File No: NA840

January 2001

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

NEW OGA 499

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act* 1989 (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the National Occupational Health and Safety Commission which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Aged Care.

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, National Occupational Health and Safety Commission, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

Monday - Wednesday	8.30 am - 5.00 pm
Thursday	8.30 am - 8.00 pm
Friday	8.30 am - 5.00 pm

Copies of this full public report may also be requested, free of charge, by contacting the Administration Coordinator on the fax number below.

For enquiries please contact the Administration Coordinator at:

Street Address: 92 -94 Parramatta Rd CAMPERDOWN NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, SYDNEY NSW 2001, AUSTRALIA
Telephone: (61) (02) 9577 9514 FAX (61) (02) 9577 9465

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

NEW OGA 499

1. APPLICANT

Chevron Oronite Australia of Level 22, 385 Bourke Street, MELBOURNE VIC 3000 (ARBN 001 010 037) has submitted a standard notification statement in support of their application for an assessment certificate for NEW OGA 499.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

Marketing Name:	NEW OGA 499
Other Names:	CP 2043; SP 2043; OLOA 2509U.
Number-Average Molecular Weight (NAMW,M_n):	2 146
Weight-Average Molecular Weight (M_w):	2 297
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	0
Molecular Weight < 1 000:	0.32
Polydispersity (M_w/M_n):	1.07
Method of Detection and Determination:	InfraRed analysis; ^{13}C Nuclear Magnetic Resonance

Comments on Chemical Identity

A gel permeation chromatography trace and printout was supplied to determine the NAMW and percentage of low molecular species. An infrared chromatograph was submitted for the identification of the notified polymer.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C & 101.3 kPa:	Colourless to yellowish viscous liquid
Boiling Point:	Decomposes before boiling
Specific Gravity:	0.968 g/mL at 15°C
Vapour Pressure:	< 1.33 x 10^{-3} kPa at 25°C
Water Solubility:	< 1 ppm
Partition Co-efficient (n-octanol/water):	log P_{ow} >7.6
Kinematic Viscosity:	275 x 10^{-6} m^2/sec at 40°C
Hydrolysis as a Function of pH:	Not determined (see comments below)
Adsorption/Desorption:	Not determined (see comments below)
Dissociation Constant:	Not determined (see comments below)
Flash Point:	>200°C
Flammability Limits:	Combustible, will not burn unless preheated
Autoignition Temperature:	> 200°C
Explosive Properties:	Not known to be explosive
Degradation Products:	Stable under normal conditions
Loss of Monomers, Additives, Impurities:	None expected
Particle Size:	Polymer is a viscous liquid and unlikely aerosols of inspirable size will be generated under forseeable uses

Comments on Physico-Chemical Properties

Most of the information on physico-chemical properties submitted with this application was previously submitted by the notifier and assessed with the notification for OGA 499 (NA730) which is chemically very similar to the notified polymer.

The boiling point of the notified polymer was not determined. The notifier estimates that the polymer will have a low vapour pressure.

The water solubility of the notified polymer was not determined. However, the notifier indicates that the butyl groups of the polyether make the notified polymer very insoluble in water. The polymer is expected to have a water solubility of about 1 mg/L.

Due to the low water solubility of the notified polymer hydrolysis is unlikely in the environmental pH range of 4 and 9. Also the notified polymer contains no functional groups that can hydrolyse.

The partition coefficient log P_{OW} of OGA 499 between n-octanol and water was estimated to be greater than 7.6 at 20°C by a flask shaking method using reverse phase HPLC similar to the test OECD TG 107.

The determination of the adsorption/desorption coefficient of the notified polymer was not undertaken. The notified polymer is expected to be insoluble in water and will largely partition into *n*-octanol rather than water. Due to its low water solubility and its high surface activity the polymer is expected to become associated with the organic component of soils and sediments. The notifier also indicates from studies of similar dispersant/detergent substances to the notified polymer that the adsorption/desorption binding coefficients are in the 40 to 50 000 range.

No dissociation constant data was provided for the notified polymer. It is expected that the polymer will be protonated in aqueous environment, leading to increased water solubility.

4. PURITY OF THE CHEMICAL

Degree of Purity:	> 94%
Hazardous Impurities:	Exempt Information: Impurities are present at less than 0.5%
Non-hazardous Impurities (> 1% by weight):	Exempt Information: Three impurities are each present at less than 6%.
Additives/Adjuvants:	None

5. USE, VOLUME AND FORMULATION

NEW OGA 499 is to be used as a carrier fluid for detergent/dispersant additives in unleaded petrol to control the formation of port fuel injector deposits and intake valve deposits. The notified polymer will be imported as a component of an additive package at a concentration of 35 to 80% w/w. The additive package will be blended either directly into petrol, or into retail aftermarket concentrates. The notified polymer will be present in aftermarket concentrates at concentrations of 10 to 20%. The final concentrations of the notified polymer in finished petrol will be 100 to 300 ppm or 0.25 to 1% in some future applications.

NEW OGA 499 will not be manufactured in Australia. Approximately 20 to 40 tonnes per annum of the notified polymer will be imported in 5 200 L isotanks or 200 L steel drums for the first few years, increasing up to 500 tonnes over an unspecified time period.

NEW OGA 499 is blended in a completely enclosed and fully automated process. Blending of the fuel additive package into petrol will occur at approximately 24 sites and blending into aftermarket concentrates will occur at up to three sites across Australia. Using an automatic computer controlled in-line blender, the components for the aftermarket blends are drawn directly from their storage tanks, blended then packaged into plastic bottles of 500 mL or less. Plastic bottles of the aftermarket concentrates will be distributed to service stations, convenience stores and automotive supply stores, probably by road.

For direct addition to unleaded petrol, the components for the petrol blends are similarly drawn directly from their storage tanks, blended and then sent to another product storage tank or directly to petrol delivery trucks. Some petrol may be drummed off. The final blended petrol will be distributed to service stations and convenience stores by tank truck.

6. OCCUPATIONAL EXPOSURE

The table identifies the nature of work done where occupational exposure to the notified polymer (in additive package) may occur at either the petrol blending terminal (petrol) or at the aftermarket blending plant (aftermarket).

Nature of Activity & (Number of Workers)	*% NEW OGA 499 in formulation*	*Maximum Potential Exposure Duration*
Unloading (2)	35 – 80 (petrol) 75 (aftermarket)	8 hours/day; 5 days/year.
Sampling (2)	35 – 80 (petrol) 75 (aftermarket)	8 hours/day; 220 days/year.
Analysis (1 to 2)	35 – 80 (petrol) 75 (aftermarket)	1 hour/day; 220 days/year.
Packaging- Drumming & Bottling (2)	<1 (petrol) 10 – 20 (aftermarket)	8 hours/day; 150 days/year.
Loading tanker trucks (2)	<1 (petrol)	8 hours/day; 220 days/year.
Equipment Cleaning (1 to 2)	<1 (petrol & aftermarket)	2 hours/day; 1 day/year.
ISO tank & Drum Cleaning (2)	<1 (petrol & aftermarket)	8 hours/day; 12 days/year.

Marine Terminals
The additive packages containing the notified polymer will be imported in drums and 5 200 L isotanks. Occupational exposure is not likely except in the event of a spill.

Petrol Blending Plant
During unloading workers will fasten a four inch hose to the bottom of the iso-container, to enable the additive package to be pumped to a storage tank. Fastening takes about 10 minutes. A special air back flush system is used to prevent spillage during transfer. The notifier estimates that by adhering to ISO 9001 procedures spills and leaks are less than 50 grams of additive package per unloading operation. For unloading of drums workers will connect a pump line to the drum. For unloading of both iso-containers and drums incidental skin contact to splashes, drips and spills may occur as pump lines are connected or disconnected.

Blending of the additive package into petrol occurs in-line and is computer controlled, thereby minimising the potential for occupational exposure. The majority of the blended petrol is transferred automatically to petrol tanker trucks. Some, however, may be sent to a storage tank for blended petrol for later filling into drums for special deliveries. Drumming is an automated process.

Additive package in storage tanks, and blended petrol will be sampled for laboratory analysis and incidental skin contact from splashes, drips and spills may occur as valves are manipulated to collect samples and during analysis.

Aftermarket
At the blending plant, workers unload the drums by inserting a probe and pumping the additive package through flexible hoses and hard piping to a storage tank. For unloading of drums incidental skin contact to splashes, drips and spills may occur as pump lines are connected or disconnected. Whole body exposure to mist may occur if emptied drums are steam cleaned for re use or disposal.

Blending of the additive package into petrol or a solvent carrier is done in-line between the storage tanks thereby minimising the potential for occupational exposure. Additive package in drums, and final product containing the additive package will be sampled for laboratory analysis and incidental skin contact from splashes, drips and spills may occur during sampling and analytical procedures. The packaging operation is enclosed and automated and worker intervention is not required unless spills occur on the filling line operation requires adjustment. Extensive skin contact may occur where it may be necessary to clean, enter and repair equipment containing the additive package.

Service Stations
Mechanics and service station personnel may be exposed to the very low concentration of notified polymer in the final fuel, during routine work procedures. It is inevitable that mechanics will receive skin contact given the nature of the job and that personal protective equipment is not widely used by this trade group. Accidental eye contact may occur, particularly while mechanics are working under vehicles.

Control Measures and Worker Education and Training
Workers at petrol blending and aftermarket blending sites will wear coveralls, gloves & eye protection. The notifier states that inspections of their customers sites have found that their blending facilities are well ventilated, with control systems for accidental spills and wastewater treatment. The notified polymer will be handled by employees of major Australian aftermarket blenders or lubricant manufacturers. Workers involved in the blending activities are reported to have received training in the handling of additive packages.

7. PUBLIC EXPOSURE

There is negligible potential for public exposure to NEW OGA 499 arising from blending in Australia as the process is completely enclosed and fully automated.

Accidental spills during transportation of the fuel additive package, the petrol containing the notified polymer or aftermarket concentrates containing the notified polymer or spills of petrol or aftermarket concentrates by the general public could result in contamination of soil or streams.

