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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

TLA-7700

This Assessment has been compiled in accordance with the provisions of *the Industrial Chemicals (Notification and Assessment) Act 1989, as amended* and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment, Sport, and Territories and the assessment of public health is conducted by the Department of Health, Housing, Local Government and Community Services.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, Worksafe Australia, 92-94 Parramatta Road, Camperdown NSW 2050, between the hours of 10.00 a.m. and 12.00 noon and 2.00 p.m. and 4.00 p.m. each week day except on public holidays.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

TLA-7700

1. APPLICANT

Caltex Oil (Australia) Pty Ltd, Caltex House, 167-187 Kent Street, Sydney 2000.

2. IDENTITY OF THE CHEMICAL

Based on the nature of the chemical and the data provided, TLA-7700 is considered to be non-hazardous. Therefore, the chemical names, molecular and structural formulae, spectral data, and identity of impurities and monomer ingredients and residues have been exempted from publication in the Full Public Report and the Summary Report.

Chemical Abstact Service (CAS) Registry No.: None assigned

Other Names: Amine monomer grafted ethylene-propylene copolymer

Dispersant olefin copolymer

Modified ethylene/propylene copolymer dispersant

Trade name: TLA-7700

PC-633

(these names refer to the notified polymer in the diluent oil and solubilizer)

Number-average molecular weight:

80,000 when derived from ethylene/propylene copolymer; other copolymers with NAMW up to 140,000 NAMW may also be used.

Maximum percentage of low molecular weight species:
has been deducted from the fact that the starting polymer is distilled at 208°C that very low concentrations of particles are below 500 and 1000.

Methods of detection and determination:

No specific analytical methods are available for this polymer.

Spectral data:
infra-red spectrum for TLA-7700 (polymer in oil) was provided.

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is synthesized overseas in the presence of diluent oil and is not isolated during the manufacturing process. Consequently, all analytical data are for TLA-7700, the polymer in diluent oil.

Appearance at 20°C and 101.3 kPa:	Dark viscous liquid.
Odour:	Amine like and oily.
Boiling point:	Unknown but expected to be very high based on the molecular weights of the synthetic polymer and the diluent oil.
Specific Gravity:	870 kg/m^3
Vapour Pressure:	Not provided, however expected to be that of the diluent oil < 0.1 mm Hg.
Water Solubility:	Estimated to be < 0.1% w/w.
Partition Co-efficient (n-octanol/water) log $P_{O/W}$:	Not provided but expected to partition to the hydrophobic compartment due to base oil.

Hydrolysis as a function of pH: Not provided but this polymer is not expected to readily hydrolyse at ambient temperature based on the structure of the polymer functionality.

Adsorption/Desorption: Not provided but would be expected to be similar to that of other oily substances.

Dissociation Constant: Expected to be low because of the chemical functionality. It has one basic nitrogen but dissociation would be hard to measure in view of the low water solubility.

Flash Point: 193°C (Cleveland Open Cup).

Flammability Limits: Not provided.

Combustion Products: Carbon monoxide, carbon dioxide.

Pyrolysis Products: Not provided.

Decomposition Temperature: Not provided.

Decomposition Products: There are no known degradation products produced under normal use conditions.

Autoignition Temperature: Not provided, but is expected to be similar to that of similar base oil products (approximately 354°C).

Explosive Properties: Does not exhibit explosive properties when exposed to heat, friction or flame.

Reactivity/Stability:	Reacts vigorously with strong oxidisers, but not with air, water or under normal heating conditions.
Viscosity:	900 cSt at 100°C.

4. PURITY OF THE CHEMICAL

Degree of purity (of the notified polymer only): ~ 100%

(Approximately 14 % w/w of TLA-7700 is the notified polymer, 84 % w/w is the oil and 2 % w/w is the solubilizer.
content of residual monomers: < 0.1%

Additives/Adjuvants:

(c) Chemical name:	mineral oil, petroleum distillates, solvent-dewaxed heavy paraffinic
Synonyms:	distillates (petroleum), solvent-dewaxed heavy paraffinic (9CI) distillate SNO-100 oil
CAS No.:	64742-65-0
Weight percentage:	approximately 84, range 80.01 - 89%
Toxic Properties:	Carcinogen group 1 IARC (2) Exposure Standard (NOHSC) 5mg/m^3 (1)

