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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Z-17

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For Enquiries please contact the Administration Coordinator at:

Street Address: 92 Parramatta Rd Camperdown, NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, Sydney 2001, AUSTRALIA
Telephone: (61) (02) 565-9466 **FAX (61) (02) 565-9465**

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Z-17

1. APPLICANT

Lubrizol Australia of 28 River St, Silverwater, NSW 2141 have submitted a standard notification for assessment of Z-17.

2. IDENTITY OF THE CHEMICAL

Z-17 is not considered to be hazardous based on the nature of the chemical and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, exact use, exact molecular weight and exact import volume have been exempted from publication in the Full Public Report and the Summary Report

Other name: Z-17

Molecular weight: < 1000

Method of detection and determination:

UV/Vis, Infrared and NMR spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	yellow liquid
Pour point:	-39°C
Boiling point:	176°C
Density:	1060 kg/m^3 at 22°C
Vapour pressure:	2 X 10^{-4} Pa at 21°C
Water Solubility:	2.2 X 10^{-3} g/L at pH 4.0 2.6 X 10^{-3} g/L at pH 7.0 2.8 X 10^{-3} g/L at pH 9.0
Hydrolysis as a function of pH:	half-life: pH 4, 55°C, 45 hours pH 4, 65°C, 21 hours pH 7, 35°C, 118 hours at 50°C the notified chemical degraded 11.7% and 48.7% at pH 4 and pH 7, respectively, after 5 days and 52.6% at pH 9 for 2.5 hours

Dissociation Constant
pKa**:** it is predicted that the notified chemical will not dissociate on the basis of chemical structure

Partition coefficient
(n-octanol/water) $logP_{OW}$: > 3.9

Soil adsorption/
desorption: not determined

Flash Point: 158°C

Flammability Limits: not flammable

Autoignition Temperature: 370°C

Explosive Properties: none

Reactivity/Stability: not an oxidising agent

Comments on physico-chemical properties

Soil adsorption/desorption: It is argued that in view of the intended use, the material should not be distributed in the environment. Based on the partition coefficient and low solubility, relatively strong absorption may be expected.

4. PURITY OF THE CHEMICAL

Degree of purity: > 95%

Toxic impurities: none

Non-toxic impurities
(> 1% by weight): one impurity related to the notified chemical present at < 4%

Additives/Adjuvants:none

5. INDUSTRIAL USE

The notified chemical is to be used as an oil additive in the crankcase oil of cars.

6. OCCUPATIONAL EXPOSURE

The notified chemical will be imported as a component (1.5 - 7% v/v) of an oil additive package in 205 L steel drums at a rate of 1 - 100 tonnes/ year for the first 5 years. Typically, a performance additive package which contains the notified chemical contains anti-oxidants, corrosion inhibitors, antiwear agents, detergents and dispersants. Viscosity modifiers may be part of the additive package or may be added separately by the lubricant manufacturer.

Following transport by road or rail to the blend facilities of the oil industry, the drums are stored prior to lubricant manufacture. Typically, lubricant manufacture involves first charging the blending vessel with an oil blend. Then two blend plant operators transfer the oil additive package to the blend vessel either by decanting it into a drum dump trough or inserting a spear into the drum. In either case the additive package is pumped directly into the blend vessel through enclosed lines.

Additional diluent oil is pumped into the blend vessel. This process is overseen by one operator and is typically computerised.

The blend is stirred for 1 - 2 hours and then about 0.5 L is sampled for analysis. When the blend is approved it is 'bottled' in 1 to 205 L containers for sale to workshops and retail outlets. Once the 'bottling' process is completed the various feed lines are flushed with diluent oil. The flushings are labelled and used in subsequent batches. The concentration of the notified chemical in the final product will vary between 0.1 and 1.47% v/v.

It is stated that the above processes are carried out in closed systems.

Typically the blending process may continue for several days depending on the amount to be blended. In the first year this would mean a total processing time of 20 - 30 days.

Occupational exposure to the notified chemical may also occur when oil containing it is added to car engines by vehicle assemblers or when the oil is being changed in garage workshops.

7. PUBLIC EXPOSURE

The public may be dermally exposed to the notified chemical when using or disposing of engine oils. Oil changes by individuals represent 15% of the total (1).

8. ENVIRONMENTAL EXPOSURE

. Release

Apart from accidental spills, there should be no waste generated during lubricant manufacture. The lubrication oil will then be sold in bulk or as small packages to vehicle manufacturers, garages and the general public. The bulk containers are normally returned for reuse and the small packages disposed in the domestic garbage.

Disposal of the notified chemical will occur with the waste oil when vehicles oils are changed. Approximately 86% of vehicles have oil changes done by industry, garages etc., with less than 15% of oil changes done by individuals (1).

