File No: NA/669

March 2001

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME**

**FULL PUBLIC REPORT**

**MCP 1610**

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Director
Chemicals Notification and Assessment

# FULL PUBLIC REPORT

## MCP 1610

## 1. APPLICANT

Hellay Laboratories Pty Ltd of 8/9 Monterey Road DANDENONG VIC 3075 has submitted a standard notification statement in support of its application for an assessment certificate for MCP 1610.

## 2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition, hazardous and non-hazardous impurities, and additive/adjuvants have been exempted from publication in the Full Public Report and the Summary Report.

**Trade Name:** MCP 1610

**Number-Average Molecular Weight (NAMW):** < 2 000

**Method of Detection and Determination:** GC, GPC

**Comments on Chemical Identity**

The notifier provided a GPC trace together with associated slice data for the new polymer from which the molecular weight was derived.

The new chemical is very similar to other high molecular weight synthetic branched alkanes previously notified by Hellay Laboratories Pty Ltd and assessed as NA/328, NA/451, NA/452 and NA/618. The new chemical is structurally and chemically similar to the polymeric product MCP 1602 assessed as NA/328, and the notifier has argued strongly that many of the physico-chemical, toxicological and ecotoxicological properties of MCP 1602 will be similar to those of the new polymer. Given the close structural formulae of the two polymers, the notifier has asked for waivers for much of the physico-chemical, toxicological and ecotoxicological data required for a standard notification. For this particular class of polymers used only in the formulation of synthetic lubricants, the surrogate data has been accepted.

## 3. PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|---|
| **Appearance at 20°C and 101.3 kPa:** | clear, slightly viscous liquid |
| **Boiling Point:** | not determined - see notes below |
| **Specific Gravity:** | 0.83 at 25°C |
| **Vapour Pressure:** | < 13.3 x$10^{-3}$ kPa at 25°C |
| **Water Solubility:** | < 0.42 mg/L - see notes below |
| **Partition Co-efficient (n-octanol/water):** | log $P_{OW}$ > 6, (estimated, see notes below) |
| **Hydrolysis as a Function of pH:** | not determined - see notes below |
| **Adsorption/Desorption:** | not determined - see notes below |
| **Dissociation Constant:** | not determined - see notes below |
| **Flash Point:** | 244°C (closed cup) |
| **Flammability Limits:** | not determined |
| **Autoignition Temperature:** | see notes below |
| **Explosive Properties:** | not explosive |
| **Reactivity/Stability:** | stable to light and heat |
| **Viscosity:** | 6.0 cSt at 100°C |

**Comments on Physico-Chemical Properties**

No boiling point data was submitted, but it is expected that the boiling point would be close to that for the analogous polymer MCP 1602 which is 368°C (NA/328, NICNAS, 1996).

The water solubility was not determined, but the notifier indicated that in comparison with the solubility of related branched aliphatic compounds, it was likely to be less than 0.42 mg/L. Water solubility for polymers of this nature is likely to be very low.

Log $P_{OW}$ for the analogous polymer MCP 1602 was estimated to be between 6 and 8 and since the molecular weight of the present polymer is higher than the analogue, the value of log $P_{OW}$ is likely to be greater than the above estimates. High values for this parameter are in keeping with the chemical constitution of the polymer.

Adsorption/desorption was not determined, but given the expected high value for log $P_{OW}$, it is anticipated that the new polymer will have high affinity for the organic component of soils and sediments, and would be immobile in these media.

The polymer contains no functional groups capable of ionising or hydrolysing, so no hydrolysis or dissociation constant data were generated.

## 4. PURITY OF THE CHEMICAL

**Degree of Purity:** > 98%

**Residual Monomers/Other Reactants:** Exempt information.

## 5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be imported into Australia as part of a number of different finished products in 200 L steel drums or 20 000 L iso-containers. The concentration of MCP 1610 in imported products will be 20-60% by weight. The new polymer is used as a base fluid in gear and hydraulic lubricant formulations employed in both industrial and automotive applications.

Import volumes for the notified polymer are anticipated to be 200 tonnes in the first year, increasing to 300 tonnes by the fifth year.

Around 90% (or up to 270 tonnes per annum) of the imported polymer will be sold directly in import containers to industrial users. The remaining 10% (estimated to be a maximum of 30 tonnes per year) will be sold for general consumer use in automotive gear boxes and transmissions and re-packaged into 1 L and 4 L plastic containers.

The notifier stated that in the future the notified polymer may be imported as a neat substance for formulating lubricants within Australia. However no timeframe for such activity is presently available.

## 6. OCCUPATIONAL EXPOSURE

Inhalation exposure to the notified polymer during repackaging and its end use application is not expected as the notified polymer has a very low vapor pressure and is of a viscous nature thereby minimising the potential for vapour and aerosol formation. Therefore, the principal route of occupational exposure is expected to be skin contact.