Finished petrol containing the notified polymer will be sold to the public through service stations or convenience stores. Some public contact may occur while pumping petrol into vehicle fuel tanks, or into small engines used for home and garden activity. The most likely route of exposure to the notified polymer will be through the skin. However, the potential for exposure is low, because contact would be brief and intermittent, and the concentration of the notified polymer in finished petrol will be 0.01 to 0.03% v/v (100 to 300 ppm) or up to 1% in the future. Aftermarket concentrates containing the notified polymer will be sold to the public through service stations, convenience stores and automotive supply stores. The notifier has estimated that up to 100 000 members of the public per annum may make skin contact with small amounts of the end use product containing the notified polymer when pouring it into fuel tanks. The concentration of the notified polymer in aftermarket concentrates is 10 to 20% v/v. Although members of the public may make skin and possibly eye contact with an aftermarket concentrates containing the notified polymer at a concentration 300 to 2 000 times higher than finished petrol, contact would be brief and intermittent.

8. ENVIRONMENTAL EXPOSURE

8.1 Function of Notified Polymer in Fuel

In addition to the notified polymer the additive packages will contain a carrier fluid (typically a polyethoxylate), other surfactants, polyether amines, polybutene succinimides and other substances which mitigate the build up of deposits in fuel injectors and inlet manifolds of internal combustion engines. The notified polymer is one of the active additives in the package.

Papers by Gibbs LM (1990) Lewis et al (1983) Taniguchi et al (1986), together with other published reports indicate that the mitigation of injector and intake valve deposits helps promote free flow of fuel/air mixture into the engine cylinders and this in turn allows for cleaner and more uniform (and economic) burning of the fuel and to lower exhaust emissions of particulate material, carbon monoxide, hydrocarbons and nitrogen oxides (Gibbs, 1990). The negative effects of flow restrictions in fuel injectors and air intake ports on engine exhaust emissions has been well documented (Houser and Crosby, 1992) and is discussed further below.

The deposits which form around intake valves and on the pintels of fuel injection assemblies are apparently due primarily to the presence of olefinic hydrocarbons and nitrogen containing molecules in the petrol which form polymeric gums on the surfaces of the hot engine components (Taniguchi et al, 1986; Tupa and Koehler, 1986). This occurs after the motor has

been turned off and fuel/air flow into the cylinders stops and the low molecular weight (MW) fuel hydrocarbons from the residual fuel evaporate leaving olefins and higher MW fuel components. The olefins then polymerise under the influence of the residual heat, and the resultant gums adhere strongly to the metal surfaces. The situation is exacerbated on restarting the motor when small amounts of very fine dust drawn in with the air are attracted and agglomerated by the gum. This cycle repeats on each starting and stopping of the engine until finally large masses of such deposits have built up on and around the metal fuel intake components. There is also ample evidence that different vehicle and engine designs have different propensities for the build up of such deposits and these differences may be correlated with different engine operating temperatures (Taniguchi et al, 1986; Tupa, 1987).

The presence of certain surfactant (detergent) compounds including carrier fluids such as the notified polymer in fuel around 100 ppm apparently break up the polymeric film on the metal surfaces and prevent the unregulated build up of the accretion deposits. Further, even when such deposits have been allowed to form, the use of fuel containing surfactants may break up the agglomerated masses and clean the engine components (Taniguchi et al, 1986; Tupa and Koehler, 1986).

Effects of new fuel additive on vehicle exhaust emissions

Future Commonwealth fuel quality legislation which will require motor fuels to meet certain standards in respect of vehicle exhaust emissions, and the notifier was asked to provide documentation of the effects of the notified polymer on exhaust emissions. A number of papers were provided in which the positive effects of deposit control additives (not necessarily containing the notified polymer) on aspects of vehicle exhaust emissions were examined (Gibbs, 1990; Taniguchi et al, 1986; Houser and Crosby, 1992; Lewis et al, 1983). However, as the notified polymer is one component of a particular additive formulation, the effects observed and described can not be attributed to the notified polymer or other "carrier fluids" alone.

The studies of Houser and Crosby (1992), Tupa and co-workers and certain observational data summarised by Taniguchi et al (1986) and Gibbs (1990) are relevant to the assessment and provide representative descriptions of the effects of build up of deposits on intake valves and fuel injector deposits on exhaust emissions, and mitigation of this problem through the use of deposit control additives. The pertinent information is briefly described below.

Although these papers do not specifically address the effects of polyether "carrier fluid" additives on the vehicle exhaust emissions, they provide information on the deleterious effects of intake valve deposits on the emissions. Restrictions on the flow of air/fuel mixture into the cylinders leads to uneven and incomplete fuel combustion.

In a 20 vehicle study conducted by Houser and Crosby (1992) average NOx emissions increased by up to 20% in the vehicles running with dirty input valves compared with those without input deposits, with similar results for CO and hydrocarbon emissions. Taniguchi et al (1986) demonstrated that the use of deposit control additives in fuel could prevent build up of deposits and, in most cases after a period of time could remove deposits on fuel injectors and valves which had already formed. By inference this would improve exhaust emission levels of CO, NOx and hydrocarbons (HC). More explicitly, Gibbs (1990) presented comparative summarised data on exhaust emissions HC, CO and NOx between vehicles using fuel containing a deposit control additive and those using same "base" fuel. For the three emission parameters, HC, CO and NOx, there was significantly increased emissions

(20-30%) for the cars using the base fuel without deposit control additive[1] after running the vehicles for 50 000 miles (80 000 km).

Similar results were reported in a series of papers by Tupa and Koehler (1986, 1988). Tupa (1987) indicated that in comparison with engines with clean intake ports a 30% flow reduction in the intake ports could lead to approximately 40% increase in NOx, around 100% increase in CO and several hundred percent increase in HC in the exhaust emissions (ie around 1.2 g per mile with "dirty" injection ports as compared with around 0.2 g per mile in the case of "clean" ports).

However, the papers made no specific reference to the notified polymer, and the benefits accruing from mitigation of inlet valve deposits should be generic and not confined to the notified polymer alone. Nevertheless, the available evidence suggests that use of the notified polymer as an additive for preventing/cleaning inlet port deposits and fuel injectors would be beneficial to exhaust emissions of HC, CO and NOx. It is also relevant that mitigation of these engine deposits also has significant positive impact on engine efficiency (see for example Tupa and Koehler 1988).

8.2 Release

Formulation into petrol and after market "concentrates"
The notifier indicates that the blending operations are to be performed at specially constructed sites (24 gasoline blending sites and three aftermarket concentrate blending sites), owned and operated by petroleum companies. The additive packages containing the new material will be delivered to the blending facilities in 5 200 L ISO tanks or 200 L drums then pumped to on site storage tanks. As the pumping and transfer equipment is automated and self contained it is anticipated that very little of the additive package (containing between 35 and 80% of the notified polymer) will be released during transfer to the storage containers. The notifier estimates 50 grams per unloading. Unloading of around 200 ISO tanks per annum, equates to an annual release of 10 kg of additive or 8 kg of the notified polymer. All transfer operations from the storage facility to the closed blending equipment are automated, and any spills incurred in the blending operations would be contained within concrete bunds and reclaimed or sent with other waste material to the on-site waste water treatment facilities at the refineries. These facilities employ technologies such as oil/water separation, induced air flotation, sand filtration and biological treatment. Treated water is discharged to either municipal sewage or receiving waters while most of the hydrocarbon material including the notified polymer would be recovered into waste sludge. Sludge is usually incinerated or placed into landfill.

No estimates of the quantity of material left in the emptied ISO tanks and drums were provided, but the residue remaining in the ISO containers is estimated to be a maximum of 1%. Assuming a maximum importation of 500 tonnes per annum, this equates to a total maximum annual release of 5 tonnes of polymer each year as residue. The empty containers are steam cleaned at a reconditioning facility, and the waste condensate containing the residual material is treated to remove the hydrophobic material in equipment similar to that used at refineries. The waste sludge containing notified polymer residue would be either placed into landfill or incinerated.

[1] However, it is of some interest to note that in the early stages of this test (ie. up to 15 000 miles running) the exhaust NOx and CO emissions were slightly larger in the vehicles using fuel supplemented with deposit control additive than for those using on the base fuel.

Residue of notified polymer would remain in aftermarket concentrates used by the general public. Very little release is anticipated from blending and bottle filling and any spills at the facilities would be treated in the same way as described for waste handling at refineries.

End use release
Finished petrol is transported to service stations by bulk rail or road tankers, and distributed to the general public from bowsers. It is estimated that total losses of petrol through transport and transfer operations would be a maximum of 1%. If it is assumed all this is spilt onto the concrete driveways of service stations, following evaporation of the volatile hydrocarbons, up to 5 tonnes of the notified polymer could be left on the service station driveways per annum. It is likely that this would be washed into stormwater systems, or possibly sewers where it would be expected to rapidly become associated with sediments because of the anticipated high affinity of the polymer for organic material.

Residue of notified polymer would remain in aftermarket concentrates used by individuals. Empty bottles would be placed into landfill with domestic and industrial garbage. The notifier estimated that more than 650 kg of the notified polymer could be placed into landfill each year with empty concentrate bottles.

The vapour pressure of the material is low, so any release to the atmosphere during all transfer operations, or from spilt materials would be low.

8.3 Fate

The majority of the material will be burnt with the petrol with evolution of water vapour and oxides of carbon. Similarly, any material lost as a result of spills at refineries or blending facilities will be recovered into waste sludge and likely to be incinerated. The notifier indicates that use of the notified polymer as an additive for non-leaded fuels will not increase levels of HC, CO, CO_2 or NOx emissions in exhaust emissions, and claims that use of the notified polymer will reduce emissions through improved engine performance.

The notified polymer is not readily biodegradable under aerobic conditions, and a modified Sturm biodegradation test conducted according to the protocols of OECD TG 301B (Mead, 1998a) indicated 50% degradation after 28 days. However, any polymer released to the soil or water compartments through accidental spills or leaks from storage tanks would rapidly become associated with the organic component of soils and sediments, and could be expected to undergo slow degradation through bacterial action with production of water, oxides of carbon and, nitrogen and under anaerobic conditions, methane and ammonia.

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

9. EVALUATION OF TOXICOLOGICAL DATA

Test data on the notified polymer, NEW OGA 499, are not available. In support of claims by the notifier for Variation to the Schedule Requirements, data on OGA 499 were submitted as read across data for the assessment of the potential health effects of the notified polymer. OGA 499 has been assessed by NICNAS under the identifier NA730. OGA 499 differs from the notified polymer in the length of its alkyl chains. Toxicity tests on OGA 499 were performed in compliance with OECD/EEC Test Methods (European Commission 1992), (OECD 1995-1996) and according to OECD Principles of Good Laboratory Practices. The data on OGA 499 are accepted for the assessment of NEW OGA 499.