5. INDUSTRIAL USE

The notified polymer will be imported into Australia as a solution in diluent oil which is in turn a 11 - 20% component of lubricant oil additive packages. It will be used as a viscosity index improver for gasoline and diesel engine motor oils. The viscosity index improvers are normally used to formulate a multigrade motor oil and control the viscosity for all-seasons performance. The polymer will also act as an antioxidant and dispersant to solubilize sludge and inhibit sludge formation in motor oils. The notified polymer will be incorporated into motor oils at a final concentration of 0.3-2.0% by weight.

The estimated quantity of modified ethylene/propylene copolymer dispersant to be imported is 7.1 - 42.6 tonnes in the first year and 7.1 - 142.6 tonnes per annum over the next four years.

TLA-7700 is currently used in the United States, major European countries and in Central and Southern American countries.

6. OCCUPATIONAL EXPOSURE

TLA-7700 will be imported in large 205 litre metal drums or in bulk liquid tanks. The bulk liquid will be shipped in containers in approximately 20 tonne parcels or in chemical parcel tankers in 150 to 400 tonne lots. The parcels will then be transported by road and rail to approximately 25 separate locations.
exposure may occur during the following activities:

- unloading the additive packages from the vessel at the port
- transportation of the containers from the port to the storage tanks, warehouses or lubricant oil manufacturer's blending plants
- blending operations at the lubricant oil manufacturer's blending plants
- maintenance of pumps and associated equipment at all locations

Approximately 2-5 workers will be involved at each location. Worker exposure is estimated at 1 hour/day for the sampling operation, 4 hour/day for tanker loading/unloading and drum filling, and 4 hour/day for blending operations for approximately 220 days/year. The blending procedure involves the introduction of TLA-7700 into a heated blending kettle containing a stirrer, followed by the addition of premixed additives via a pump. The notifier states that exposure levels will be minimal during blending operations due to the use of contained liquid handling systems.

After reformulation the blended motor oil will be packaged and sold to automotive outlets. The motor oil will contain 0.3-2.0 weight % of the polymer but typically 1.1% in an SAE 20W50 multigrade motor oil.

7. PUBLIC EXPOSURE

It appears that there is low potential for public exposure to the notified polymer during shipment and transportation. The public may come into contact with the blended chemical in the final commercial motor oil when it is used in automobile crank cases.

8. ENVIRONMENTAL EXPOSURE

- Release

The imported drums and parcels of the notified polymer in the additive packages are stored at warehouses and storage locations operated by transport companies and chemical storage companies largely in the major capital cities.
Waste streams containing the notified polymer are confined to slops, washings and spills and are contained within bunded areas for adequate treatment or disposal to prevent entry into sewers and waterways.

The notifier stated the spilled material is washed into a separator, a fully enclosed system comprising a series of baffle units and a skimmer to separate oil or immiscible material from the carrier water stream, followed by a unit consisting of adsorbent polypropylene (oleophilic) mats to remove the oil sheen. The water stream is further treated to ensure pH, BOD, sulphides etc comply with the parameters contained within the EPA (State) license before discharge to the outfall.

The residues from the skimmer unit pass to tanks for settling and dewatering. The oil based layer is incinerated typically as bunker fuel oil. Sludge residues are mixed with activated clay and taken by licensed industrial waste groups for ultimate disposal by land fill or incineration. Oil or product spills containing the notified polymer may also be treated with solid adsorbent and disposed of in the same manner by the licensed industrial waste groups.

In the lubricant oil blending process it is estimated that typically a 0.2% product loss may be experienced or 40 kg blended oil in a 20 tonne blend batch containing 0.3 - 2 % w/w of the notified polymer. For example, 0.4 kg of polymer may be released as slops or washings during transfers to storage tanks and filling lines, unloading additive from drums or bulk road tankers and sampling for testing purposes. These liquid releases are

contained and controlled in appropriate compounds or pits for treatment or disposal. Over one year the amount of polymer released would be ~285 kg (worst case situation - based on 142.6 tonnes imported per annum).

