Material Safety Data Sheet

Product	Doosan Gear Oil		
List No.	Issuing date	Last revised date	Department
LB2778	2012-11-30	2018-01-01	Finished Lubricants R&D Team

1. Identification of the substance/mixture and of the company/undertaking

1) Product identifier

- Doosan Gear Oil

2) Relevant identified uses of the substance or mixture and uses advised against

- Relevant identified uses : (Lubricants and additives)
- Uses advised against : Do not use for any other purpose.

3) Supplier information

○ **Manufacturer information**

- Company name [Manufacture] : GS Caltex Corporation
- Address : GS Tower, 508, Nonhyeon-ro, Gangnam-gu, Seoul, Korea
- Emergency telephone number : +82-2-1899-5145

2. HAZARD IDENTIFICATION

1) Hazard classification

Hazardous to the aquatic environment, long-term (chronic) Chronic 3

2) Allocation label elements

○ **Hazard pictograms**

- Not applicable

○ **Signal word**

- Not applicable

○ **Hazard statements**

- H412 Harmful to aquatic life with long lasting effects.

○ **Precautionary statements**

1) Prevention

- P273 Avoid release to the environment.

2) Response

- Not applicable

3) Storage

- Not applicable

4) Disposal

- P501 Dispose of contents/container to ....

3) Other hazards

○ **Product NFPA Level : Health , Flammability , Reactivity**

(※ 0-Lack, 1-Low, 2-Moderate, 3-High, 4-Very High)

※ Chemical NFPA Level.

- Distillates (petroleum), hydrotreated heavy paraffinic : Health=1, Flammable=1, Reaction=0
- Polyisobutylene : Health=1, Flammable=1, Reaction=0
- Business Secret1 : Health=0, Flammable=0, Reaction=0
- tert-Alkyl(C=12-14) amines : Health=1, Flammable=0, Reaction=0
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Health=1, Flammable=0, Reaction=0

3. Composition/Information on ingredients

Chemical name	Trade names and Synonyms	CAS No.	EC No.	Contain Ratio(%)
Distillates (petroleum), hydrotreated heavy paraffinic		64742-54-7	265-157-1	65 ~ 75
Polyisobutylene		9003-27-4		20 ~ 30
Business Secret1				2 ~ 5
tert-Alkyl(C=12-14) amines		68955-53-3	273-279-1	0.1 ~ 0.5
2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole		89347-09-1	289-493-3	0.01 ~ 0.2

4. FIRST AID MEASURES

1) Following eye contact

- Seek immediate medial assistance.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.

2) Following skin contact

- Seek immediate medial assistance.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.

3) Following inhalation

- Move to fresh air.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.

4) Following ingestion

- Seek immediate medial assistance.

5) Advice to physician

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. FIRE FIGHTING MEASURES

1) Suitable (and unsuitable) extinguishing media

○ **Suitable extinguishing media**

- Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material.
- Use dry sand or earth to smother fire.
- Dry chemical.
- Water spray.
- Regular foam.
- CO2.

○ Unsuitable extinguishing media

- High-pressure water.

2) Special hazards arising from the substance or mixture

- Containers may explode when heated.
- Some may burn but none ignite readily.
- Fire may produce irritating and/or toxic gases.

3) Special protective equipment for firefighters

- Evacuate area and fight fire from a safe distance.
- Substance may be transported hot.
- Dike fire-control water for later disposal; do not scatter the material.
- Move containers from fire area if you can do it without risk.
- Fire involving Tanks: Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Fire involving Tanks: ALWAYS stay away from tanks engulfed in fire.

6. ACCIDENTAL RELEASE MEASURES

1) Health considerations and protective equipment

- Clean up spills immediately, observing precautions in Protective Equipment section.
- Do not touch or walk through spilled material.
- Stop leak if you can do it without risk.
- Prevent dust cloud.
- Please note that materials and conditions to be avoided.

2) Environmental precautions

- Keep out of waterways.
- Prevent entry into waterways, sewers, basements or confined areas.

3) For cleaning up

- Absorb spill with inert material (e.g., dry sand or earth), then place in a chemical waste container.
- Absorb the liquid and scrub the area with detergent and water.
- Large Spill: Dike far ahead of liquid spill for later disposal.
- With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
- Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.
- Small Spill: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.

7. HANDLING AND STORAGE

1) Precautions for safe handling

- Follow all MSDS/label precautions even after container is emptied because they may retain product residues.
- Please note that materials and conditions to be avoided.
- Handling refer to engineering control/personal protection section.
- CAUTION: High temperature.

