MATERIAL SAFETY DATA SHEET

MSDS No.: N/A

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

A. Product Name: MOBIL VACUOLINE 548
Product Description: Base Oil and Additives
Product Code: 201560504080, 608489-87

B. Recommended Use of Product and Restrictions in Use.
Recommended use of the product: Lubricants
Restrictions in Use: This product is not recommended for any industrial, professional or consumer use other than the identified uses above.

C. Manufacturer/Supplier information:
For details contact
Mobil Korea Lube Oil Inc.
Level 22, Seoul Square bd., 416
Hangang-daero, Jung-gu,
Seoul Republic of Korea

Emergency Response Number	00-308-13-2549 / +1-703-527-3887
Supplier General Contact	82-2-750-8700
FAX	82-2-750-8751

SECTION 2 HAZARDS IDENTIFICATION

This material is not hazardous according to regulatory guidelines (see (M)SDS Section 15).

A. Hazard Classification: Not Applicable

B. Label Elements Including Precautionary Statements: Not Applicable

Hazard Pictogram: Not Applicable

Signal Word: Not Applicable

Hazard Statements: Not Applicable

Precautionary Statements: Not Applicable

C. Other Hazards Which Are Not Included In The Classification Criteria

Physical / Chemical Hazards

No significant hazards.

Health Hazards

High-pressure injection under skin may cause serious damage. Excessive exposure may result in eye, skin, or respiratory irritation.

Environmental Hazards

No significant hazards.

NFPA Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0
HMIS Hazard ID:	Health:	0	Flammability:	1	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

This material is defined as a mixture.

Hazardous Substance(s) or Complex Substance(s) required for disclosure

Name	Other Name	CAS # or Id. No.	Concentration*	GHS Hazard Codes
2-PENTANOL, 4-METHYL-, HYDROGEN PHOSPHORODITHIOATE, ZINC SALT	-	KE-24722	0.1 - < 1%	H303, H315, H318, H401, H411
NAPHTHALENESULFONIC ACID, DINONYL-, CALCIUM SALT	-	KE-11963	0.1 - < 1%	H315, H319(2A), H317

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 4 FIRST AID MEASURES

A. Eye Contact

Flush thoroughly with water. If irritation occurs, get medical assistance.

B. Skin Contact

Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be

evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

C. Inhalation

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

D. Ingestion

First aid is normally not required. Seek medical attention if discomfort occurs.

E. Other note to physician

None

Acute and Delayed Symptoms/Effects

See Toxicological Section

Pre-existing Medical Conditions Which May Be Aggravated By Exposure

None.

SECTION 5 FIRE FIGHTING MEASURES

Flammability Properties

Flash Point [Method]: >265° C (509° F) [ASTM D-92]
Autoignition Temperature: N/D
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0

A. Suitable (and Unsuitable) Extinguishing Media

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

B. Specific Hazards arising from the Chemical

Unusual Fire Hazards: None

Hazardous Combustion Products: Aldehydes, Incomplete combustion products, Oxides of carbon, Smoke, Fume, Sulfur oxides

C. Special Protective Equipment and Precautions for Fire-fighters

Evacuate area. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces

and to protect personnel.

SECTION 6 ACCIDENTAL RELEASE MEASURES

A. Personal Precautions and Protective Equipment

Avoid contact with spilled material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

B. Environmental Precautions and Protective Procedure

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.
Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

C. Methods and Materials for Containment and Cleaning Up

Land Spill: Stop leak if you can do it without risk. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Confine the spill immediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbents. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

SECTION 7 HANDLING AND STORAGE

A. Precautions for Safe Handling

Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). When the material is handled in bulk, an electrical spark could ignite any flammable vapors from liquids or residues that may be present (e.g., during switch-loading operations). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator.

B. Conditions for Safe Storage

The type of container used to store the material may affect static accumulation and dissipation. Do not store in open or unlabelled containers. Keep away from incompatible materials.

SECTION 8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

A. Exposure Limit Values, Biological Limit Values

Exposure limits/standards for materials that can be formed when handling this product: When mists/aerosols can occur the following is recommended: 5 mg/m^3 - ACGIH TLV (inhalable fraction).

No biological limits allocated.