The polymer may also be released to the environment through exhaust emissions, leakage and disposal of used oil.

The notifier has stated that during engine use the chemical is oxidised to combustion products. The amount lost, which is not burned, is probably not measurable, and to the notifier's knowledge has never been determined. The notifier expects this quantity to be no different than with other engine lubricants.

It should be noted that oil emissions with the exhaust are very low (2) and the level of unoxidised polymer is likely to be higher from oil leakage from crankcase lubricated engines and the disposal of used oil.

Oil leaks have a tendency to accumulate in the environment, resulting in a significant environmental load (2). One-third of the lubricating oil sold is lost during use; some is lost on the pavement surface, in the streets, roads and in car parks. The oil remains on these surfaces until stormwater or the municipal services wash the oil off, when it is transported by stormwater drains to waterways or the ocean of urban zones, or to adjacent soils from roads in non-urban areas (3).

The notifier has stated that losses of the polymer during motor oil changes would not be expected to be any different than losses experienced with other motor oils. Used lubricant handling guide-lines stress minimising personal contact and disposal in an environmentally acceptable manner. However, it should be noted a report on used lubricating oil in Australia (4) indicates that lubricating oil not collected for recycling or reuse on site as a fuel or lubricant amounts to 22% of total sales. The methods of disposal of used oil includes dust and vegetation control, and dumping in sewers and landfill.

- Fate

The notifier has stated that waste polymer from the blending process is prevented from entry into sewers and waterways.

The notified polymer will enter the environment when waste polymer from the blending process is disposed of by land fill or incineration. When the polymer is land filled it is likely to remain at the site of deposition. Leaching of the polymer is unlikely due to its large molecular weight, expected low water solubility and likely adsorption to soil. Incineration of the polymer is unlikely to produce toxic compounds.

The amount of polymer released to the environment through the exhaust emissions is likely to be low as the chemical is oxidised during combustion and any emissions can be expected to become associated with the soil compartment (including sediment).

Any unoxidised polymer which enters the environment from engine oil leakage and is lost on the pavement surface, in the streets, roads and in car parks is washed off (by rain or the municipal services) and is transported by stormwater drains in the case of urban zones to waterbodies and become associated with the sediment. When the polymer is washed off roads to adjacent soils, it is likely to accumulate at the site of deposition unless erosion events transport it to water bodies where it is likely to become associated with the sediment.

The fate of the polymer in lubricating oils lost during use in motor vehicles, diesel trucks compared to off-highway diesel engines is likely to be different. The main difference will occur where off-highway diesel engines are stationary, as this will result in the continual emission of the polymer and products of its combustion at a specific point in the environment.

The amount of unoxidised polymer in used oil is unclear. However, the potential exists for a significant portion of oil containing the polymer to be disposed of in an environmentally unacceptable manner (eg dust and vegetation control, and dumping in sewers and landfill). Any unoxidised polymer in used oil that is used for dust and vegetation control are likely to remain at the site of application until erosion events transport the polymer to waterbodies, where the polymer is likely to become associated with the sediment. The polymer is unlikely to leach when it is dumped at landfills. The dumping of the polymer in sewers is likely to result in the polymer becoming associated with sludge during treatment.

Hydrolysis

The polymer contains succinimide linkages which may be susceptible to hydrolysis. However, it is unlikely that the polymer would be readily degraded by hydrolysis under environmental conditions because of limited solubility.

Biodegradation

No information has been provided by the company. The presence of succinimide linkages in the polymer indicate it would be vulnerable to cleavage *in vivo* with subsequent elimination. However, the polymer is unlikely to be readily biodegraded under environmental conditions.

Bioaccumulation

The high molecular weight of the polymer (~80,000) indicates it is unlikely to bioaccumulate.

9. EVALUATION OF TOXICOLOGICAL DATA

The *Industrial Chemicals (Notification and Assessment) Act 1989* does not require the provision of toxicology data for polymers where the number average molecular weight exceeds 1,000. However, the following tests have been conducted and were submitted as part of the notification statement.

