

OPTIMAL GROUP OF COMPANIES

(466583 K, 466592 M, 466586 D)

An Affiliate of The Dow Chemical Company and Petroliam Nasional Berhad

CHEMICAL SAFETY DATA SHEET



O P T I M A L

Product Name: UCON™ Brake Fluid E-360

Effective Date: 3 April 2001

MSDS #: UBF36

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OPTIMAL CHEMICALS urges the recipient of the Chemical Safety Data Sheet to study it carefully to become aware of hazards, if any of the product involved. In the interest of safety you should (1) notify your employees, agents and contractors of the information on this sheet, (2) furnish a copy to each of your customers for the product, and (3) request your customer to inform their employees and customers as well.

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY UNDERTAKING

1.1. IDENTIFICATION OF THE SUBSTANCE OR PREPARATION

CHEMICAL NAME:	Not applicable (mixture)
CHEMICAL FAMILY:	Glycol ether/glycol
FORMULA:	Not applicable (mixture)
CAS # AND NAME:	See Section 2, "Ingredients"
SYNONYMS:	None

1.2. COMPANY IDENTIFICATION

Headquarters:

OPTIMAL CHEMICALS (Malaysia) Sdn Bhd (466586 D)

A subsidiary of The Dow Chemical Company and Petroliam Nasional Berhad

Level 13, Tower I

Petronas Twin Towers

KLCC, 50088 Kuala Lumpur Malaysia

Plant site:

OPTIMAL CHEMICALS (MALAYSIA) SDN BHD (466586 D)

A subsidiary of The Dow Chemical Company and Petroliam Nasional Berhad

OPTIMAL Administration Complex

Kerteh Industrial Area

KM 106 Jalan Kuala Terengganu - Kuantan

24300 Kerteh, Kemaman

Terengganu

1.3. EMERGENCY TELEPHONE NUMBER

24 hours a day: Malaysia 00-800-2537-8747

or call Bomba: 994

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2. COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient (CAS #)	Concentration % by weight	Hazard	Danger Symbol (s)
Triethylene glycol monobutyl ether (CAS # 143-22-6)	22-70	Irritating to eyes	Xi
Polyethylene glycol (CAS # 25322-68-3)	5-15	See Section 3	--
Polyethylene glycol monobutyl ether (CAS # 9004-77-7)	5-15	Irritating to eyes	Xi
Polyethylene glycol monomethyl ether (CAS # 9004-74-4)	5-15	Irritating to eyes	Xi
Diethylene glycol (CAS # 111-46-6)	<= 5	Harmful if swallowed	Xn
Triethylene glycol (CAS # 112-27-6)	2-10	None	--
Diethylene glycol monobutyl ether: (CAS # 112-34-5)	2-10	Irritating to eyes	Xi
Triethylene glycol monomethyl ether (CAS # 112-35-6)	2-10	None	--
Inhibitor package	<1	See Section 3	--

3. HAZARDS IDENTIFICATION

3.1. HEALTH HAZARD DATA

3.1.1. EFFECTS OF A SINGLE OVEREXPOSURE

Swallowing

May cause pain or discomfort in the abdomen, pain in the lumbar region, nausea, vomiting, diarrhea, dizziness, drowsiness, decreased urine production, malaise, and loss of consciousness. Severe kidney damage may occur which can be fatal if not promptly and adequately treated. Liver injury may also occur.

Skin absorption

Prolonged or widespread contact may result in the absorption of potentially harmful amounts of material.

Inhalation

Short-term harmful health effects are not expected from vapour generated at ambient temperature. Vapour or mist from heated material may cause nausea and headache.

See "Effects of Repeated Overexposure."

Skin contact

May cause slight irritation with discomfort and local redness. Prolonged or repeated contact may cause defatting and drying of the skin.

Eye contact

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Causes severe irritation, experienced as discomfort or pain, excess blinking and tear production, with marked excess redness and swelling of the conjunctiva. Causes corneal injury.

3.1.2. EFFECTS OF REPEATED OVEREXPOSURE

Repeated exposure may cause kidney damage.

Exposure to high concentrations of aerosol generated at room temperature may cause lung injury and liver dysfunction.

Repeated overexposure to vapour or mist may cause headache, nausea and dizziness.

3.1.3. MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE

Skin contact may aggravate an existing dermatitis.

May aggravate an existing dermatitis.

3.1.4. OTHER EFFECTS OF OVEREXPOSURE

Short-term repeated ingestion of diethylene glycol may produce renal failure.

4. FIRST AID MEASURES

4.1. SWALLOWING

If patient is fully conscious, give two glasses of water. DO NOT induce vomiting. Obtain medical attention without delay. If medical advice is delayed, and if the person has swallowed a moderate volume of material (a few ounces), then give three to four ounces of hard liquor, such as whiskey. For children, give proportionally less liquor, according to weight.