B. Appropriate Engineering Controls

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:
No special requirements under ordinary conditions of use and with adequate ventilation.

C. Personal Protective Equipment

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:
No special requirements under ordinary conditions of use and with adequate ventilation.
Particulate

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and

breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:
No protection is ordinarily required under normal conditions of use. Nitrile,Viton

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:
No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

Environmental Controls

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

A. Appearance
Physical State: Liquid
Color: Brown
B. Odor: Characteristic
C. Odor Threshold: N/D
D. pH: N/A
E. Melting Point: N/A
Freezing Point: N/D
F. Initial Boiling Point / Range: > 316° C (600° F)
G. Flash Point [Method]: >265° C (509° F) [ASTM D-92]
H. Evaporation Rate (n-butyl acetate = 1): N/D
I. Flammability (Solid, Gas): N/A
J. Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
K. Vapor Pressure: < 0.013 kPa (0.1 mm Hg) at 20 ° C
L. Solubility in Water: Negligible
M. Vapor Density (Air = 1): > 2 at 101 kPa
N. Relative Density (at 15 ° C): 0.92
O. Log Pow (n-Octanol/Water Partition Coefficient): > 3.5
P. Autoignition Temperature: N/D
Q. Decomposition Temperature: N/D
R. Viscosity: 676.9 cSt (676.9 mm2/sec) at 40 ° C | 36.9 cSt (36.9 mm2/sec) at 100° C

S. Molecular Weight: N/D

Other Information

Pour Point: -9° C (16° F)
DMSO Extract (mineral oil only), IP-346: < 3 %wt

SECTION 10 STABILITY AND REACTIVITY

A. Chemical Stability and Possibility of Hazard Reactions
Chemical Stability: Material is stable under normal conditions.
Possibility of Hazardous Reactions: Hazardous polymerization will not occur.

B. Conditions to Avoid: Excessive heat. High energy sources of ignition.

C. Incompatible Materials: Strong oxidizers

D. Hazardous Decomposition Products: Material does not decompose at ambient temperatures.

SECTION 11 TOXICOLOGICAL INFORMATION

A. Information on Likely Routes of Exposure
No data available

B. Information on Health Hazards
Acute Toxicity (Inhalation):
Product
No end point data for material. Minimally Toxic. Based on assessment of the components.
Inhalation Irritation: No end point data for material. Negligible hazard at ambient/normal handling temperatures.
Acute Toxicity (Ingestion):
Product
No end point data for material. Minimally Toxic. Based on assessment of the components.
Component
2-PENTANOL, 4-METHYL-, HYDROGEN PHOSPHORODITHIOATE, ZINC SALT Oral Lethality: LD50 2230 mg/kg (Rat)
Acute Toxicity (Dermal)
Product
No end point data for material. Minimally Toxic. Based on assessment of the components.
Skin corrosion/irritation
Product

No end point data for material. Negligible irritation to skin at ambient temperatures. Based on assessment of the components.

Serious eye damage/irritation

Product

No end point data for material. May cause mild, short-lasting discomfort to eyes. Based on assessment of the components.

Respiratory sensitization

Product

No end point data for material. Not expected to be a respiratory sensitizer.

Skin sensitization

Product

No end point data for material. Not expected to be a skin sensitizer. Based on assessment of the components.

Carcinogenicity

Product

No end point data for material. Not expected to cause cancer. Based on assessment of the components.

Germ cell mutagenicity

Product

No end point data for material. Not expected to be a germ cell mutagen. Based on assessment of the components.

Reproductive toxicity

Product

No end point data for material. Not expected to be a reproductive toxicant. Based on assessment of the components.

Specific target organ toxicity - single exposure

Product

No end point data for material. Not expected to cause organ damage from a single exposure.

Specific target organ toxicity - repeat exposure

Product

No end point data for material. Not expected to cause organ damage from prolonged or repeated exposure. Based on assessment of the components.

Aspiration hazard

Product

Data available. Not expected to be an aspiration hazard. Based on physico-chemical properties of the material.

Other Information

For the product itself:

Component concentrations in this formulation would not be expected to cause skin sensitization, based on tests of the components, this formulation, or similar formulations.

Contains:

Base oil severely refined: Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitizing in test animals.

IARC Classification:
The following ingredients are cited on the lists below: None.

