, these residuals would probably be incinerated.

Release during transfer of the product during the filling of transmissions would be low and, while no information was provided by the notifier, it is estimated (on the basis of experience in assessing lubricant products with similar use patterns) to be a maximum of 50 mL per transfer operation. If it is assumed that each transfer uses 10 L of lubricant these losses amount to 0.5% of lubricant, or a maximum of around 2.5 kg of the notified polymer per year

(assuming 5% content of CP-505 in the lubricant). In the majority of cases the filling of transmissions with the product would take place at sites of vehicle production or maintenance work shops, and these releases could be expected to be contained and disposed of with other lubricant and petroleum product waste. In most cases this would be through incineration or oil recycling.

When used as a component of automotive transmission oil, the material will be contained in an enclosed system, and release is expected to be insignificant. Gear oils are changed very infrequently, and typically would not be changed till the vehicle had “clocked up” around 800 000 km. Few of these major transmission overhauls are likely to be undertaken by independent owners, and in the majority of cases such operations would be performed in specialist heavy transport maintenance workshops. The fate of the majority of transmission fluid would be associated with that of the old transmissions and differentials. In most cases the old transmissions would be drained and the recovered oil sent for recycling. Some old gear oil may be disposed of in an inappropriate manner but, due to the high aliphatic hydrocarbon content of the notified polymer, it is expected that the material will have high affinity for organic matter (see notes on physico-chemical properties above) and is likely to be immobilised through association with the organic component of soils and sediments. The old gear assemblies would be sent for metal recovery where it is likely that the residual oil would be destroyed as a consequence of smelting operations.

Fate

No information on biodegradation was provided by the notifier (this is not required by the Act for new synthetic polymers), but the material could be expected to be inherently biodegradable. The new chemical has a high value for log P_{ow} (ie estimated as > 8.0 - see physico-chemical properties above) which indicates no affinity for water, and consequently the chemical is not expected to have potential for bioaccumulation.

Incineration of the notified material would lead to its complete destruction with production of water vapour and oxides of carbon.

If placed into landfill, the polymer would have a strong affinity for the organic component of soils, and is expected to be immobile and unlikely to leach into groundwater. Under these conditions the polymer is expected to eventually be degraded or assimilated by naturally occurring bacteria/fungi etc. Overall degradation of the new chemical would lead to production of water, methane and carbon dioxide. The notified material contained in oils and lubricants sent for recycling is likely to be destroyed during the re-refining process or to become associated with waste sludge from the recycling plant waste treatment facilities. In the latter case, the sludge would be either incinerated or sent to landfill where the fate of the material would be as described above.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological data were submitted. The MSDS for the notified polymer describes anticipated health effects of the chemical based on effects seen in similar materials and states that the polymer would have very low acute oral and dermal toxicity (rat LD₅₀ > 5 000 mg/kg and 2 000 mg/kg, respectively). It is not expected to cause eye or primary skin irritation, but prolonged or repeated skin contact may lead to dermatitis. The MSDS also states that exposure to any mists or vapours generated through heating of the notified polymer could lead to respiratory irritation.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicity data were provided.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The environmental hazard from the notified chemical is assessed to be low provided it is used in the manner indicated.

Releases of the material to the environment are expected to be low as both product formulation and the majority of transmission filling operations are performed under well controlled conditions where spills and other losses would be expected to be minimal. Similarly, gear oils are changed very infrequently (around every 800 000 km), and in the majority of cases under well controlled conditions. The ultimate fate of the majority of the material is expected to be incineration of waste oil resulting in its destruction with production of water vapour and non hazardous gases. Some used oil containing the notified chemical may be disposed of into landfill, as may some oil lost during transfer operations when filling transmission assemblies. If placed into landfill it is likely the material would become strongly associated with the organic component of soils and sediments, and be slowly degraded as a consequence of the biological and abiotic processes operative in these facilities. These degradation processes would lead to production of water, methane and carbon dioxide.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer has a NAMW greater than 1 000 which is expected to preclude absorption across biological membranes and any potential systemic effects. The levels of low molecular weight species (NAMW less than 1 000) and residual monomers should not lead to a hazardous classification according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1994a). Residual monomers were stated to be mainly aliphatic alcohols. Perusal of the NOHSC *List of Designated Hazardous Substances* (National Occupational Health and Safety Commission,

1994b) reveals that aliphatic alcohols commonly have a concentration cut-off of 25%. Information on the MSDS indicates that dermatitis may occur after prolonged or repeated skin contact and that respiratory irritation may occur if mists or vapours are generated. The MSDS recommends that exposure limits for mineral oils should be observed.

The risk of adverse health effects to waterside, transport and storage workers, to workers involved in reformulation and to workers using the formulated oils and hydraulic fluids containing the notified polymer is expected to be minimal on the basis of its likely low hazard.

Workers involved in importation, transport and storage could only be exposed in the event of accidental spillage.

Reformulation occurs in large enclosed systems so that the potential for exposure is limited to contact with residues in lines and on couplings and during clean up of any spills. Except in cases where there is a large accidental spill, exposure would be expected to be low. Following blending, automatic filling of containers of oil or hydraulic fluid should not result in exposure unless overfilling or spillage occurs. In any case, the concentration of the notified chemical in the final products is a maximum of 5% so that exposure to the notified polymer would be low.

End use of the formulated products, namely, addition or changing of engine or gear oils or hydraulic fluids may potentially result in frequent exposure if gloves are not employed, but the risk of adverse health effects is still low given the likely low hazard of the notified polymer coupled with its low level in the products. Nitrile or neoprene gloves should be worn to minimise the risk of dermatitis through frequent skin contact.

For the same reasons and because the frequency of use is much lower, the risk of adverse health effects to the public changing lubricants in their own cars is negligible.

13. MATERIAL SAFETY DATA SHEET

The MSDS for a product containing the notified chemical was provided in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994c).

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

14. RECOMMENDATIONS

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

- 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);
- Impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998);
- All occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);
- Spillage of the notified chemical should be avoided. Spillage 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.
- Employers should ensure that the NOHSC exposure standard for oil mist, refined mineral, of 5 mg/m³ is not exceeded in the workplace.

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 (1994a) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Canberra, Australian Government Publishing Service.

National Occupational Health and Safety Commission (1994b) List of Designated Hazardous Substances [NOHSC:10005(1994)]. Canberra, Australian Government Publishing Service.

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

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. 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 (1994) 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, Sydney.