4.2. INHALATION

Remove to fresh air.

4.3. SKIN CONTACT

Remove contaminated clothing. Wash skin with soap and water. If irritation persists or if contact has been prolonged, obtain medical attention.

4.4. EYE CONTACT

Immediately flush eyes with water and continue washing for at least 15 minutes. DO NOT remove contact lenses, if worn. Obtain medical attention without delay, preferably from an ophthalmologist.

4.5. NOTES TO PHYSICIAN

It is estimated that the lethal oral dose to adults is of the order of 1.0-1.2 ml/kg. Diethylene glycol produces metabolites that cause an elevated anion-gap metabolic acidosis and renal tubular injury. Liver injury may occur, but not as severe as kidney injury. The signs and symptoms in diethylene glycol poisoning are those of metabolic acidosis, CNS depression, and kidney injury. Urinalysis may show albuminuria, hematuria, and oxaluria. The currently recommended medical management of diethylene glycol poisoning includes elimination of diethylene glycol and its metabolites, correction of metabolic acidosis, and prevention of kidney injury. It is essential to have immediate and follow-up urinalysis and clinical chemistry. There should be particular emphasis on acid-base balance, and liver and kidney function tests. A continuous infusion of 5% sodium bicarbonate with frequent monitoring of electrolytes and fluid balance status is used to achieve correction of metabolic acidosis and forced

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diuresis. For severe and/or deteriorating cases, hemodialysis may be required. Dialysis should be considered for patients who are symptomatic, have severe metabolic acidosis, a blood diethylene glycol concentration greater than 25 mg/dl, or compromise of renal function. There are no reported cases in which ethanol has been used antidotally, although a limited number of laboratory animal studies suggest that it may be effective. If used clinically, a therapeutically effective blood concentration is probably around 100-150 mg/dl, although this is unproven; this concentration should be achieved by a rapid loading dose and maintained by intravenous infusion. One animal study has suggested that pyrazole may be an effective early antidote, but its value in human diethylene glycol poisoning is unproven.

5. FIRE-FIGHTING MEASURES

5.1. EXTINGUISHING MEDIA

Extinguish fires with water spray or apply alcohol-type or all-purpose type foam by manufacturer's recommended techniques for large fires. Use carbon dioxide or dry chemical media for small fires.

5.2. EXTINGUISHING MEDIA TO BE AVOIDED

None.

5.3. SPECIAL FIRE FIGHTING PROCEDURES

Do not direct a solid stream of water or foam into hot, burning pools: this may cause frothing and increase fire intensity.

5.4. SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS

Use self-contained breathing apparatus and protective clothing.

5.5. UNUSUAL FIRE AND EXPLOSION HAZARDS

During a fire, oxides of nitrogen may be produced.

6. ACCIDENTAL RELEASE MEASURES

Steps to be taken if material is released or spilled

Small spills can be flushed with large amounts of water; larger spills should be collected for disposal. Wear suitable protective equipment.

Avoid contact with eyes.

7. HANDLING AND STORAGE

7.1. HANDLING

General handling precautions

Do not swallow.

Avoid contact with eyes.

Avoid prolonged or repeated breathing of mist or vapour.

Use with adequate ventilation.

Wash thoroughly after handling.

Ventilation

General (mechanical) room ventilation is expected to be satisfactory.

Other precautions

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WARNING: Sudden release of hot organic chemical vapours or mists from process equipment operating at elevated temperature and pressure, or sudden ingress of air into hot equipment under a vacuum, may result in ignitions without the presence of obvious ignition sources. Published "autoignition" or "ignition" temperature values cannot be treated as safe operating temperatures in chemical processes without analysis of the actual process conditions. Any use of this product in elevated-temperature processes should be thoroughly evaluated to establish and maintain safe operating conditions. Further information is available in a technical bulletin entitled "Ignition Hazards of Organic Chemical Vapours." Standard (ASTM) test values do not predict many real life situations. Autoignition is the result of a gas-phase runaway reaction, which occurs when the heat generation rate inside a given volume of reactant exceeds that of heat loss rate. The heat balance determining autoignition is therefore dependent on factors such as the reactant pressure plus the volume and geometry of any container. The ASTM standard AIT test uses a small (500 ml), heated, open-necked glass flask in which autoignition always occurs at atmospheric pressure. The AITs determined using this test can be appreciably greater than those that might be experienced in large commercial equipment, especially if elevated pressures are involved. Any operation at temperatures close to or above the flash point should be reviewed by the appropriate expert (e.g., safety engineer, chemist). When the ASTM autoignition temperature is required it can be obtained by calling OPTIMAL CHEMICALS.

7.2. STORAGE

Keep container closed.

Glycol ethers as a family of solvents can be stored in carbon steel.