**Transport and storage**
Transport and storage workers are unlikely to be contaminated with the notified polymer unless the packages were breached.

**Repackaging**
Imported finished automotive oils containing the notified polymer will be repackaged into I L to 4L containers for consumer use. Repackaging may involve the use of different pump types, operated by hand, air or electrical means. Automated pumps will be used for repackaging the notified chemical from iso-containers and the majority of drums. Exposure to the notified chemical is expected to be low but some drips and spills may be expected on each transfer from opening of drums and when lines are connected or disconnected. Manual pumps will be used for repackaging if the number of drums (and/or surrounding conditions) limit the use of automated pumps. Pump equipment will be cleaned by either having air blown through the lines, or by flushing with water or a solvent (depending on the compatibility with other products).

Under normal conditions, no spillage or leakage is anticipated during repackaging. Workers will be equipped with chemical impervious gloves and standard industrial work clothes. Repackaging facilities are equipped with standard local exhaust ventilation.

Repackaged products will contain 20-60% notified polymer.

**End use**
During use of the finished oil in the industrial setting, individuals may be exposed to drips and spills on addition to and removal from the closed systems. It is expected there will be a similar likelihood of exposure to used oil when it is pumped into and removed from tanks for disposal by incineration.

For automotive applications, workers such as garage mechanics may be exposed dermally while charging and draining the engine. The oil is usually transferred via a funnel into the engine. Oil drained from engines is usually poured into a spent oil container for collection by a contractor. The total volume to be used in automotive lubricants is 20 to 30 tonnes. Protective clothing for garage mechanics is likely to be limited to overalls, therefore, dermal exposure is the predominant route of exposure during oil-change.

**Disposal**
Disposal of waste oil is accomplished by a contractor at industrial sites. The oil is then either burned as fuel or disposed of by high temperature incineration. The oil is presumed to be pumped into a storage container for transport and exposure to drips and spills is possible.

## 7. PUBLIC EXPOSURE

The notified polymer will be imported as a component of a finished oil, and transported by road to the re-packaging site. Exposure to the public from these operations would expected to be minimal, except in the event of an accidental spill.

Public exposure to the notified substance is expected to be occasional, but widespread as the automotive oil is to be sold to the public in 1 L and 4 L containers. Public exposure will occur when replenishing automotive oil or undertaking an oil change at home. The most likely route of exposure is dermal, as the notified polymer has a very low vapour pressure, and is viscous in nature. From its use as an industrial oil, minimal public exposure is expected.

## 8. ENVIRONMENTAL EXPOSURE

### Release

The notified polymer will be imported as part of a finished product, and the notifier indicates that at present no manufacture or reformulation processes will be performed in Australia.

The major source of environmental release of the notified polymer is in the unlikely event of an accident during transport and/or handling of the oil product. Oil spills can be contained with inert materials and the mixture shovelled into a suitable container for disposal. These activities are likely to be coordinated by state or local government authorities.

Some of the product containing the notified polymer (approximately 30 tonnes per year of the polymer) will be repackaged into 1 L and 4 L containers. This will be principally carried out at one site. The notifier claims that if the equipment is operating properly and correct procedures are followed, no leakage or spillage during repackaging is anticipated. The equipment will be cleaned by flushing with air, water or a solvent. This resultant waste will be collected by a hazardous waste contractor and disposed of in accordance with local regulations.

The notifier has estimated the residue of polymer remaining in the 200 L drums to be less than 0.2 kg, and in the 20 000 L isocontainers to be less than 25 kg. This equates to an approximate release of 0.1-0.15% of total imports. Consequently with a maximum annual import of 300 tonnes, release will be up to 450 kg per year. The drums and isocontainers will be collected by a reconditioner and washed out and cleaned for reuse. Washing from the cleaning process will be passed to an on-site waste water treatment plant (in accordance with water authority regulations).

Residues in the 1 L and 4 L containers used by the general public are estimated at less that 0.008 kg. The containers are made of recyclable plastic and, although no details were specified in the dossier, the notifier indicates that consumers are encouraged to recycle them. However, many of these containers are likely to be disposed of to landfill.

The amount of notified polymer that may be lost to the environment during handling and use (ie filling and topping up gear boxes and transmissions) has been estimated by the notifier to be less than 60 kg per year. The notifier claims that the new synthetic oil product has a significantly longer life than mineral based oils, thus its draining interval is longer. This extended interval between oil changes results in less waste.

The industrial oils containing the notified polymer will be used in gear oils and hydraulic oils, both of which are closed systems with limited potential for environmental exposure. Hydraulic systems lose very little volume over the service life of the oil (Australian and New Zealand Environment and Conservation Council, 1991). Automotive oils will be supplied to automotive supply stores, automotive garages and automotive dealers. Release to the environment of the oils may occur due to engine leaks and during engine oil changes. Collected used oils will be either re-used/recycled/cleaned or burnt for fuel value.