--REGULATORY LISTS SEARCHED--
1 = IARC 1 2 = IARC 2A 3 = IARC 2B

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data for the material, components of the material, or for similar materials, through the application of bridging principals.

A. Ecotoxicity

Material -- Not expected to be harmful to aquatic organisms.

B. Persistence and Degradability

Biodegradation:

Base oil component -- Expected to be inherently biodegradable

C. Bioaccumulation

Base oil component -- Has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

D. Mobility

Base oil component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

E. Other adverse effects: Not applicable

SECTION 13 DISPOSAL CONSIDERATIONS

A. Disposal methods

Disposal recommendations based on material as supplied. Disposal must be in accordance with current

applicable laws and regulations, and material characteristics at time of disposal.

B. Disposal precautions

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products. Protect the environment. Dispose of used oil at designated sites. Minimize skin contact. Do not mix used oils with solvents, brake fluids or coolants.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

REGULATION ON SHIP-TRANSPORTATION AND STORAGE OF DANGEROUS SUBSTANCES (SEA (IMDG)) Not Regulated for Sea Transport according to IMDG-Code

A. UN Number: Not applicable
B. Proper Shipping Name: Not applicable
C. Hazard Class & Division: Not applicable
D. Packing Group: Not applicable
E. Marine Pollutant: Not applicable
F. Special Precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance: Not applicable

LAND (ADR/RID) Not Regulated for Land Transport

A. UN Number: Not applicable
B. Proper Shipping Name: Not applicable
C. Hazard Class & Division: Not applicable
D. Packing Group: Not applicable
E. Marine pollutants: Only applicable for sea transport
F. Special Precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance: Not applicable

AIR (IATA) Not Regulated for Air Transport

A. UN Number: Not applicable
B. Proper Shipping Name: Not applicable
C. Hazard Class & Division: Not applicable
D. Packing Group: Not applicable
E. Marine pollutants: Only applicable for sea transport
F. Special Precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance: Not applicable

SECTION 15 REGULATORY INFORMATION

This material is not considered hazardous according to Korean GHS classification criteria.

Regulatory Status and Applicable Laws and Regulations

A. Industrial Safety & Health Act : Prohibited, Subject to an Approval for Manufacturing and Controlled Hazardous Substances: None.

B. Chemicals Control Act : Toxic, Banned and Restricted Toxic Chemicals, Authorization substances, Accidental Release Prevention Substances and Priority Existing Chemicals to Registration: None.

C. ACT ON THE SAFETY CONTROL OF HAZARDOUS SUBSTANCES: Not applicable.

D. Waste Control Act: Waste Oil is a designated waste.

E. Other requirements in domestic and other countries

Listed or exempt from listing/notification on the following chemical inventories : AIIC, DSL, ENCS, IECSC, KECI, PICCS, TCSI, TSCA

SECTION 16 OTHER INFORMATION

A. Information sources and references: Sources of information used in preparing this SDS included one or more of the following: results from in house or supplier toxicology studies, CONCAWE Product Dossiers, publications from other trade associations, such as the EU Hydrocarbon Solvents REACH Consortium, U.S. HPV Program Robust Summaries, the EU IUCLID Data Base, U.S. NTP publications, and other sources, as appropriate.

B. The first Issuing date: 310ct2007

C. Revision number and latest revision date
Revision Number:1
Revision Date: 16 Dec 2021

D. Others

N/D = Not determined, N/A = Not applicable

KEY TO THE H-CODES CONTAINED IN SECTION 3 OF THIS DOCUMENT (for information only):

H303: May be harmful if swallowed; Acute Tox Oral, Cat 5
H315: Causes skin irritation; Skin Corr/Irritation, Cat 2

H317: May cause allergic skin reaction; Skin Sensitization, Cat 1
H318: Causes serious eye damage; Serious Eye Damage/Irr, Cat 1
H319(2A): Causes serious eye irritation; Serious Eye Damage/Irr, Cat 2A
H401: Toxic to aquatic life; Acute Env Tox, Cat 2
H411: Toxic to aquatic life with long lasting effects; Chronic Env Tox, Cat 2

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:MSDS reformatted and Implementation of new GHS adoption according to regulation requirements.

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