9.1 Acute Toxicity

Summary of the acute toxicity of OGA 499

Test	*Species*	*Outcome*
Acute oral toxicity	Rat	> 5 000 mg/kg
Acute dermal toxicity	Rat	> 2 000 mg/kg
Skin irritation	Rabbit	Slight to moderate irritant
Eye irritation	Rabbit	Slight irritant
Skin sensitisation:		
100% OGA 499 (SP2043)	Guineapig	Sensitising
85% OGA 499 (XF661*)	Guineapig	Non-sensitising
85% OGA 499 (OX15622**)	Guineapig	Sensitising
75% OGA 499 (OX15623)	Guineapig	Non-sensitising
50% OGA 499 (OX15624)	Guineapig	Non-sensitising
39% OGA 499 (OGA 600)	Guineapig	Non-sensitising
1% OGA 499 (OGA 600)	Guineapig	Non-sensitising
Repeat Insult Patch Test 0.2% OGA 499 (OGA 600)	Human	Non-sensitising

The name in parenthesis is the code for the various formulations containing the notified polymer.
* formulation containing notified polymer in light aromatic solvent naphtha.
** formulation containing notified polymer in Stoddard solvent & hydrotreated light distillates.

9.1.1 Oral Toxicity (Safepharm Laboratories Limited 1998c)

Species/strain:	Rat/Sprague Dawley Crl:CD
Number/sex of animals:	5/sex
Observation period:	15 days
Method of administration:	5 000 mg/kg bodyweight, (dose volume of 5.29 mL/kg)
Test method:	OECD TG 401
Clinical observations:	No signs of systemic toxicity noted
Mortality:	Nil
Morphological findings:	No abnormalities noted
LD_{50}:	> 5 000 mg/kg bodyweight
Result:	OGA 499 was of very low acute oral toxicity in rats.

9.1.2 Dermal Toxicity (Safepharm Laboratories Limited 1998b)

Species/strain:	Rat/Sprague Dawley CD
Number/sex of animals:	5/sex
Method of administration:	2 000 mg/kg (dose volume 2.12 mL/kg) held under semi occlusive dressing for 24 hours; after the treatment period, the dressing was removed and the treated site wiped clean with cotton wool moistened with liquid paraffin
Observation period:	14 days. The treated sites were observed for evidence of dermal irritation approximately 30 minutes after dressing removal and on days 3, 7, 10 and 14
Clinical observations:	No signs of toxicity noted
Test method:	OECD TG 402
Mortality:	Nil
Morphological findings:	No abnormalities noted

Draize scores:

	Animal #									
	males					females				
Time after Treatment:	***1***	***2***	***3***	***4***	***5***	***6***	***7***	***8***	***9***	***10***
Erythema										
30 minutes	1[a]	1	2	1	2	2	2	2	1	1
day 3	0	0	0	0	0	2*	2**	1**	1	1**
day 7	0	0	0	0	0	1	1	0*	0	0
day 10	0	0	0	0	0	0	0	0	0	0
Oedema										
30 minutes	0	1	0	0	0	0	0	0	0	0
Day 3	0	0	0	0	0	0	0	0	0	0

[a] see Attachment 1 for Draize scales. * slight fissuring. ** moderate fissuring.

Dermal responses:
Slight or moderate erythema was noted at the treatment sites of all animals 30 minutes after dressing removal. Slight oedema was also noted at the treatment site of one male at this time. Slight or moderate erythema and slight or moderate fissuring were noted at the treatment sites of all females at day 3. Slight erythema was noted at the treatment site of two females and slight fissuring was noted at the treatment site of one female at day 7.
The treatment sites of males were normal at day 3. The treatment sites of females appeared normal at days 7 or 10.

LD_{50}: > 2 000 mg/kg bodyweight

Result: OGA 499 was of low dermal toxicity to the rat.

9.1.3 Inhalation Toxicity

Claims were made and accepted by the notifier for Variation of Schedule Requirements for this toxicological endpoint. OGA 499 is claimed not to be an inhalation hazard based upon its low vapour pressure. In addition, the high viscosity makes it unlikely that aerosols of inhalable size would be generated under normal use conditions.

9.1.4 Skin Irritation (Safepharm Laboratories Limited 1998a)

Species/strain: Rabbit/New Zealand White

Number/sex of animals: 5 males and 1 female

Observation period: 1, 24, 48,72 and 96 hours post exposure

Method of administration: 0.5 mL of the neat test substance was introduced under a 2.5 x 2.5 cm cotton gauze patch on the dorsal skin of the rabbit and held in place under a corset; four hours after application

residual test material was removed by gentle swabbing with cotton wool soaked in liquid paraffin.
A contralateral area of untreated skin served as the control site.

Test method: OECD TG 404

Draize scores:

Time after treatment	***Animal #***					
	1	***2***	***3***	***4***	***5***	***6***
Erythema/Eschar formation						
30 minutes	[a]2	2	2	2	1	2
24 hours	1	2	1	1	2*	2
48 hours	1	2	1	1	1	1
72 hours	0	1	0	1	0	0
96 hours	0	0	0	0	0	0
Oedema						
30 minutes	[a]1	2	1	1	0	1
24 hours	1	1	0	0	1	1
48 hours	1	1	0	0	0	0
72 hours	0	0	0	0	0	0
96 hours	0	0	0	0	0	0

[a] see Attachment 1 for Draize scales. * reaction extended up to 6 cm beyond treatment site.

Mean group score (24, 48 & 72 hour observation): Erythema/Eschar Formation: 1
Oedema: 0.3

Comment: Very slight to well-defined erythema and very slight to slight oedema was noted at all treated skin sites at 1, 24 and 48 hours. All treated skin sites appeared normal at 96 hours.

Result: OGA 499 was slight to moderately irritating to rabbit skin.

9.1.5 Eye Irritation (Safepharm Laboratories Limited 1998e)

Species/strain:	Rabbit/New Zealand White
Number/sex of animals:	9 males
Observation period:	1, 24, 48 and 72 hours post instillation
Method of administration, Unirrigated eyes:	0.1 mL of the neat test substance was instilled into the conjunctival sac of the right eye of 6 rabbits; the left eye served as the control
Method of administration, Irrigated eyes:	0.1 mL of the neat test substance was instilled into the conjunctival sac of the right eye of 3 rabbits; after 30 seconds the eye was gently irrigated with 100mL of lukewarm water for one minute; the left eye served as the control
Test method:	OECD TG 405

Draize scores of nonirrigated eyes:

	Time after instillation											
Animal	***1 hour***			***24 hours***			***48 hours***			***72 hours***		
Conjunctiva	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***D***
1	1	1	2	1	1	0	1	0	0	0	0	0
2	2	2	2	1	1	1	0	0	0	0	0	0
3	2	1	1	1	0	0	0	0	0	0	0	0
4	1	1	1	1	0	0	0	0	0	0	0	0
5	1	1	2	0	0	0	0	0	0	0	0	0
6	1	1	1	0	0	0	0	0	0	0	0	0
Cornea	*All individual scores were zero*											
Iris	*All individual scores were zero*											

[1] see Attachment 1 for Draize scales
r = redness c = chemosis d = discharge

Mean scores for nonirrigated eyes:	Corneal opacity: 0.0 Iridial lesion: 0.0 Redness of conjunctivae: 0.3 Chemosis of conjunctivae: 0.2

Comment, Nonirrigated eyes:	Conjunctival irritation was noted in all treated eyes, and conjunctival chemosis and discharge was noted in one treated eye at 1 hour; all treated eyes appeared normal at 24 hours; no iridial or conjunctival effects were noted (all individual scores were zero)

Draize scores of irrigated eyes:

	Time after instillation											
Animal	***1 hour***			***24 hours***			***48 hours***			***72 hours***		
Conjunctiva	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***
1	1	1	1	0	0	0	1	0	0	0	0	0
2	2	1	1	1	0	0	0	0	0	0	0	0
3	1	0	0	0	0	0	0	0	0	0	0	0
Cornea	*All individual scores were zero*											
Iris	*All individual scores were zero*											

[1] see Attachment 1 for Draize scales

r = redness c = chemosis d = discharge

Comment, Irrigated eyes:	Conjunctival irritation was noted in all treated eyes at the 1 hour observation; Conjunctival redness persisted in one treated eye at 24 hours; No corneal or iridial effects were noted during the study (all individual scores were zero)
Result:	OGA 499 was very slightly irritating to rabbit eye.

9.1.6 Skin Sensitisation – Buehler Technique

The potential of the notified polymer, OGA 499, and formulations that contain it at varying concentrations, to produce delayed contact hypersensitivity in guineapigs was evaluated using the Buehler Method. In total, six studies were conducted, and all complied with the protocol recommended in OECD TG 406 (Buehler test).

Experimental Design and Methodology

In all studies a primary irritation study was conducted to determine the irritation threshold of the test substance for the purposes of determining the induction concentration (minimal irritant concentration) and challenge concentration (maximal sub irritant concentration). The irritation potential of the test substance at levels of neat test substance or test substance diluted in mineral oil at 50%, 25%, 10%, 5%, 2.5%, 1.0%, & 0.5% w/v was evaluated in two groups of four animals each. Four levels of the test substance were evaluated per animal such that each animal in a given group was exposed to the same levels. Results of the irritation screens are presented in Table 1. For the formulation identified as XF 661 (containing the notified chemical at 85%) the irritation study (Covance Laboratories Inc 1999a) was repeated for the neat test substance and at concentrations of 50, 25 and 10%, because of the dermal reactions observed in the first screen.

For the induction procedure, each test animal received a 6-hour occlusive application (using a Hill Top Chamber) of 0.3 mL of test substance to a clipped site on the animals back. The animals in the test group (20) received one application per week for 3 weeks for a total of three applications.

Two weeks following the administration of the third induction dose, a challenge dose of 0.3 mL of the test substance was administered on a previously untreated site on the test animals' back in the same manner as during the induction phase. At this time naïve control animals (10) were also treated in the same manner.

In some instances, a second challenge phase was conducted to further examine the sensitising potential of the test substance – a second challenge dose was conducted two weeks after the first challenge application, except for the study on 85% OGA in hydrocarbon solvent (Covance Laboratories Inc 2000a), where the 2nd challenge was conducted 3 weeks after the 1st challenge. Two new naïve sites were selected on each animal in the test group. In addition, 10 new naïve control animals were selected. Each animal in the test and additional naïve control group received a 0.3 mL dose of the test substance in the same manner as the first challenge application. The initial naïve control animals were not treated during this phase of the study.