The major release of the polymer to the environment will be through inappropriate disposal of uncollected oil from the general consumer automotive market, and this is anticipated (Australian and New Zealand Environment and Conservation Council, 1991) to be around 35% of lubricant sales into this sector. This equates to an annual release of around 10 tonnes of the new polymer. However, since the products will be distributed and used nation wide, such releases are expected to be at low levels and not significant at any one site.

**Fate**

The notified polymer will be used in automotive and industrial oils and will share their fate. Therefore, most spent oil will be combusted, if used for fuel or recycled. Combustion of the polymer will result in its complete conversion to water vapour and oxides of carbon. A minor component will be released to the environment from spills and leaks, but this would be widely dispersed. Notified polymer washed off road surfaces would be expected to adsorb to soils or sediments adjacent the road.

Collection of waste oils is more easily accomplished from industrial and commercial users than from the small but significant quantity arising from the community do-it-yourself (D-I-Y) market (Australian and New Zealand Environment and Conservation Council, 1991). The notifier has indicated that around 10% of the imported polymer will be used in the oil product supplied for automotive lubricants, which amounts to a maximum of around 30 tonnes per annum. It is estimated from the ANZECC Report (Australian and New Zealand Environment and Conservation Council, 1991) that 35% of the oil used for automotive purposes (in the present case a maximum of 10 tonnes) may not be collected and could be disposed of in an inappropriate manner. However, even in such cases it is probable that the oils would become associated with the organic components of soils and aquatic sediments would remain immobile and subject to slow biodegradation.

- ***biodegradation***

Biodegradation of MCP 1610 was not determined. However, the analogue MCP 1602 (NA/328) was shown to be not readily biodegradable but to be inherently biodegradable (27% degradation after 28 days - Shake Flask Method; US EPA 560/6-82-003, CG-2000). Given the high degree of chemical similarity between the present polymer and MCP 1602, it is likely that the new polymer would be inherently biodegradable.

Most of the used oil, or lubricant released as a consequence of spills or accident would be incinerated or become associated with the organic component of soils or sediments and slowly degraded through biological and abiotic processes. The polymer would be mineralised to water, oxides of carbon and possibly methane (under anaerobic conditions).

- ***bioaccumulation***

The bioaccumulation potential of the notified polymer was not determined. The notifier suggests that the polymer may have potential for bioaccumulation. However, due to the size of the molecule, the expected low water solubility and high log $P_{OW} > 6$, it is not considered to have a high potential for biaccumulation. This is supported by general principles on bioaccumulation potential described by Connell (1989).

## 9. EVALUATION OF TOXICOLOGICAL DATA

No toxicity studies were provided for the notified polymer, MCP 1610. However, it is a close analogue of MCP 1602, and the toxicity of MCP 1602 was assessed by NICNAS in the notification NA/328. Both MCP 1610 and MCP 1602 are polyalphaolefins (PAOs) and have similar physico-chemical properties. The chemical assessed as MCP 1602 was 1-dodecene, polymer with 1-decene and 1-octene, hydrogenated, which has a structure similar to that of the notified polymer.

MCP 1602 is of very low acute oral toxicity ($LD_{50}$> 2 000 mg/kg) in rats and low acute dermal toxicity ($LD_{50}$> 2 000 mg/kg) in rabbits. It is a slight skin irritant and a slight to moderate eye irritant in rabbits. MCP 1602 is not a skin sensitiser in guinea pigs.

In a 4-week repeated dose dermal study, four groups of rats were treated with MCP 1602 at 0, 125, 500 and 2 000 mg/kg/day, 5 days per week. Two additional groups (0 and 2 000 mg/kg/day) had a 14 day recovery period after treatment. Rats at 2 000 mg/kg/day had an increased incidence of hyperplasia of the sebaceous glands, hyperplasia/hyperkeratosis of the epidermis and dermal inflammation. These symptoms subsided during recovery period. Males from this dose group had decreased bodyweight gain and altered serum chemistry parameters. The NOAEL was established at 500 mg/kg/day.

MCP 1602 did not induce gene mutation in *Salmonella typhimurium*. There was no increased frequency of chromosomal aberrations *in vitro* in Chinese hamster ovary cells exposed to MCP 1602. Based on the studies presented, MCP 1602 is not genotoxic.

In an acute rat inhalational study with another structural analogue, Alkane 4 (assessed in NA/618), the $LC_{50}$ was > 5 mg/L. The notifier indicated that MCP 1610 was reviewed for possible classification in the EU with R65 (Harmful: May cause lung damage if swallowed). However, R65 was not assigned as the kinematic viscosity of MCP 1610 was greater than prescribed for R65.