. Fate

The environmental fate of the notified chemical is closely aligned with that of the used engine oil. Approximately 40% of the engine oil sold in Australia is consumed by burning during use and lost from leaks etc. As most oil is sold to industry, garages and other service centres (206 ML), most of the waste engine oil is collected ordisposed of correctly. In Australia 96% of collected waste engine oil is used as fuel or incinerated, with little being recycled (1). The old practice of using waste oils as a dust suppressant is currently being phased out or is not practised by local councils and represents a very minor use (1). The DIY market for oil sales in Australia is approximately 40 ML, with about 33 ML being used when individuals do an oil change (1). It is from this group that the majority of used engine oil reaches the environment. Only 5 ML is collected from individuals and households (figure for 1990), with the rest being disposed of in various ways (1). Assuming 40% of the oil used by the DIY market is consumed during use and that 5 ML is collected, then approximately 19 ML of waste oil enters the environment in various ways. The fate of this used oil is uncertain, either ending up in landfill, poured down the drain, disposed of on land to kill weeds or used to paint fences etc. A ready biodegradation test was submitted by the notifier which showed that the notified chemical is not ready biodegradable. The modified Sturm test (OECD test guideline 301E) did show some degradation (1.3% over 28 days). While this is so low that it is unclear whether the compound is inherently biodegradable or not, hydrolysis of the ester should proceed relatively readily. The notified chemical has the potential to bioaccumulate. It has a low molecular weight, high partition coefficient and is not readily biodegradable. However, it does hydrolyse by loss of the methyl ester.

A bioaccumulation study is currently in progress in Japan and will be submitted when it becomes available. The methyl ester should hydrolyse to a salt *in vivo* which is not expected to bioaccumulate (2).

9. EVALUATION OF TOXICOLOGICAL DATA

9.1 Acute Toxicity

Table 1 Summary of the acute toxicity of Z-17

Test	Species	Outcome	Reference
Acute oral toxicity	Rat	LD_{50} > 5000 mg/kg	(3)
Acute dermal toxicity	Rabbit	LD_{50} > 2000 mg/kg	(4)
Skin Irritation	Rabbit	slight irritant	(5)
Eye irritation	Rabbit	slight irritant	(6)
Skin sensitisation	Guinea pig	non-sensitiser	(7)

9.1.1 Oral Toxicity (3)

Sprague-Dawley rats (5/sex) received a single dose of Z-17 by gavage at a dose level of 5000 mg/kg.

There were no deaths over the 14 day observation period no significant clinical changes were observed and no gross macroscopic changes were noted on necropsy at day 15.

It can be concluded that the acute oral LD_{50} for the notified chemical in rats is > 5000 mg/kg.

9.1.2 Dermal Toxicity (4)

New Zealand White rabbits (5/sex) received a single dose of 2000 mg/kg of Z-17 applied under an occlusive patch held in place for 24 hours.

There were no deaths during the 14 day observation period, no significant effects on body weight gain, no significant clinical findings and no significant gross necropsy findings.

The notified chemical did not induce erythema or oedema.

It can be concluded that the acute dermal LD_{50} for the notified chemical in rabbits is > 2000 mg/kg.

9.1.3 Skin Irritation (5)

New Zealand White rabbits (3/sex) received a dose of 0.5 mL of the notified chemical under a gauze patch for 4 hours.

Slight erythema was observed in all animals at 24 hours and in 4 animals at 72 hours post-treatment. Slight oedema was observed in 5 animals at 24 hours and 1 animal at 72 hours.

It can be concluded that the notified chemical is a slight skin irritant in rabbits.

9.1.4 Eye Irritation (6)

New Zealand White rabbits (3/sex) received a dose of 0.1 mL of the notified chemical directly into the cupped lower conjunctival sac of the right eye of each animal.

No effects on the cornea or iris were observed in any animal at 24, 48 or 72 hours post-treatment. Slight conjunctival redness was observed in each animal at 24 hours but no other effects were observed up to 72 hours post-treatment.

It can be concluded that the notified chemical is a slight eye irritant in rabbits.

9.1.5 Skin Sensitisation (7)

This study was conducted using a modified Buehler method (8) with 10 guinea pigs (5/sex) of the Hartley strain in the test group. All applications of the test material were to the shaved skin under an occluded patch.

Induction was carried out as three 6-hour topical applications of undiluted test substance over a two week period. Challenge was performed 2 weeks after induction and rechallenge 6 days later with 25% w/v Z-17 in acetone.

At most, equivocal responses were observed following challenge with more of these in the test group than the control group. However, this situation was reversed on rechallenge.

It can be concluded that the notified chemical is not a sensitising agent in guinea pigs.

9.2 28-Day Repeated Dose Oral Toxicity (9)

This study was conducted in accordance with OECD guideline No. 407 (10). Sprague-Dawley rats (5/sex/dose) received doses of 0, 30, 150 or 750 mg/kg/day by gavage

No significant treatment-related clinical signs were noted.