Dermal responses were evaluated 24 and 48-hours after removal of the challenge patches and graded to a 5 point scale:

Grade 0	No reaction
Grade +/- or 0.5	Very faint erythema, usually nonconfluent
Grade 1.0	Faint erythema, usually confluent
Grade 2.0	Moderate erythema
Grade 3.0	Strong erythema, with or without oedema

Induction and challenge concentrations and dermal responses are presented in Table 2.

The criteria for a positive reaction - skin reactions of grade 1 or more are considered positive. The decision whether a test substance is a sensitiser is based on comparisons of results (incidence and severity) in test and naïve control animals.

Results:
SP2043 (100% OGA 499) is moderately to strongly sensitising to guineapig skin. OX15622, a formulation containing OGA 499 at 85% in a mixture of Stoddard solvent (CAS# 8052-41-3) & hydrotreated light distillates (CAS# 64742-47-8) is also moderately to strongly sensitising to guineapig skin. However, XF661 a formulation containing OGA 449 at 85% in light aromatic solvent naphtha (CAS# 64742-95-6) was not considered sensitising to guineapig skin under the conditions of the test. OX15623, OX15624, or OGA 600, formulations containing OGA 499 at 75%, 50%, or 39% in a mixture of Stoddard solvent & hydrotreated light distillates were not considered sensitising to guineapig skin under the conditions of the test. OGA 600, diluted to 1% OGA 499 in mineral oil was considered non-sensitising to guineapig skin under the conditions of the test.

TABLE 1 – RESULTS OF THE PRIMARY IRRITATION STUDY

Test substance identity & Formulation details	*Maximum Concentration Not Giving Rise To Irritating Effects*	*Remarks*
SP2043 100% OGA 499. (Hill Top Research 1997)	Not identified. At 0.5%, the lowest concentration tested, Grade 0.5 erythema was observed.	Very faint erythema reactions were observed with the neat test substance and at 2.5%, 1% & 0.5%. Very faint to faint reactions were observed at 50%, 25%, 10% & 5%.
XF661 85% OGA 499 in light aromatic solvent naphtha. (Covance Laboratories Inc 1999a)	Not identified. At 0.5%, the lowest concentration tested, Grade 0.5 erythema was observed.	During the second irritation study, very faint to moderate erythema reactions were observed at the sites treated with neat test substance and at 50%. Very faint erythema reactions were observed at one to three sites treated with either 10% or 25%. Very faint erythema reactions were observed at approximately the same incidence for all concentrations of test substance applied during the initial irritation study. Areas of subcutaneous haemorrhaging were also observed at one of the eight the test sites treated with neat test substance, and at one of the eight test sites treated at 50%.
OX15622 85 wt% OGA 499 in Stoddard solvent & hydrotreated light distillates (Covance Laboratories Inc 2000a)	25%	Very faint to faint erythema reactions were observed at sites treated with the neat test substances and at 50%.
OX15623 75 wt% OGA 499 in Stoddard solvent & hydrotreated light distillates (Covance Laboratories Inc 2000b)	5%	Very faint erythema reactions were observed at a minimum of one of the sites treated with 10 & 25%, and very faint to faint erythema reactions were observed at sites treated with the neat test substance and at 50%. Pinpoint areas of subcutaneous haemorrhaging were also observed at one site treated with the neat test substance.
OX15624 50 wt% OGA 499 in Stoddard solvent & hydrotreated light distillates (Covance Laboratories Inc 2000c)	10%	Very faint erythema reactions were observed at 3 of the 4 sites treated with 25%, very faint to faint erythema reactions were observed at 50%, and faint to moderate erythema reactions were observed at sites treated with neat test substance.
OGA 600 39% OGA 499 in Stoddard solvent, hydrotreated light distillates & 10% OGA 574 (Covance Laboratories Inc 1998b)	Not identified. At 0.5%, the lowest concentration tested, Grade 0.5 erythema was observed.	A faint erythema reaction was observed at one of the treated with 50%. No erythema was observed at 2.5% and 5%. Very faint erythema was observed on at leats one site of all other concentrations.
OGA 600 Diluted to 1% OGA 499 in mineral oil. (Covance Laboratories Inc 1998a)	25%	Faint erythema reactions were observed with the neat test substance and at 50%. Pinpoint areas of subcutaneous haemorrhaging were also observed at the test sites treated with neat test substance.

TABLE 2 – INCIDENCE OF DERMAL RESPONSES FOLLOWING CHALLENGE

Test substance identity & formulation details	*Induction Concentration*	*Challenge Concentration*	*Challenge*	*Animal*	*Incidence of Dermal Response Grades*										*Response*
					24 hour					*48 hour*					
					0	*0.5*	*1*	*2*	*3*	*0*	*0.5*	*1*	*2*	*3*	
SP2043 100% OGA 499. (Hill Top Research 1997)	SP2043 undiluted (100% OGA 499)	SP2043 undiluted (100% OGA 499)	1st	*Test*	0	5	9	5	1	0	1	8	10	1	Sensitising
				Naïve	0	10	0	0	0	1	9	0	0	0	
			Total No. of test animals with positive response:				*15/20*					*19/20*			
XF661 85% OGA 499 in light aromatic solvent naphtha. (Covance Laboratories Inc 1999a)	XF661 Undiluted (85% OGA 499)	10% XF661 in mineral oil (8.5% OGA 499)	1st	*Test*	12	8	0	0	0	9	8	1	1	0	Non-Sensitising
				Naïve	10	0	0	0	0	6	4	0	0	0	
			Total No. of test animals with positive response:				*0/20*					*0/20*			
		10% XF661 in mineral oil (8.5% OGA 499)	2nd	*Test*	15	5	0	0	0	15	4	1	0	0	
				Naïve	6	4	0	0	0	5	4	1	0	0	
			Total No. of test animals with positive response:				*0/20*					*1/20*			
		1% XF661 in mineral oil (0.85% OGA 499)	2nd	*Test*	20	0	0	0	0	20	0	0	0	0	
				Naïve	10	0	0	0	0	9	1	0	0	0	
			Total No. of test animals with positive response:				*0/20*					*0/20*			
OX15622 85 wt% OGA 499 in Stoddard solvent & hydrotreated light distillates (Covance Laboratories Inc 2000a)	OX15622 Undiluted (85% OGA 499)	25% OX15622 in mineral oil (21% OGA 499)	1st	*Test*	0	0	10	9	1	0	0	12	7	1	Sensitising
				Naïve	10	0	0	0	0	4	6	0	0	0	
			Total No. of test animals with positive response:				*20/20*					*20/20*			
		25% OX15622 in mineral oil (21% OGA 499)	2nd	*Test*	0	8	9	3	0	0	5	8	6	1	
				Naïve	2	5	3	0	0	2	7	1	0	0	
			Total No. of test animals with positive response:				*12/20*					*15/20*			
		2.5% OX15622 in mineral oil (2.1% OGA 499)	2nd	*Test*	17	3	0	0	0	15	4	1	0	0	
				Naïve	7	3	0	0	0	8	2	0	0	0	
			Total No. of test animals with positive response:				*0/20*					*1/20*			

TABLE 2 – INCIDENCE OF DERMAL RESPONSES FOLLOWING CHALLENGE (cont')

Test substance identity & formulation details	*Induction Concentration*	*Challenge Concentration*	*Challenge*	*Animal*	*Incidence of Dermal Responses*										*Result*
					24 hour					*48 hour*					
					0	*0.5*	*1*	*2*	*3*	*0*	*0.5*	*1*	*2*	*3*	
OX15623 75 wt% OGA 499 in Stoddard solvent & hydrotreated light distillates (Covance Laboratories Inc 2000b)	OX15623 Undiluted (75% OGA 499)	5% OX15623 in mineral oil (3.8% OGA 499)	1st	*Test*[1]	16	3	0	0	0	17	2	0	0	0	Non-Sensitising
				Naïve	10	0	0	0	0	8	2	0	0	0	
			Total No. of test animals with positive response:				*0/20*					*0/20*			
OX15624 50 wt% OGA 499 in Stoddard solvent & hydrotreated light distillates (Covance Laboratories Inc 2000c)	OX15624 Undiluted (50% OGA 499)	10% OX15624 in mineral oil (5% OGA 499)	*1st*	*Test*	15	5	0	0	0	14	6	0	0	0	Non-Sensitising
				Naive	10	0	0	0	0	8	2	0	0	0	
			Total No. of test animals with positive response:				*0/20*					*0/20*			
OGA 600 39% OGA 499 in Stoddard solvent, hydrotreated light distillates & 10% OGA 574 (Covance Laboratories Inc 1998b)	OGA 600 Undiluted (39% OGA 499)	OGA 600 Undiluted (39% OGA 499)	1st	*Test*	0	12	6	1	0	2	13	4	1	0	Non-Sensitising
				Naïve	0	9	1	0	0	0	9	1	0	0	
			Total No. of test animals with positive response:				7/20					5/20			
		OGA 600 Undiluted (39% OGA 499)	2nd	*Test*	2	16	2	0	0	4	15	1	0	0	
				Naïve	4	5	1	0	0	2	7	1	0	0	
			Total No. of test animals with positive response:				*2/20*					*1/20*			
		5% OGA 600 in mineral oil (2% OGA 499)	2nd	*Test*	20	0	0	0	0	18	2	0	0	0	
				Naïve	10	0	0	0	0	10	0	0	0	0	
			Total No. of test animals with positive response:				*0/20*					*0/20*			
OGA 600 Diluted to 1% OGA 499 in mineral oil. (Covance Laboratories Inc 1998a)	50% OGA 600 w/v in mineral oil (0.5% OGA 499)	25% OGA 600 w/v in mineral oil (0.25% OGA 499)	1st	*Test*	6	14	0	0	0	7	13	0	0	0	Non-Sensitising
				Naïve	1	9	0	0	0	1	9	0	0	0	
			Total No. of test animals with positive response:				*0/20*					*0/20*			

1 – One animal was euthanised on day 29. Necropsy did not reveal treatment related effects.