On the basis of toxicological results for MCP 1602 and Alkane 4, MCP 1610 is not classified as a hazardous substance according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999).

## 10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicity studies were submitted with the notification, but the notifier indicated that the new polymer would be expected to exhibit similar ecotoxicity characteristics to the related polymer MC-1602. The use of surrogate data for this general class of synthetic polymers is acceptable. The ecotoxicity data for the analogue polymer are as below, while further details of the test results and methodology are included in the NICNAS report for NA/328.

**Ecotoxicity test results for Related Polymer MCP-1602 (NA/328)**

| *Test* | *Species* | *Result (nominal), mg/L* |
|---|---|---|
| Acute Toxicity<br>96 hr acute, static | Rainbow Trout<br>(*Oncorhynchus mykiss*) | $LC_{50}$ > 5 010 |
| Acute Immobilisation<br>48 hr acute, static | Water Flea<br>(*Daphnia magna*) | $EC_{50}$ >5 220 |
| Reproduction<br>3 brood, chronic<br>static-renewal | Water Flea<br>(*Daphnia magna*) | $EC_{50}$ (survival) &<br>$IC_{50}$ (reproduction) > 5 400 |
| Growth Inhibition<br>72 hr | Algae<br>(*Scenedesmus subspicatus*) | $EC_{50}$ > 5 220 |

## 11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The new polymer MCP-1610 will be used as a base for automotive and industrial oil blends. The main environmental exposure will result from inappropriate disposal of oil, which could equate to an annual release of up to 10 tonnes of the polymer. However, release is not likely to be significant at any one site. Released polymer would associate strongly with the organic component of soils and sediments. It is expected to be immobile in these media, and to be slowly degraded and mineralised through biological processes. The available ecotoxicity data indicate that the polymer is non-toxic to aquatic organisms up to the limit of its solubility.

The new polymer is not expected to be a hazard to the environment when used as a gear lubricant in the manner indicated by the notifier.

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

Based on the toxicological data from the analogue MCP 1602, the notified polymer is not expected to exhibit acute or chronic toxicity, is not likely to be a skin sensitiser and is not likely to be genotoxic. However, it is likely to be a slight skin and a slight to moderate eye irritant. It is not classified as a hazardous substance according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999).

*Occupational Health & Safety*
Exposure of workers involved in repackaging the finished oil containing the notified chemical into 1 L and 4 L containers is expected to be low. Repackaging will involve mainly automated equipment so that exposure to 20-60% polymer is only likely when connecting and disconnecting lines to 200 L drums or 20 000 L isocontainers. The likelihood of exposure is slightly greater when manually operated pumps are used. In this case the volumes are likely to be low as the purpose is to provide samples to send to customers.

Use of the oil in the industrial setting as gear and hydraulic oil involves manual addition to and removal from various systems. Exposure to drips and spills is possible. It is expected

there will be a similar likelihood of exposure to used oil when it is pumped into and removed from tanks for disposal.

Exposure of transport and storehouse workers to the notified chemical is only likely to occur in the event accidental spillage.

The main occupational health risk to workers involved in repackaging the imported oil containing the notified chemical and in the use as a gear and hydraulic oil is likely to be skin irritation. Workers will need to use automatic equipment where possible, and wear protective gloves and clothing. Moderate eye irritation is possible but ocular exposure is unlikely. Goggles should be worn where splashing may occur. The health risk to other workers handling containers of the chemical is likely to be minimal. In the case of workers involved in disposal of used oil, the risk of adverse health effects from oil contaminants is likely to be greater than that due to the notified chemical.

*Public Health*
Dermal exposure is likely to occur during oil changes or replenishment of automotive oil. Consequently public exposure is likely to be occasional but widespread. Although the notified polymer will comprise 20 to 60% of the final automotive lubricant, it is likely to be of minor hazard, based on the low (predicted) toxicity and its intermittent use. Minimal public exposure is expected from its transport, repackaging, industrial use, and disposal/recycling.

## 13. RECOMMENDATIONS

To minimise occupational exposure to MCP 1610 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) and AS 3765.1 (Standards Australia, 1990);
- Impermeable gloves or mittens should conform to AS 2161 (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. Spillages 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.

- The deficiency in the MSDS for MCP 1610 is rectified as following:

  - Remove the statement under Health Effects-Acute. This statement does not provide a description of health effects.

## 14. MATERIAL SAFETY DATA SHEET

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

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

## 15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical may be required if any of the circumstances stipulated under section 64 of the Act arise. No other specific conditions are prescribed.

## 16. REFERENCES

Australian and New Zealand Environment and Conservation Council (1991) Used lubricating oil: Generation, recovery and reuse in Australia Prepared by Technisearch Ltd for the Waste and Resources Committee (WRAC).

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