9.1 Acute Toxicity

Table 1: Summary of the acute toxicity of TLA-7700

Test	Species	Outcome	Reference
Skin irritation	Rabbit	Moderate irritant	(5)
Eye irritation	Rabbit	Moderate irritant	(6)

9.1.1 Skin Irritation (5)

A dose of 0.5 ml of TLA-7700 was applied to three separate sites on each of six New Zealand White rabbits. All sites were clipped free of hair and were located as follows: Upper dorsal trunk (intact), lower dorsal (intact) and lower dorsal (abraded). The test compound was occluded under gauze patches on the single upper dorsal site for four hours and on the two lower sites for 24 hours. Observations were made on the upper dorsal site at 30-

60 minutes, 24, 48 and 72 hours and daily through to day 9 after removal of the gauze patches. The lower dorsal sites were observed 24, 48 and 72 hours after exposure, and daily through to day 9. Irritation was scored according to the method of Draize (7).

Slight to well defined erythema, which persisted for up to seven days, was observed on the upper dorsal site after the 4 hour occlusion in all treated animals.

On the two lower sites, after 24 hour occlusion, slight to severe erythema accompanied by slight to moderate oedema was observed in all treated animals up to 48 hours post-application. Erythema persisted in all treated animals up to day eight. In general the degree of erythema and oedema was greater, as expected, for the abraded areas.

Under the conditions of this test TLA-7700 was found to be slightly irritating to rabbit skin.

9.1.2 **Eye Irritation** (6)

Six New Zealand White rabbits (three of each sex) received a single 0.1 ml dose of the reaction product in the conjunctival sac of one eye. The untreated eye served as the control. Treated eyes were examined at 1, 24, 48 and 72 hours and 7 and 14 days after treatment.

Moderate to severe erythema, slight chemosis and mild to moderate discharge were observed in all treated eyes at 1 and 24 hours. At 48 hours, irritation had subsided and by day 7 only one animal exhibited erythema.

Under the conditions of this study, TLA-7700 was found to be moderately irritating to the rabbit eye.

9.2 **Overall Assessment of Toxicological Data**

The toxicity data presented for TLA-7700 indicate that the substance is a slight skin and moderate eye irritant. However, these effects are likely to be due to the diluent oil and solubilizers present in TLA-7700, which are known irritants, rather than to the notified polymer.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

Since the chemical being notified is a polymer of greater than 1000 molecular weight, environmental effects information is not required.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The loss of the polymer from the blending process is likely to present negligible hazard to the environment as only ~285 kg is likely to be released each year, spread over a number of sites across Australia, and the notifier states that waste is prevented from entering sewers and waterways. The disposal of the waste polymer from the blending process by land fill or incineration is unlikely to present a hazard to the environment.

Emissions during engine use are unlikely to present a hazard to the environment as the amount of intact polymer being lost is likely to be very low due to the oxidation of the polymer during combustion.

The hazard to the environment from the leaking of oil from engines and the disposal of used oil containing the polymer in an environmentally unacceptable manner (eg dust and vegetation control, and dumping in sewers and landfills) is likely to be low because:

The release will be dispersed across Australia (predominantly in the urban regions) and the environmental concentration of the polymer should be very low (below 1 ppb);

The bulk of this release is likely to become associated with soil/sediment;

The toxicity of such modified polyalkylene copolymers is low because of low bioavailability; and

Where the polymer is contained in urban and rural runoff and enters aquatic environments, the expected very low concentration of the polymer and its high molecular weight (~80,000) indicates it is unlikely to present a hazard to organisms inhabiting these environments.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified chemical is a high molecular weight polymer (NAMW~ 80,000) and therefore unlikely to be absorbed across biological membranes such as the skin, gut and respiratory tract. Toxicity data on TLA-7700 indicate that it is a skin and eye irritant. However, these effects are likely to be due to the diluent oil and solubilizers which are present in the TLA-7700 and known to cause these effects. Workers involved in formulating operations (11 - 20% of the notified polymer) and mechanics using motor oil (up to 2.0% w/w of the notified polymer) if sufficiently exposed to the product containing the polymer may suffer skin and eye irritation. The negligible amount of impurities and residual monomers present in the polymers are unlikely to pose a significant health hazard.

As the polymer will be present in diluent oil which is more hazardous than the polymer, the methods proposed by the notifier to reduce exposure to the diluent oil will also be sufficient to reduce exposure to the polymer.