Stainless steel or high baked, phenolic-lined tanks may be considered for critical applications sensitive to slight discoloration or trace iron contamination. Piping can be made of the same material as the storage tank. A centrifugal pump is suitable for transfer services. Butyl rubber or EPDM can be used for gaskets and packing. NOTE: OPTIMAL CHEMICALS does not recommend using aluminum, copper, galvanized iron, galvanized steel, Viton, neoprene, nitrile or natural rubber with glycol ethers. Glycol ethers do not present a significant flammability hazard at normal storage temperatures. They have relatively low vapor pressures, viscosities and freezing points.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. EXPOSURE LIMITS

MALAYSIA

Triethylene glycol (CAS # 112-27-6)	100 mg/m ³ TWA8
Diethylene glycol (CAS # 111-46-6)	50 ppm TWA-8hr, vapour and aerosol, AIHA WEEL 10 mg/m ³ TWA-8hr, aerosol, AIHA WEEL

8.2. PERSONAL PROTECTION

Respiratory protection

None expected to be needed.

Hand protection / protective gloves

PVC-coated

Eye protection

Monogoggles

Other protective equipment

Eye bath and safety shower.

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9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Liquid
COLOUR	Transparent yellow
ODOUR	Pungent
MOLECULAR WEIGHT	Not applicable (mixture)
BOILING POINT	284.0 °C at 1013 hPa
FREEZING POINT	(pour point) -47 °C
MELTING POINT	Not applicable
FLASH POINT	143.3 °C METHOD: Pensky-Martens closed cup ASTM D 93 171.1 °C METHOD: Cleveland open cup ASTM D 92
FLAMMABILITY LIMITS IN AIR (% by volume)	LOWER: Not determined UPPER: Not determined
SPECIFIC GRAVITY (H2O=1)	1.024 at 20/20 °C
VAPOUR PRESSURE	<0.01 hPa at 20 °C
VAPOUR DENSITY (air=1)	7
EVAPORATION RATE (Butyl acetate = 1)	<0.01
SOLUBILITY IN WATER (% by weight)	100 at 20 °C
PERCENT VOLATILES	0.4

10. STABILITY AND REACTIVITY

10.1. STABILITY

Stable.

Conditions to avoid

None known.

Incompatible materials

None.

Hazardous combustion products

Burning can produce the following combustion products: Oxides of carbon and nitrogen. Carbon monoxide is highly toxic if inhaled; carbon dioxide in sufficient concentrations can act as an asphyxiant. Acute overexposure to the products of combustion may result in irritation of the respiratory tract.

10.2. POLYMERIZATION

Will not occur.

Conditions to avoid

None known.

11. TOXICOLOGICAL INFORMATION

11.1. ACUTE TOXICOLOGICAL INFORMATION

No information currently available.

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11.2. OTHER TOXICOLOGICAL INFORMATION

Triethylene glycol was given to rats by inclusion in the diet for 90 days at concentrations of 10,000, 20,000 or 50,000 ppm. At the highest dose, there were decreases in body weight. Physiologic responses to these high doses were observed in kidney weight and urinalysis. No specific organ toxicity was seen.

In a 9-day (whole body) repeated inhalation exposure (6 hours/day) study with rats, mortality occurred at 4284 mg/m³ and effects included eye irritation and increased alanine aminotransferase and alkaline phosphatase activities; at 494 mg/m³ there was slightly increased alkaline phosphatase activity. In a subsequent 9-day (nose-only) repeated aerosol study rats were exposed to concentrations up to 1036 mg/m³. The only effect noted was slight (not statistically or biologically significant) decrease in body weight gain at 517 and 1036 mg/m³, but not at 102 mg/m³. No indications of local or systemic target organ toxicity were noted, including effects on hematology, clinical chemistry or urinalysis. In a sensory irritation study in mice, exposure to high concentrations of triethylene glycol aerosol resulted in a decreased respiratory rate. The RD50, or concentration which produced a 50% decrease in respiratory rate, was 5.1 mg/l.