9.1.6.5 Human Repeated Insult Patch Test (Hill Top Research Inc 1998)

Study Group:	152 females, 37 males (ages 21 to 60)
Test substance:	OGA 600, diluted with mineral oil to 0.2 wt% CP 2043 (OGA 499)
Induction procedure:	Nine repeat applications of the test substance (0.2 mL, 24 hour exposure, covered by a semi occlusive patch) at 3 applications/week for 3 weeks, to the same skin area of the deltoid region of the upper arm, followed by a 2-week rest period; Mineral oil served as the negative control and was administered similarly
Challenge procedure:	Same as induction procedure but applied to the other arm; challenge sites were examined for dermal reactions 48 and 96 hours post-application
Challenge outcome:	There were no reactions indicative of sensitisation to the test article or negative control following the challenge application
Test method:	OECD TG 40
Result:	OGA 600 (diluted to 0.2% wt OGA 499) was not considered a skin sensitiser in human volunteers.

9.2 Combined 4-Week Repeated Dose Oral Toxicity, Reproduction and Neurotoxicity Screen in Rats (WIL Research Laboratories Inc 1999)

The potential sub-chronic toxicity, neurotoxicity and reproductive toxicity related to the administration of the notified polymer were evaluated in a combined repeated dose study.

Investigated parameters common to all study phases included viability, clinical signs, bodyweight, food consumption and necropsy evaluations. Clinical pathology, organ weight and histopathology data (gross lesions only) were collected in the sub-chronic toxicity phase. Neuropathology, functional observational battery and motor activity data were collected in the neurotoxicity phase. Mating indices, neonatal parameters, organ weights and histopathology data were recorded in the reproduction phase.

Sub-Chronic Phase

Species/strain:	Rat/Crl:CD (SD)IGS BR
Number/sex of animals:	5/sex/group (control, treatment and recovery groups)
Method of administration:	Oral (gavage)
Dose/Study duration:	0, 100, 300 or 1 000 mg/kg/day for 28 consecutive days followed by a treatment free period of 16 days;
Test method:	OECD TG 407

Mortality:

One control group female was found dead on day 4.

Clinical observations:
Clinical findings, bodyweight gain, food consumption were comparable to the control group throughout the treatment and recovery periods.

Clinical Pathology:

Serum Chemistry:
Significant findings at 1 000 mg/kg/day were increased mean globulin for males at the end of treatment (Week 4) and end of recovery (Week 6). Consequently, the Week 4 albumin/globulin ratio was reduced and the Week 6 total protein was increased. Increased mean aspartate aminotransferase (AST) and potassium in females at Week 4 were observed together with increased mean calcium at Week 6 in males.

Urinalysis:
No significant findings at Weeks 4 and 6.

Haematology:
Significantly increased neutrophil count (absolute and differential) and a decreased lymphocyte count (differential only) in males at 1 000 mg/kg/day at Week 4 and/or Week 6. However, the total leucocyte count for this group at Week 4 was comparable to that in the control group.
An increased incidence of anisocytosis was found in all treated females, and males of the 300 and 1000 mg/kg/day groups at Week 4, and in all treated animals at Week 6; the changes were considered minimal by the study authors. No changes in erythrocyte indices were observed.

Pathology:

Organ Weights:
Significantly increased mean spleen weights (absolute and relative to final body and brain weights) in the 1 000 mg/kg/day group females at the Week 4 necropsy. At the Week 6 necropsy, mean spleen weights relative to final body and/or brain weights for the 300 and 1 000 mg/kg/day group males were significantly increased relative to control group values.
Macroscopic:
No treatment related findings were observed.
Microscopic:
Gross lesions and other tissues examined at Week 4 and Week 6 did not reveal any treatment related effects.

- *Neurotoxicity Phase*

Species/strain:	Rat/Crl:CD (SD)IGS BR
Number/sex of animals:	5/sex/group
Method of administration:	Oral (gavage)
Dose/Study duration:	0, 100, 300 or 1 000 mg/kg/day for 28 consecutive days
Test method:	OECD TG 407
Mortality:	Nil

Clinical observations:
No treatment related clinical findings. No remarkable differences in body weights or food consumption to that of controls.

Functional Observation Battery:
Home cage and Handling observations:
No remarkable differences were apparent between the control and treated groups.

Open field observations:
Significantly decreased mean time to first step for all treated female groups at the Week 4 evaluation.
Sensory observations:
Significantly increased number of males in the 300 mg/kg/day group with no reaction to the touch response test at the Week 2 evaluation, but not at the Week 4 evaluation or in animals of the 1 000 mg/kg/day group at any evaluation.
Neuromuscular observations:
Significantly increased hindleg grip strength mean for the 1 000 mg/kg/day group females at the Week 2 evaluation, but not at the Week 4 evaluation.
Physiological observations and motor activity:
No apparent effect on activity, catalepsy, body temperature or mean body weight between the control and treated groups.

Clinical Pathology:
Plasma cholinesterase:
Cholinesterase activity was comparable between the treated and the control group throughout the treatment and recovery periods.

Pathology:
Brain weight and dimensions:
No treatment related differences in mean brain weight or brain measurements.

Microscopy:
No remarkable neuropathological lesions in the control and 1 000 mg/kg/day groups.

- *Reproduction Phase*

Species/strain:	rat/Crl:CD BR
Number/sex of animals:	12/sex/dose group
Method of administration:	Oral (gavage)
Doses:	0, 100, 300, or 1 000 mg/kg/day
Test method:	OECD TG 414

Dosing schedule:
Males were dosed for 28 consecutive days prior to mating, continuing for a total minimum dosing period of 71 or 72 days.
Females were dosed for 28 consecutive days prior to mating, continuing to the scheduled necropsy (lactation day 4 for females that delivered a litter; post mating day 25 for females that did not deliver a litter; 25 days after the termination of the breeding period for females with no evidence of mating).

F_0 generation findings:

Mortality:
One control female was found dead on lactation day 4.

Reproductive performance:
Administration of test substance revealed no adverse effects in reproductive performance, or mating and fertility indices.

Gestation length and Lactation:
Differences between the treated groups and control were slight and were not statistically significant. No adverse signs were noted in the control or treated females during parturition.

Clinical observations:
Males of the 1 000 mg/kg/day group had increased incidence of yellow matting on the anogenital and urogenital areas during study weeks 7 through 11; dried red material around the nose and soft stool, generally between weeks 6 and 11.

Body weights:
Males of the 1 000 mg/kg/day group had significantly decreased mean body weights (13.5% relative to the control group at week 10), body weight gains and cumulative body weight gains which was attributable to administration of the test substance.

Pathology:
Organ weights -
In males of the 1 000 mg/kg/day group, mean absolute epididymal weights and mean liver weights (absolute and relative to brain weight) were significantly decreased compared to controls. The decrease was attributed to the reduced final body weight observed for this group. Mean brain, spleen, kidney and testis weights for males of the 1 000 mg/kg/day group were significantly elevated relative to final body weight. The mean testis weight relative to final body weight in the 300 mg/kg/day group was also significantly increased when compared to the control. However, the mean absolute weights for these organs were comparable to their respective control group values, as were the relative testes-to-brain weight values. The differences in organ-to-final body weight ratios were not considered to be related to treatment.
Macroscopy:
One female of the control group had no evidence of mating and was non gravid. One female of the 1 000 mg/kg/day group failed to deliver a litter. This female was non gravid. One female of the 100 mg/kg/day group had total litter loss on lactation day 1. All 3 females were internally normal.
Microscopy:
No treatment related lesions were observed. The frequency of lesions observed in the 1 000 mg/kg/day group were similar to that observed for the control group, or the findings were noted for a limited number of animals.

F_1 generation findings
Litter data and postnatal survival:
No adverse effects on live litter size, viability, sex ratios or body weights or general physical condition at any dose level.

Mortality:
The number of pups examined that were found dead or euthanised *in extremis* were 16, 16, 10 and 3 in the control, 100, 300 and 1 000 mg/kg/day groups, respectively. In the same respective groups, 0, 3, 3 and 0 pups were missing and presumed to have been cannibalised.

Pup necropsies:
No significant treatment related findings.

Lactation day 4:
Malformations - bilateral anophthalmia was observed in one pup of the 100 mg/kg/day group, and one pup of the 300 mg/kg/day group had hydrocephaly;
Developmental variations - one pup of the 1 000 mg/kg/day group had a major blood vessel variation; two pups of the control group and one pup of the 100 mg/kg/day group had a haemorrhagic ring around the iris; two pups of the control group had undeveloped renal papillae.

Conclusions:
There were no adverse effects on survival of the animals in the sub-chronic toxicity, neurotoxicity and reproduction phases. Increased incidence of yellow matting on the anogenital and urogenital areas, dried red material around the nose and soft stool were noted for the 1 000 mg/kg/day group males in the reproduction phase between study weeks 6 and 11. No treatment related clinical findings were observed at any dose level in the subchronic or neurotoxicity phases.

Treatment related decreased mean body weight (13.5% relative to the control group at week 10), body weight gains and cumulative body weight gain were observed in males of the 1 000 mg/kg/day group. These decreases were limited to the reproduction phase and were sustained from the second week of treatment until the end of the study. No similar changes were observed in the subchronic and neurotoxicity phases. Additionally no remarkable differences from the control group were observed for these parameters when the data from the subchronic, neurotoxicity and reproduction phases were combined for Weeks 0 to 4. Female weekly, gestational and lactational body weight and body weight gain were unaffected by test substance administration.

No test substance related changes in clinical chemistry or urine parameters were recorded during the subchronic toxicity phase. An increased incidence of anisocytosis was observed during the treatment and recovery phases in treated animals. However this finding occurred in the absence of other red blood cell changes.

No remarkable differences were found between the treated and control groups in the functional observational battery and motor activity evaluations. No treatment related neuropathological lesions were observed.

No adverse effects on reproduction in F_0 generation or development in the F_1 generation were observed.

Where examined, there were no treatment related macroscopic or microscopic lesions and no test substance related effects on organ weight data in adult male and female rats.

The No Observed Adverse Effect Level (NOAEL) determined for subchronic oral toxicity was 300 mg/kg/day, based upon substantial body weight decrease and clinical observations for the 1 000 mg/kg/day group males in the reproduction phase of the study. The NOAELs for neurotoxicity and reproductive toxicity were 1 000 mg/kg/day, based upon the absence of adverse neurotoxic, reproductive or developmental effects at this dose level.