TLA-1609 is stable in ambient conditions, has negligible vapour pressure, low water solubility and is not explosive, and therefore should not present a significant hazard to workers.

The major route of exposure to the notified polymer will be dermal. Exposure during transport and storage is considered unlikely except in the event of spillage or leaks, as the polymer will be contained in secure containers. Workers may come into direct contact with the notified chemical during the reformulation process and dermal contact may be high if personal protection is not implemented. Mechanics may also come into direct contact with the polymer through handling of motor oils. However, the concentration of the notified polymer in the motor oils is low at 0.3-2.0% w/w.

The public may be exposed to TLA-7700 in the final blended commercial product, which is to be used in automobile crankcases. However the exposure is likely to be infrequent and skin contact will be to small amounts only.

Based on the above information, it is considered that TLA-7700 will not pose a significant risk to public or occupational health when used in the prescribed manner.

13. RECOMMENDATIONS

To minimise occupational and public exposure to the notified polymer the following guide-lines and precautions should be observed:

. If engineering controls and work practices are insufficient to significantly reduce exposure to a safe level, then personal protective devices which conform to and are used in accordance with Australian Standards (AS) for chemical-type goggles with face shield (AS 1336; AS 1337) (8,9), impermeable gloves (AS 2161) (10) and protective clothing (AS 3765.1 AS 3765.2) (11,12) should be worn.

. Good work practices should be implemented to avoid splashing or spillages.

. Good personal hygiene should be adopted.

. A copy of the MSDS for products containing the notified polymer in diluent oil, such as TLA-7700 and other additive packages, should be easily accessible to employees working with products containing the chemical.

14. MATERIAL SAFETY DATA SHEET (MSDS)

The Material Safety Data Sheet (MSDS) for TLA-7700 (Attachment 1) was provided in Worksafe Australia format (Ref No:13). This MSDS was provided by Caltex Oil (Australia) Pty Ltd as part of their notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of Caltex Oil (Australia) Pty Ltd.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989*, secondary notification of the notified polymer present in TLA-7700 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

1. National Occupational Health and Safety Commission, Exposure Standards for Atmospheric Contaminants in the Occupational Environment, Australian Government Publishing Service, Canberra, NOHSC:3008 (1991).

2. Van Donkelaar P, *Environmental Effects of Crankcase and Mixed Lubrication*, The Science of the Total Environment, 92 (1990), p165-179.

3. Vazquez-Duhalt R, *Environmental Impact of Used Motor Oil*, The Science of the Total Environment, 79 (1989), p1-23.

4. Australian and New Zealand Environmental Council, (1991), *Used Lubricating Oil Generation, Recovery and Reuse in Australia*, p11.

5. Primary Dermal Irritation Study in Rabbits. Data on file, Study number PH-420TX-006-88, compound 87-3474, Pharmakon Research International Inc., Pennsylvania, USA, July 1988.

6. Primary Eye Irritation. Data on file, Study number PH-421-TX-002-89 compound 87-3474, Pharmakon Research International Inc., Pennsylvania, USA, February 1989.

7. Draize, J.H., *The Appraisal of Chemicals in Foods, Drugs and Cosmetics*, pp. 36-45. Association of Food and Drug Officials of the United States, Austin, Texas 1959.

8. Australian Standard 1336-1982, *Eye protection in the Industrial Environment*, Standard Association of Australia Publ. Sydney, 1982.

9. Australian Standard 1337-1984, *Eye protectors for Industrial Applications*, Standard Association of Australia Publ. Sydney, 1984.

10. Australian Standard 2161-1978, *Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves)*, Standard Association of Australia Publ., Sydney, 1978.

11. Australian Standard 3765.1-1990, *Clothing for Protection against Hazardous Chemicals*, Standard Association of Australia Publ., Sydney 1990.

12. Australian Standard 3765.2-1990, *Clothing for Protection against Hazardous Chemicals Part 2 Limited Protection Against Specific Chemicals*, Standard Association of Australia Publ., Sydney 1990.

13. National Occupational Health and Safety Commission, *Guidance Note for Completion of a Material Safety Data Sheet* 2nd Edition, AGPS, Canberra, 1990.