Slight reductions in body weights of males during weeks 2-4 and a slight reduction food consumption for males and females during week 1 were observed in the 750 mg/kg/day dose group.

No significant treatment-related effects on haematology, clinical chemistry or urinalysis parameters were observed.

Statistically significant increases in the group mean liver to body weight and liver to brain weight were observed for males and females of the 750 mg/kg/day dose group.

No treatment-related macroscopic or microscopic tissue changes were observed at the scheduled week 4 necropsy.

It can be concluded that there may be some liver toxicity associated with repeated oral administration of the notified chemical.

9.3 Genotoxicity

9.3.1 Salmonella typhimurium Reverse Mutation Assay (11)

Salmonella typhimurium strains TA 1535, TA 1537, TA 98 and TA 100 and *Escherichia coli* strain *WP2* were treated with doses up to 5000 µg/plate in the presence or absence of metabolic activation provided by rat liver S9.

No treatment-related increase in the number of prototrophic back mutants was observed in any strain. Responses to the positive control substances 9-aminoacridine, sodium azide, N-ethyl-N' -nitro-N-nitrosoguanidine, 2-nitrofluorene and 2-aminoanthracene were as expected.

It can be concluded that the notified chemical is unlikely to be mutagenic in *Salmonella typhimurium* and *Escherichia coli.*

9.3.2 Micronucleus Assay in the Bone Marrow Cells of the Mouse (12)

Groups of B6C3F1 mice (5/sex) were dosed once intraperitoneally at 0, 100, 200 or 400 mg/kg and then killed 24, 48 or 72 hours later. One thousand polychromatic erythrocytes per animal were scored for the presence of micronuclei.

The positive control substance, cyclophosphamide, at 50 mg/kg, induced micronuclei as expected but the notified chemical did not increase the frequency of micronucleated polychromatic erythrocytes above control levels.

It can be concluded that the notified chemical is not clastogenic in mice.

9.3.3 Dominant Lethal Test (13)

This study appears to have been conducted in accordance with the methods of Anderson *et al.* (14) and Green *et al.* (15) but this is not specifically stated.

Sprague-Dawley male rats (15/dose) received doses of 0, 30, 150 or 750 mg/kg/day of Z-17 for 70 days. Another group received the positive control substance triethylenemelamine at 0.05 mg/kg/day for 70 days.

One male rat died as a result of an accident on day 57.

On day 70 each surviving male rat was co-housed with 2 virgin young adult Sprague-Dawley female rats per week for 2 consecutive weeks following which the male rats were killed and their testes and final body weights recorded.

No statistically significant reduction in fertility or increases either in pre-implantation or post-implantation loss was detected in females mated with Z-17-treated males at any of the doses evaluated.

For the positive control substance statistically significant ($p \geq 0.01$) decreases in the number of live implants, increases in the number of dead implants and increases in the frequency of post-implantation loss were observed.

In can be concluded that the notified chemical did not induce dominant lethal mutations in the germ cells of the male rats under the conditions of the study.

9.4 Overall Assessment of Toxicological Data

The notified chemical exhibited low acute oral toxicity in rats, low acute dermal toxicity in rabbits, was a slight skin and eye irritant in rabbits and was not a skin sensitiser in guinea pigs. A 28-day oral repeated dose toxicity study suggested there may be some liver toxicity in rats at the highest dose used.

The notified chemical was not genotoxic as judged by its inability to induce back mutation to prototrophy in bacteria, dominant lethal mutations in germ cells of rats and micronuclei in bone marrow cells of mice.

On the basis of submitted data, the notified chemical would not be classsified as hazardous in accordance with *Approved Criteria for Classifying Hazardous Substances* (16) in relation to Acute lethal effects (oral, dermal) ; Severe effects after repeated or prolonged exposure (oral route); Irritant effects (skin, eye); Sensitising effects (skin) and Mutagenic effects.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The results of ecotoxicity tests (table 2) were provided by the notifier. No precipitates or other irregularities were noted in these tests and the concentrations used were actual. There were significant differences between the nominal and actual concentration and the notifier states it is possibly due to hydrolysis of the dithiocarbamate. These tests were performed in accordance with OECD test guidelines as indicated. All facilities used complied with OECD principles of GLP.