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* and *Escherichia coli* Reverse Mutation Assay (Safepharm Laboratories Limited 1998f)

Strains:	*Salmonella typhimurium* strains: TA 1535, TA 1537, TA 98, TA 100; *Escherichia coli* strain*:* WP2uvrA$^-$
Concentration range:	0, 15, 50, 150, 500, 1500 and 5000 μg/plate, each concentration was tested in triplicate, with or without metabolic activation, in two independent experiments; appropriate strain specific positive control reference substances were used
Metabolic activation system:	liver fraction (S9 mix) from rats pretreated with Aroclor 1254
Test method:	OECD TG 471 & 472 - plate incorporation method
Comment:	toxicity of the notified polymer was noted at 5 000 μg/plate for the strains TA100, TA 1535 and TA 1537 in the absence of S9 mix; an oily precipitate was noted at and above 1 500 μg/plate; there were no significant increases in revertant colony numbers at any dose level, in the presence or absence of metabolic activation; concurrent positive controls used in the test induced marked increases in the frequency of revertant colonies and the activity of the S9 fraction was found to be satisfactory
Result:	OGA499 was not considered mutagenic in the bacterial strains tested.

9.3.2. Chromosomal Aberration Assay in Chinese Hamster Lung Cells (Covance Laboratories Inc 1999b)

Cells:	Chinese Hamster Lung Fibroblasts
Metabolic activation system:	liver fraction (S9 mix) from rats pretreated with Aroclor 1254

Dosing schedule:	Each concentration was tested in duplicate, with or without metabolic activation (S9), in two independent experiments. The solvent was McCoy's 5a Culture Medium (ethanol and acetone were unsuitable);
	
	<u>Experiment 1:</u>
	without S9,
	0*, 100, 200, 400, 600*, 800, 1 000*, 1 200, 1 600 µg/mL;
	treatment/harvest time = 6/24 hours;
	positive control: 0.05µg/mL mitomycin C;
	
	with S9:
	0*, 0.310, 0.620, 1.24, two-fold dilutions to 314*, 626*, 1 250*, 2 500, 5 000 µg/mL,
	treatment/harvest time: 6/24 hours,
	positive control: 10µg/mL cyclophosphamide;
	
	<u>Experiment 2:</u>
	without metabolic activation,
	0*, 12.5, 25, 50*, 100*, 200*, 400, 600*, 800, 1 000, 1 200, 1 600 µg/mL;
	treatment/harvest time = 24/24 or 48/48 hours;
	positive control: 0.05µg/mL mitomycin C;
	
	with metabolic activation,
	0*, 200, 400, 600, 800, 1 000*, 1 200, 1 600*, 2 000*, 2 500 µg/mL,
	treatment/harvest time: 6/48 hours,
	positive control: 10µg/mL cyclophosphamide.
	
	asterisk* indicates cultures selected for metaphase analysis

Test method:	OECD TG 473

Comment:	At higher test concentrations toxicity was observed, generally without consistency between duplicate cultures. The difference in this observation was explained by the presence of precipitate at these concentrations inducing differential toxicity depending on its dispersion in the culture medium. The test substance did not cause any significant increases in the incidence of cells with chromosomal aberrations, polyploidy or endoreplication, at the concentrations analysed, in the presence or absence of metabolic activation; Positive controls used in the test caused marked increases in the incidence of aberrant cells and the activity of the S9 fraction was found to be satisfactory
Result:	OGA499 was not considered clastogenic under the conditions of the chromosomal aberration assay.

9.3.3 Micronucleus Assay in the Bone Marrow Cells of the Mouse (Safepharm Laboratories Limited 1998d)

Species/strain:	Mouse/Crl:CD-1 (ICR) BR
Number and sex of animals:	7 males/group
Doses/Method of administration:	test substance: 500 mg/kg (low), 1 000 mg/kg (mid) or 2 000 mg/kg (high); positive control: cyclophosphamide 50 mg/kg; vehicle control: arachis oil; vehicle control and test substance administered via intraperitoneal injection at a constant volume of 10 mL/kg bw; positive control was administered orally.
Sampling schedule:	Two sampling times: Vehicle control, positive control, low, mid and high dose animals sacrificed 24 hours after dosing; Vehicle control group and high dose animals sacrificed 48 hours after dosing;
Clinical observations:	no mortality; in the preliminary range finding study, clinical signs of toxicity were observed at 1 000 and 2 000 mg/kg during the 72 hour observation and included hunched posture, lethargy, piloerection and red/brown staining around the mouth

Micronuclei score:	no significant increase in micronucleated polychromatic erythrocytes (PCEs) caused by test substance at either sampling time; the ratio of PCEs to monochromatic erythrocytes (PCE/NCE) for each group was similar to the concurrent control group; the positive control caused a significant increase in micronucleated PCEs
Test method:	OECD TG 474
Result:	OGA 499 did not induce a significant increase in micronucleated PCEs in bone marrow cells of the mouse *in vivo.*

9.4 Overall Assessment of Toxicological Data

Toxicity Summary
The assessment of the potential health effects of NEW OGA 499 are based on the assessment of OGA 499 (NA/730). OGA 499, was of very low acute oral toxicity (LD_{50}>5 000 mg/kg) and low acute dermal toxicity (LD_{50}>2 000 mg/kg) in rats. It was a slight eye irritant and a slight to moderate skin irritant in rabbits. Although no acute inhalation studies have been conducted, the notified polymer is not expected to be an inhalation hazard based upon its low vapour pressure and high viscosity.

The skin sensitisation potential of OGA 499 and formulations that contain it has been investigated in guineapigs using the Buehler method. OGA 499 is a moderate to strong skin sensitiser in guineapigs. The nature of the skin sensitisation response for formulations containing OGA 499 varied with the composition of the formulation. A formulation containing OGA 499 at 85% in a mixture of Stoddard solvent & hydrotreated light distillates was also found to be sensitising to guineapig skin. However, formulations containing the same hydrocarbon mixture and OGA 499 at 75%, 50%, or 39% were not considered sensitising to guineapig skin. Formulations containing OGA 499 at 85% in light aromatic solvent naphtha, or OGA 499 at 1% in mineral oil were considered non-sensitising to guineapig skin. No interpretation of these findings was given by the notifier. The notified polymer did not elicit delayed contact hypersensitivity when tested at 0.2% in volunteers.

In a combined repeated oral dose study (sub-chronic toxicity, neurotoxicity and reproductive toxicity) rats received 0, 100, 300 or 1000 mg/kg/day of notified polymer. No treatment related findings were observed at any dose level in the subchronic or neurotoxicity phases. An increased incidence of yellow matting on the anogenital and urogenital areas, dried red material around the nose and soft stool were noted for males of the 1 000 mg/kg/day group in the reproductive study, in addition to a significant decrease in bodyweight in this group. These findings were considered to be treatment related. The No Observed Adverse Effect Level (NOAEL) determined for the subchronic oral toxicity was 300 mg/kg/day, based upon body weight effects and clinical observations for the 1 000 mg/kg/day group males in the reproduction phase of the study. The NOAELs for neurotoxicity and reproductive toxicity were 1 000 mg/kg/day based upon the absence of adverse neurotoxic, reproductive or developmental effects at this dose.

OGA 499 was not considered mutagenic in a bacterial reverse mutation assay. Genotoxicity was not observed in mammalian cells *in vivo* or *in vitro*.

Hazard Classification

The results of the acute oral and dermal studies in rats and the skin and eye irritant studies in rabbits are below the thresholds for health effects classification as hazardous for these endpoints under NOHSC (NOHSC 1999). In a non-adjuvant type test, the notified polymer, OGA 499 elicited a moderate to strong dermal sensitisation reaction in guineapigs. The sensitisation response for formulations containing OGA 499 appears to depend on the composition of the formulation. The 28-day repeat oral dose study did not reveal evidence of organ dysfunction or systemic toxicity, neurotoxicity or reproductive toxicity. The notified polymer was not considered mutagenic. Based upon the dermal sensitisation observed in guineapigs the notified polymer, OGA 499, meets the criteria for classification as a skin sensitiser under the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC 1999). Therefore, the overall hazard classification for OGA 499 is Irritant (Xi) with risk phrase R43- May Cause Sensitisation by Skin Contact. By analogy the same hazard classification applies to NEW OGA 499.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier has supplied ecotoxicity studies summarised in the following table. The tests were performed in compliance with OECD/EEC Test Methods (European Commission 1992), (OECD 1995-1996) and according to OECD Principles of Good Laboratory Practices.

10.1 Ecotoxicity Test Results

Test	***Species***	***Test concentrations (nominal) mg/L***	***Results (nominal) mg/L***
Acute Toxicity (Static Test) (OECD TG 203)	Rainbow trout *Oncorhynchus mykiss*	10, 18, 32, 56 & 100	96 h LC_{50} = 22 96 h NOEC = 10
Acute Toxicity - Immobilisation (Static Test) (OECD TG 202)	Water Flea (*Daphnia magna*)	1000	48 h EC_{50} > 1000 48 h NOEC = 1000
Growth Inhibition Growth (μ) & Biomass (b) (Static Test) (OECD TG 201)	Green Algae (*Pseudokirchneriella subcapitata*)	6.25, 12.5, 25, 50 & 100	$E\mu C_{50}$ = 11.0 E_bC_{50} = 8.8 NOEC = 6.25
Respiration Inhibition (OECD TG 209)	Activated Sludge - Aerobic Waste Water Bacteria	1000	***3 h EC_{50} > 1000***

10.1.1 Fish (Safepharm Laboratories Limited 1998h)

Rainbow trout were exposed to Water Accommodated Fractions (WAF) of the notified polymer at nominal loading rates of 10, 18, 32, 56 and 100 mg/L for a period of 96 hours under semi-static test conditions. WAF were obtained by stirring the test substance for 24 hours at each concentration followed by standing for 4 hours prior to removal of the aqueous phase. Based on these nominal loading rate WAF, the 96 hour LC_{50} was 22 mg/L with 95% confidence limits of 20 to 24 mg/L. The no observed effect concentration was 10 mg/L loading rate WAF. Sub-lethal effects of exposure were observed at and above the 18 mg/L loading rate WAF. Effects observed were swimming at the bottom, swimming at the surface, swimming at the bottom and hyperventilating, hyperventilating, loss of equilibrium and the presence of moribund fish. The concentration, homogeneity and stability of the test material in the test solutions were not determined.

10.1.2 Aquatic Invertebrates (Safepharm Laboratories Limited 1998g)

After 48 hours exposure of the notified polymer to *Daphnia magna* the EC_{50} was determined to be greater than a WAF of 1 000 mg/L. No immobilisation or other signs of intoxication were observed in *Daphnia magna* at that WAF concentration. WAF were made according to the method outlined above.