There was no evidence in developmental toxicity studies for either embryotoxic or teratogenic effects in mice or rats given triethylene glycol by gavage. Maternal toxicity was seen as reduced body weight and food consumption, increased water consumption, and increased relative kidney weight with rats, and clinical signs and increased relative kidney weight with mice. There was no histologic evidence of damage to the kidneys in either species. The no-observable effects doses for maternal toxicity were 1125 mg/kg/day for rats and 5630 mg/kg/day for mice. Minor fetotoxicity (reduced fetal body weights and increased skeletal variations) was present with doses of 11260 mg/kg/day for rats and 5630 and 11260 mg/kg/day for mice. The no-observable effect dose for fetotoxicity was 5630 mg/kg/day for rats and 563 mg/kg/day for mice. A chronic dietary feeding study of diethylene glycol with rats showed mild kidney injury at 1%, while concentrations of 2% and 4% caused more marked kidney injury. In addition, at 2% and 4% of diethylene glycol in the diet, some rats developed benign papillary tumors in the urinary bladder. These have been attributed to the presence of urinary bladder calcium oxalate stones. No evidence for carcinogenicity was found with a chronic skin-painting study with diethylene glycol in mice. The absence of a direct chemical carcinogenic effect accords with the results in *in vitro* genotoxicity studies, which show that it does not produce mutagenic or clastogenic effects. A feeding study employing very high concentrations of diethylene glycol in the diet failed to produce any teratogenic effects. In a mouse continuous breeding study with large doses of diethylene glycol in drinking water, there was evidence for reproductive toxicity at 3,5% (equivalent to 6,1 g/kg/day) as reduced number of litters, live pups per litter, and live pup weight. No such effects were seen at 1,75% (approximately 3,05 g/kg/day). The relevance of these very high dosages to human health is uncertain. Pregnant rats receiving undiluted diethylene glycol by gavage over the period of organogenesis had toxic effects at 4.0 and 8.0 ml/kg/day as mortality, decreased body weight, decreased food consumption, increased water consumption, and increased liver and kidney weights. Fetotoxicity was seen only at these maternally toxic dosages. Decreased fetal body weights occurred at 8.0 ml/kg/day, and increased skeletal variants at 4.0 and 8.0 ml/kg/day. No embryotoxic or teratogenic effects were seen. Neither maternal toxicity nor fetotoxicity occurred at 1.0 ml/kg/day. In a study with mice also receiving undiluted diethylene glycol over the period of organogenesis, maternal toxicity occurred at 2.5 and 10.0 ml/kg/day, but not at 0.5 ml/kg/day. Definitive developmental toxicity was not seen in this species. An acute nose-only exposure (4hr) to a respirable aerosol (2.83-2.52 microns) of diethylene glycol at a mean concentration of 5.08 mg/l produced no signs of toxicity or irritancy. Based upon animal data, diethylene glycol monobutyl ether may cause hemolysis of red blood cells leading to secondary kidney and possible liver damage. However, human appear to be resistant to this effect.

11.3. ADDITIONAL INFORMATION

No additional toxicity information currently available.

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12. ECOLOGICAL INFORMATION

12.1. PERSISTENCE AND DEGRADABILITY

Partial information may be available, call your OPTIMAL CHEMICALS Sales or Customer Service Representative.

12.2. ENVIRONMENTAL RISKS

Partial information may be available, call your OPTIMAL CHEMICALS Sales or Customer Service Representative.

12.3. OTHER INFORMATION

No information currently available.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD(S)

Incinerate in a furnace where permitted under national and local regulations.

Dispose in accordance with all applicable national and local environmental regulations.

Empty containers should be recycled or disposed of through an approved waste management facility. At very low concentrations in water, this product is biodegradable in a biological wastewater treatment plant. Disposal methods identified are for the product as sold. For proper disposal of used material, an assessment must be completed to determine the proper and permissible waste management options permissible under applicable rules, regulations and/or laws governing your location.

14. TRANSPORT INFORMATION

TRANSPORT CLASSIFICATION

ADR/RID:	This product is not submitted to the ADR regulations. MONT-BLANC: OK
HAZCHEM:	2(Z)
IMDG	This product is not submitted to the IMO regulations.
MARPOL:	ANNEX II: Not evaluated at this moment. ANNEX III: Not classified.
ICAO:	This product is not submitted to the ICAO regulations.

15. REGULATORY INFORMATION

15.1. HAZARD CLASSIFICATION

DANGER SYMBOL(S):	Xi
RISK PHRASES	36
SAFETY PHRASES	--
LABEL TEXT	Irritating to eyes. FOR INDUSTRIAL USE ONLY
CONTAINS	--

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15.2. REGULATORY DATA

All other national and local regulations, if applicable to the use, transport or disposal of this product, should be observed.

15.3. CHEMICAL INVENTORY INFORMATION

EINECS

All components in this product are in compliance with EINECS.

TSCA

All components of this product are on the TSCA inventory or are exempt from TSCA Inventory requirements.

DSL

The components of this product are on the DSL or are exempt from reporting under the New Substances Notification Regulations.

16. OTHER INFORMATION

RECOMMENDED USES AND RESTRICTIONS

Please consult the relevant product and/or application information for this product.

FURTHER INFORMATION

There may be additional information on this product, which may be obtained by calling your OPTIMAL CHEMICALS Sales or Customer Service Representative.

OPTIMAL CHEMICALS believe that the information contained herein is current as of the date of the Chemical Safety Data Sheet. Since the use of the information and these opinions and the conditions of use of this product are not within the control of OPTIMAL CHEMICALS, it is the user's obligation to determine the condition of safe use of the products.