Table 2 Ecotoxicity test results

Species	Test	Result
Zebra fish, *Brachydanio rerio*	96 hour acute (OECD TG203)	NOEC > 0.26 mg/L LC_{50} = 0.72 mg/L
Daphnia, *Daphnia magna*	48 hour immobilisation (OECD TG202)	NOEC = 4 mg/L EC_{50} = 12 mg/L
Alga *Selenastrum capricornutum*	96 hours, cell growth (OECD TG201)	EC_{50} = 0.36 mg/L NOEC < 5.7 mg/L

The above results show that the notified chemical is highly toxic to fish, highly toxic to daphnia and moderately toxic to algae, based on the species tested.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

There is expected to be 100 tonnes (maximum) of Z-17 imported as part of a formulation, which is then diluted with petroleum based oil to give a final concentration in the ready to use oil of between 0.1 and 1.5%. This corresponds to a maximum of 100,000 tonnes of formulated oils containing the additive Z-17. Most of the additive is either burned with the oil during use or collected and incinerated with the waste oil. Incineration or burning will release water and oxides of carbon, nitrogen and sulphur. A significant amount of waste engine oil disposed of by the DIY households is not collected (19 ML). The majority of this waste oil is disposed of with the household garbage (7 ML), buried (2.5 ML), stored (3.2 ML) or used as a weed suppressant (2.9 ML) (1). The notified chemical disposed by landfill with the domestic garbage should slowly degrade with the oil. The same applies to the notified chemical contained in the oil that is disposed of as a weed suppressant or buried. In the hypothetical worst case scenario (all oils containing Z-17 at 1.5%) the remaining 3 ML of waste oil containing up to 45 tonnes of the notified chemical could be disposed of by the general public by pouring it down the drain. Assuming such practices to occur throughout year, this corresponds to about 120 kg per day. The notified chemical is expected to be significantly diluted in sewage effluent, to around 0.25 ppm (500 ML daily flow from city sewage works). This is in the same order of magnitude as the NOECs for the aquatic organisms tested. Given that not all oils will contain Z-17, those that do will generally contain much less than 1.5%, and that sortion and degradation during sewage treatment would reduce concentrations before discharge, the predicted environmental hazard is low. Dumping of used engine oils to stormwater is an area of concern but this practice by the general public is lessening (1).

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The toxicological studies performed using the notified chemical suggest that the only effects of concern for human health following exposure would be slight skin and eye irritantcy. Acute toxic effects following oral or dermal exposure are not expected to occur and there is unlikely to be any effects resulting from repeated or prolonged exposure. The notified chemical is not expected to be a sensitiser and is not likely to be genotoxic. No effects of inhalation are expected in view of the notified chemical's low vapour pressure.

The main route of exposure to the notified chemical is likely to be dermal and following exposure significant absorption is expected to occur given the high $\log P_{ow}$ and low molecular weight. However, the low acute dermal toxicity in rats suggests that adverse health effects are unlikely.

Lubricant oil manufacture involves the use of closed systems for blending in additives and 'bottling' the resulting product. Exposure during these processes is expected to be negligible. However, there is a small possibility of exposure to the notified chemical during decanting of drums prior to blending.

It can be concluded that there is a low risk of adverse health effects arising from occupational exposure during lubricant manufacture.

During oil addition and removal from car engines the risk of adverse health effects can be considered minimal since the concentration of the notified chemical in oil is at most 1.5%. The risk of adverse public health effects also is expected to be minimal for this reason and as a result of infrequent use.

13. RECOMMENDATIONS

To minimise occupational exposure to Z-17 the following guidelines and precautions should be observed:

- if engineering controls and work practices are insufficient to reduce exposure to a safe level, then personal protective devices which conform to and are used in accordance with Australian Standards (AS) for eye protection (AS 1336, AS 1337) (17,18) and impermeable gloves (AS 2161) (19) should be worn. Overalls and protective shoes also should be worn.;
- good personal hygiene should be practised;
- work practices should be implemented to avoid spills which should be cleaned up promptly and disposed of in accordance with the recommendations contained in the MSDS. During clean-up of spills, the personal protection described above should be worn;
- a copy of the Material Safety Data Sheet (MSDS) should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The attached MSDS for Z-17 was provided in an acceptable format.

This MSDS was provided by Lubrizol International Inc 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 Lubrizol International Inc.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989*, secondary notification of Z-17 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

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4. *Acute Dermal Toxicity in Rats - Limit Test of OS #87582,* Hill Top Biolabs Project No. 90-4224-21(B), data on file, Hill Top Biolabs Inc, Cinncinnati, OH, USA, 1991.

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13. *Dominant Lethal Test in Male Rats Treated with OS #89753*, Project No.: PH 327-LU-001-93, data on file, Pharmakon USA, Waverley, PA, USA, 1994.

14. Anderson, D. A. *et al.*, Dominant Lethal Mutation Assays in: Dean, B. J. (Ed.), Reports of the UKEM Sub-committee on Guidelines on Mutagenicity Testing, 1983.

15. Green, *et al.*, A Guide for Mutagenicity Testing Using the Dominant Lethal Assay, Mutation Res., 189, 164-174, 1987.

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18. Australian Standard 1337-1984, Eye Protectors for Industrial Applications, Standards Association of Australia Publ., Sydney, 1984.

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