10.1.3 Algae (Safepharm Laboratories Limited 1998i)

After 96 hours exposure of the notified polymer to green algae *Pseudokirchneriella subcapitata* the $E\mu C_{50}$ was 11 mg/L and the E_bC_{50} was 8.8 mg/L. The no observed effect concentration at 96 hours was 6.25 mg/L WAF concentration. WAF were made according to the method outlined above.

10.1.4 Microorganisms (Safepharm Laboratories Limited 1998k)

The effect of the notified polymer on the respiration of activated sewage sludge microorganisms was studied. The test material (500 mg) was dispersed in approximately 250 mL of water and subjected to ultrasonication for 30 minutes. Synthetic sewage (16 mL), activated sewage sludge (200 mL) and water were added to give the test concentration of 1 000 mg/L. As a 3 hour EC_{50} of greater than 1 000 mg/L was observed, the no observed effect concentration was either greater than or equal to 1 000 mg/L.

10.2 Conclusion

The ecotoxicity data for the notified polymer suggests that it has slight to moderate toxicity to fish and algae and is non-toxic to aquatic invertebrates and microorganisms. However, the studies on fish, daphnia and algae use WAF which could have much lower test substance concentrations, due to low water solubility, than the nominal ones provided. This is confirmed by Total Organic Carbon Analyses carried out by the notifier for the fish and daphnia studies. The results indicate that, on average, approximately 2 mg/L of the notified polymer is found within any given WAF regardless of the starting nominal concentration. The test substance is, therefore, likely to be at least moderately toxic to fish and algae. Acute toxic effects on aquatic invertebrates are not expected up to the limit of the notified polymers solubility.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

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

There is little potential for significant release of the material during the blending operations which will be performed at dedicated petrochemical facilities. A maximum of 5 tonne of the material may be released each year as a result of leaks and spills during blending, and most of this is expected to be recovered into waste sludge and incinerated or placed into landfill.

Some release will inevitably occur as a result of petrol spills during distribution to motorists. This is estimated as a maximum of 5 tonne per annum and release will be widespread and very diffuse.

Some of the notified polymer will be formulated into aftermarket concentrates and small quantities of the concentrate will be left in the emptied bottles used after vehicle owners have individually treated their fuel. Empty bottles would be disposed of with domestic and industrial garbage to landfill, and it is estimated that around 650 kg of the notified polymer may be disposed of in this manner, again in a diffuse manner.

The notified polymer is not readily biodegradable, although it appears to be ultimately degradable. The polymer has low water solubility and a high octanol/water partition coefficient (log Pow > 7.6), and consequently if released to the soil or water compartments is expected to bind to, and become associated with the organic component of soils and sediments. Any material released to the soil compartment (eg. from petrol spills) would firstly become associated with the organic component of the soil, and in this situation would be slowly mineralised to water and oxides of carbon through biological processes. The same fate is expected for any polymer placed into landfill with waste sludge from refineries and "concentrate" blending facilities.

The notified polymer will be used as a component of engine deposit control additives for non leaded petrol, and there is considerable evidence that modern motor vehicles using fuel containing such additives show significant improvements in exhaust emission of HC, CO and NOx over those of vehicles using un-supplemented fuel. However, the formation and control of engine deposits, their effects on fuel combustion efficiency and on the composition of exhaust emissions is complex. Factors influencing engine operating parameters may include the composition of the base fuel (eg. presence/ absence of olefins) as well as the presence of and concentration of control additives in the fuel. Nevertheless, the available evidence indicates that the use of the notified polymer as a fuel additive has no significant deleterious effects on the quality or quantity of noxious or toxic vehicular exhaust emissions. Overall, use of the polymer as intended is probably beneficial and is not considered to pose a hazard to the environment.

The majority of the notified polymer is expected to be completely destroyed by combustion within the engine, resulting in oxides of carbon, nitrogen and hydrogen.

Except in the case of a transport accident, very little of the notified polymer is likely to enter the water compartment, and any polymer released to water would become associated with

aquatic sediments and would also be slowly mineralised through biological processes. The notified polymer is not expected to have high potential for bioaccumulation.

The ecotoxicity data for the notified polymer suggests that it is moderately to slightly toxic to fish and algae and non-toxic to aquatic invertebrates and microorganisms up to the limits of its solubility. However, the high octanol/water partition coefficient indicates that if released to the soil or water compartments the polymer is expected to bind to, and become associated with the organic component of soils and sediments. This will mitigate any toxic potential of the material.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

By analogy the toxicity of the notified polymer, NEW OGA 499, is not expected to differ substantially from that of OGA 499 previously assessed by NICNAS under NA730. OGA 499 is of very low acute oral toxicity and low acute dermal toxicity. It was a slight eye irritant and slight to moderate skin irritant in rabbits. The notifier claimed that OGA 499 is not expected to be an inhalation hazard because the low vapour pressure (less than 1.33×10^{-3} kPa at 25°C) and high viscosity (275×10^{-6} m^2/sec at 40°C) would preclude aerosol formation under normal conditions.

The skin sensitisation potential of OGA 499 and formulations that contain it has been investigated in guineapigs using the Buehler method. OGA 499 is a moderate to strong skin sensitiser in guineapigs. The nature of the skin sensitisation response for formulations containing OGA 499 varies with the composition of the formulation. A formulation containing OGA 499 at 85% in a mixture of Stoddard solvent & hydrotreated light distillates was also found to be sensitising to guineapig skin. However, formulations containing the same hydrocarbon mixture and OGA 499 at 75%, 50%, or 39% were not considered sensitising to guineapig skin. Formulations containing OGA 499 at 85% in light aromatic solvent naphtha, or OGA 499 at 1% in mineral oil were considered non-sensitising to guineapig skin. The polymer did not elicit delayed contact hypersensitivity when tested at a challenge concentration of 0.2% in volunteers.

A 28-day repeat oral dose study did not reveal evidence of organ dysfunction or systemic toxicity, neurotoxicity or reproductive toxicity. The NOAEL determined for the subchronic oral toxicity was 300 mg/kg/day, based upon reduced body weight and treatment-related clinical observations for the 1 000 mg/kg/day group males in the reproduction phase of the study. The NOAELs determined for neurotoxicity and reproductive toxicity were 1 000 mg/kg/day based upon the absence of adverse neurotoxic, reproductive or developmental effects at this dose level. The notified polymer was not considered mutagenic, *in vivo* or *in vitro*. Based upon skin sensitisation observed in guineapigs OGA 499 meets the criteria for classification as a skin sensitiser under the NOHSC *Approved Criteria for Classifying Hazardous Substances*. Therefore, the overall hazard classification for the notified polymer is Harmful (Xi) with risk phrase R43 – May Cause Sensitisation by Skin Contact. By analogy the same hazard classification applies to NEW OGA 499.

Occupational Health and Safety

During importation and transport of additive packages containing NEW OGA 499 in 5 200 L iso tanks or 200 L steel drums, there is unlikely to be any worker exposure except in the event of a spill. Exposure after a spill would need to be controlled by use of the recommended practices for spillage clean up given in the Material Safety Data Sheet supplied by the notifier. These workers will need to have access to protective clothing to minimise exposure.

The transfer and blending operations at the refinery/terminal facilities are enclosed and automatically operated. However, exposure to the additive package containing OGA 499 may occur during transfer operations as delivery lines are connected/disconnected from the import containers, and during sampling for laboratory analysis. The process in which the notified polymer is used is considered non-dispersive and exposure incidental. Inhalation will be a minor route of exposure given the high viscosity and low vapour pressure. Potential for slight, transient eye irritation may occur following eye contact. Skin contact is expected to be the major route of exposure; the health effect of concern by this route is skin sensitisation.

The notifier expects NEW OGA 499 will be imported at between 35 to 80% in additive packages, however, the exact concentration of NEW OGA 499 and the composition details of the additive package are not known at this stage. On the basis of the variability in the skin sensitisation potential of formulations containing OGA 499 the risk of skin sensitisation cannot be excluded for NEW OGA 499 in additive packages. Although the risk of skin sensitisation from NEW OGA 499 is expected to diminish with the final blended petrol, containing less than 0.01% NEW OGA 499.

Because of the hazardous nature of fuel and fuel products encountered at refineries and terminals standard operating procedures at these sites required workers to wear appropriate personal protective equipment to control exposure to these substances in order to minimise the risk of adverse health effects.

Only under the conditions described, that is enclosed automated systems and the mandatory use of appropriate personal protective equipment, is the risk of skin sensitisation for these workers considered minimal.

Fuel transporters, service station workers and mechanics will receive negligible exposure because of the very low concentration of NEW OGA 499 present in the final fuel. The risk of skin sensitisation for these workers is minimal.

Public Health

No significant public exposure to the notified polymer in additive is anticipated during transport and product formulation. Members of the public may, however, make dermal and possibly ocular contact with the notified polymer when using petrol or aftermarket concentrates which contain the notified polymer. The amounts to which the public are likely to be exposed is expected to be small and exposure are expected to be brief and intermittent. Inhalation exposure is expected to be minimal, as the notified chemical is unlikely to pose a significant hazard given its anticipated low toxicity, low concentration in petrol for consumer use and high molecular weight. Based on the use pattern and hazard, it is considered that the notified polymer will not pose a significant risk to public health when used in the proposed manner.

13. RECOMMENDATIONS

Occupational Health and Safety Matters
To minimise occupational exposure to NEW OGA 499 the following guidelines and precautions should be observed:

- The notifier's MSDS be provided to the occupational health and safety officer during the workplace assessment process and to the authorised medical practitioner responsible for health surveillance in the workplace to alert them to the potential for skin sensitisation;

- Workers at refinery/terminal sites should receive regular instruction on good occupational hygiene practices in order to minimise personal contact, and contamination of the work environment with formulations that contain NEW OGA 499. In particular, contaminated clothing should be removed without delay. The affected skin area should be decontaminated with a waterless hand cleaner, mineral oil, petroleum jelly, then washed with soap and water.

- Workers should be advised of the potential for occupational dermatoses following repeated skin exposure to NEW OGA 499 and to report any skin changes to the occupational health and safety officer at their workplace. When an occupational skin disease occurs, work practices and opportunities for contact with the substance should be reviewed and preventive measures instigated to ensure other workers do not develop the same condition. Further guidance on preventing the occurrence of occupational skin diseases can be found in the NOHSC guide *Occupational Diseases of the Skin* (NOHSC 1990).

- Personal protective equipment (PPE) should be used on all occasions where exposure to additive packages containing NEW OGA 499 occurs. The notifier recommends Nitrile, Viton, polyurethane, or chlorinated polyethylene gloves. Chemical impervious clothing is also necessary to prevent skin contact. Consideration should be given to the ambient environment, physical requirements and other substances present when selecting protective clothing and gloves. Workers should be trained in the proper fit, correct use and maintenance of their protective gear. PPE guidance in the selection, personal fit and maintenance of personal protective equipment can be obtained from:

Protective eyewear:	AS 1336 (SAA 1994);
	AS/NZS 1337 (SAA/SNZ 1992).
Chemical impermeable clothing:	AS 3765.2 (SAA 1990).
Impermeable gloves:	AS 2161.2 (SAA/SNZ 1998).
Occupational footwear:	AS/NZS 2210 (SAA/SNZ 1994);

- Workplace practices and control procedures consistent with provisions of State, Territory and Commonwealth legislation based on the *National Model Regulations for the Control of Workplace Hazardous Substances* must be in operation if products containing OGA 499 are determined to be hazardous.

- NEW OGA 499 is identified as a combustible liquid and should be stored, handled and used in accordance with AS 1940 (SAA 1993);

- A copy of the MSDS should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for OGA 499 was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC 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 polymer shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise.

Secondary notification may also be relevant when details of the proposed new Commonwealth fuel legislation have been clarified.

16. REFERENCES

Connell D (1990): General Characteristics of Organic Compounds Which Exhibit Bioaccumulation. In DW C (ed), Bioaccumulation of Xenobiotic Compounds. Boca Raton: CRC Press.

Covance Laboratories Inc (1998a): Dermal Sensitisation Study of OGA 600 (Diluted to 1% SP 2043) in Guinea Pigs - Closed Patch Technique Study # 80504830. Madison.

Covance Laboratories Inc (1998b): Dermal Sensitisation Study of OGA 600 in Guinea Pigs - Closed Patch Technique Study # 80504829. Madison.

Covance Laboratories Inc (1999a): Dermal Sensitisation Study of XF 661 in Guinea Pigs - Closed Patch Technique Study #90202788. Madison.

Covance Laboratories Inc (1999b): Mutagenicity Test on SP 2043 Measuring Chromosomal Aberrations in Chinese Hamster Lung (CHL) Cells with a Confirmatory Assay with Multiple Harvests Study # 19911-0-443Z. Vienna.

Covance Laboratories Inc (2000a): Dermal Sensitisation Study of OX 15622 in Guinea Pigs - Closed Patch Technique Study #90904327. Madison.

Covance Laboratories Inc (2000b): Dermal Sensitisation Study of OX 15623 in Guinea Pigs - Closed Patch Technique Study #90904328. Madison.

Covance Laboratories Inc (2000c): Dermal Sensitisation Study of OX 15624 in Guinea Pigs - Closed Patch Technique Study #90904329. Madison.

European Commission (1992): European Commission Directive 92/69/EC , Annex V. Brussels.

European Commission (1996): Technical Guidance Document in Support of Commission Directive 93/67/EC on Risk Assessment for New Notified Substances and Commission Regulation (EC) No 1488/94 on Risk Assessment for Existing Substances - Part II, European Commission. Brussels.

Gibbs LM (1990): Society of Automotive Engineers Technical Paper No. 902104.

Hill Top Research (1997): Delayed Contact Hypersensitivity Study With SP 2043 in Guinea Pigs Study # 97-8515-21. Miamiville.

Hill Top Research Inc (1998): Repeated Insult Patch Test with OGA 600 Diluted with Mineral Oil to 0.2 wt% CP 2043 (Modified Draize Procedure) Pilot and Main Phases Study# 100695. Miamiville.

Houser KR Crosby TA (1992): The Impact of Intake Valve Deposits on Exhaust Emissions, Society of Automotive Engineers, Technical Paper No. 922259.

Lewis RA Newhall HK Peyla RJ Voss DA Welstand JS (1983): Society of Automotive Engineers of Japan, Technical Paper No. 830938.

NOHSC (1990): Occupational Diseases of the Skin. Canberra: Australian Government Publishing Service.

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

NOHSC (1999): Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999)]. Canberra: AusInfo.

OECD (1995-1996): OECD Guidelines for the Testing of Chemicals on CD-Rom. Paris: Organisation for Economic Co-operation and Development, (OECD).

SAA (1990): AS 3765.2-1990, Australian Standard Clothing for Protection against Hazardous Chemicals Part 2 Limited Protection Against Specific Chemicals. Sydney: Standards Association of Australia.

SAA (1993): AS 1940 The Storage and Handling of Flammable and Combustible Liquids. Sydney: Standards Association Australia.

SAA (1994): AS 1336-1994, Australian Standard Eye protection in the Industrial Environment. Sydney: Standards Association Australia.

SAA/SNZ (1992): AS/NZS 1337-1992, Australian/New Zealand Standard Eye Protectors for Industrial Applications. Sydney/Wellington: Standards Association of Australia and Standards New Zealand (SAA/SNZ).

SAA/SNZ (1994): AS/NZS 2210-1994, Australian/New Zealand Standard Occupational Protective Footwear. Sydney/Wellington: Standards Association of Australia and Standards New Zealand (SAA/SNZ).

SAA/SNZ (1998): AS/NZS 2161.2:1998, Australian/New Zealand Standard Occupational Protective Gloves Part 2: General Requirements. Sydney/Wellington: Standards Association Australia and Standards New Zealand (SAA/SNZ).

Safepharm Laboratories Limited (1998a): SP 2043 (C1829-41): Acute Dermal Irritation Test in the Rabbit Study # 703/101. Derby.

Safepharm Laboratories Limited (1998b): SP 2043 (C1829-41): Acute Dermal Toxicity Study in the Rat Study # 703/100. Derby.

Safepharm Laboratories Limited (1998c): SP 2043 (C1829-41): Acute Oral Toxicity Study in the Rat Study #703/099. Derby.

Safepharm Laboratories Limited (1998d): SP 2043 (C1829-41): Micronucleus Test in the Mouse Study # 703/103. Derby.

Safepharm Laboratories Limited (1998e): SP 2043 (C1829-41): Primary Eye Irritation Test in the Rabbit Study # 703/102. Derby.

Safepharm Laboratories Limited (1998f): SP 2043 (ID#C1829-41): *Salmonella typhimurium* and *Escherichia Coli* /Mammalian - Microsome Reverse Mutation Assay Study # 703/082. Derby.

Safepharm Laboratories Limited (1998g): SP 2043 (Lot No. C1829-41): Acute Toxicity to *Daphnia magna* Study # 703/105. Derby.

Safepharm Laboratories Limited (1998h): SP 2043 (Lot No. C1829-41): Acute Toxicity to Rainbow Trout (*Oncorhynchus mykiss*) Study # 703/104. Derby.

Safepharm Laboratories Limited (1998i): SP 2043 (Lot No. C1829-41): Algal Inhibition Test, Study #703/106. Derby.

Safepharm Laboratories Limited (1998j): SP 2043 (Lot No. C1829-41): Assessment of Ready Biodegradability CO_2 Evolution Test Study # 703/107. Derby.

Safepharm Laboratories Limited (1998k): SP 2043 (Lot No. C1829-41): Assessment of the Inhibitory Effect on the Respiration of Activated Sewage Sludge Study# 703/133. Derby.

Taniguchi BY PRPGHSVD (1986): The Tip of the Intake System Deposit Problem, Society of Automotive Engineers Technical Paper No. 861534.

Tupa RC (1987): Gasoline Port Fuel Injectors - Causes/Consequences/Cures, Society of Automotive Engineers Technical Paper No. 872113.

Tupa RC Koehler DE (1986): Gasoline Port Fuel Injectors - Keep Clean/Clean Up with Additives, Society of Automotive Engineers Technical Paper No. 861536.

Tupa RC Koehler DE (1988): Intake Valve Deposits - Effects of Engines, Fuel and Additives, Society of Automotive Engineers Technical Paper No. 881645.

US EPA (1994): Regulatory Impact Analysis and Regulatory Flexibility Analysis for the Interim Detergent Registration Program and Expected Detergent Certification Program: US Environmental Protection Agency, Office of Air and Radiation, Office of Mobile Sources.

WIL Research Laboratories Inc (1999): A Combined Four-Week Repeated Dose Oral Toxicity, Reproduction and Neurotoxicity Screen in Rats With SP 2043 Study# WIL-187018. Ashland.

Attachment 1

The Draize Scale for evaluation of skin reactions is as follows:

Erythema Formation	*Rating*	*Oedema Formation*	*Rating*
No erythema	0	No oedema	0
Very slight erythema (barely perceptible)	1	Very slight oedema (barely perceptible)	1
Well-defined erythema	2	Slight oedema (edges of area well-defined by definite raising	2
Moderate to severe erythema	3	Moderate oedema (raised approx. 1 mm)	3
Severe erythema (beet redness)	4	Severe oedema (raised more than 1 mm and extending beyond area of exposure)	4

The Draize scale for evaluation of eye reactions is as follows:

CORNEA

Opacity	*Rating*	*Area of Cornea involved*	*Rating*
No opacity	0 none	25% or less (not zero)	1
Diffuse area, details of iris clearly visible	1 slight	25% to 50%	2
Easily visible translucent areas, details of iris slightly obscure	2 mild	50% to 75%	3
Opalescent areas, no details of iris visible, size of pupil barely discernible	3 moderate	Greater than 75%	4
Opaque, iris invisible	4 severe		

CONJUNCTIVAE

Redness	*Rating*	*Chemosis*	*Rating*	*Discharge*	*Rating*
Vessels normal	0 none	No swelling	0 none	No discharge	0 none
Vessels definitely injected above normal	1 slight	Any swelling above normal	1 slight	Any amount different from normal	1 slight
More diffuse, deeper crimson red with individual vessels not easily discernible	2 mod.	Obvious swelling with partial eversion of lids	2 mild	Discharge with moistening of lids and adjacent hairs	2 mod.
Diffuse beefy red	3 severe	Swelling with lids half-closed	3 mod.	Discharge with moistening of lids and hairs and considerable area around eye	3 severe
		Swelling with lids half-closed to completely closed	4 severe		

IRIS

Values	*Rating*
Normal	0 none
Folds above normal, congestion, swelling, circumcorneal injection, iris reacts to light	1 slight
No reaction to light, haemorrhage, gross destruction	2 severe