2) Conditions for safe storage (including any incompatibilities)

- Not available

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

1) Chemical exposure limits, Biological exposure standard

○ Occupational exposure limits (Domestic)

- Distillates (petroleum), hydrotreated heavy paraffinic : TWA Not applicable, STEL Not applicable
- Polyisobutylene : TWA Not applicable, STEL Not applicable
- Business Secret1 : TWA Not applicable, STEL Not applicable
- tert-Alkyl(C=12-14) amines : TWA Not applicable, STEL Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : TWA Not applicable, STEL Not applicable

○ Occupational exposure limits (ACGIH)

- Distillates (petroleum), hydrotreated heavy paraffinic : TWA 5 mg/m3, STEL Not applicable
- Polyisobutylene : TWA Not applicable, STEL Not applicable
- Business Secret2 : TWA Not applicable, STEL Not applicable
- tert-Alkyl(C=12-14) amines : TWA Not applicable, STEL Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : TWA Not applicable, STEL Not applicable

○ Biological limit values

- Distillates (petroleum), hydrotreated heavy paraffinic : Not applicable
- Polyisobutylene : Not applicable
- Business Secret3 : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable

2) Appropriate engineering controls

- Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

3) Personal protection equipment

○ Respiratory protection

- If high frequency of use or exposure, wear air respirator.
- Wear breathing protection, which needs a confirmation from the Korea Occupational Safety and Health Agency.

○ Eye protection

- Wear suitable protective goggles and face shields.
- Wear face shield to protect eyes from scattering dust or hazardous liquid.
- Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

○ Hand protection

- Wear insulated gloves.
- Wear suitable protective gloves.
- Wear Non-moisture permeable chemical resistance protective gloves(latex, nitrile rubber, PVC) for prevent skin contact.

○ **Body protection**

- Wear suitable protective clothing.
- When contact is likely wear chemical resistant, oil and grease resistant, non-moisture permeable shoes and clothes.

9. PHYSICAL AND CHEMICAL PROPERTIES

Item	Input Value
Apperance	Clear, light brown liquid
Smell	a specific smell of Hydrocarbon
Smell Threshold	No Data
pH	Notapplicable
Melting/Freezing Poing	No Data
Boilling Point	330~500 ℃
Flash Point	242 ℃
Evaporating Rate	No Data
Flammability	No Data
Explosibility Range	No Data
Steam Pressure	<0.1 kPa (at 20℃)
Solubility	No Data
Vapor Density	No Data
Specific Gravity	0.89
Distribution Coefficient	No Data
SelfIgnition Temperature	No Data
Pyrolysis Temperature	No Data
Viscosity	25.5 mm2/s (at 100℃)
Molecular Weight	No Data

10. STABILITY AND REACTIVITY

1) Stability and hazardous reactivity

- Containers may explode when heated.
- Some may burn but none ignite readily.
- Fire may produce irritating and/or toxic gases.

2) Conditions to avoid

- Heat.

3) Incompatible materials

- Not available

4) Hazardous decomposition products

- Irritating and/or toxic gas.

11. TOXICOLOGICAL INFORMATION

1) Exposure route information

○ **Inhalation**

- After inhalation: No data

○ **Skin Contact**

- Following skin contact: No data

○ **Eye Contact**

- After eye contact: No data

○ **Ingestion**

- After ingestion: No data

2) Health hazard information

○ **Acute toxicity**

*** Oral - PRODUCT : Not applicable (ATEMix > 2,000 mg/kg)**

- Distillates (petroleum), hydrotreated heavy paraffinic : LD50 >15000 mg/kg Species : Rat
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : LD50 > 5,000 mg/kg Rat
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : LD50 >10000 mg/kg Species : Rat

*** Dermal - PRODUCT : Not applicable (ATEMix > 2,000 mg/kg)**

- Distillates (petroleum), hydrotreated heavy paraffinic : LD50 >5000 mg/kg Species : Rabbit
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : LD50 > 5,000 mg/kg Rat
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : LD50 >2000 mg/kg Species : Rabbit

*** Inhalation(Gas) - PRODUCT : Not applicable**

- Distillates (petroleum), hydrotreated heavy paraffinic : No data
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : No data
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

*** Inhalation(Vapour) - PRODUCT : Not applicable (ATEMix > 20 mg/L)**

- Distillates (petroleum), hydrotreated heavy paraffinic : No data
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : LC50 > 17.9 mg/L Rat
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

*** Inhalation(Dust, mist) - PRODUCT : Not applicable (ATEMix > 5 mg/L)**

- Distillates (petroleum), hydrotreated heavy paraffinic : LC50 > 5.53 mg/L 4h Rat
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : No data
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ **Skin corrosion/Irritation**

- Distillates (petroleum), hydrotreated heavy paraffinic : Rabbit - slightly irritating

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : The test substance is considered irreversible corrosive to the skin of rabbits. (Primary Irritaiton Index: 7.3, Erythema: 4, Edema: 3.3; 49CFR, Section 173.240(a),(2))

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Serious eye damage/irritation

- Distillates (petroleum), hydrotreated heavy paraffinic : Rabbit, not irritating, OECD TG 405 GLP (Read-across CAS No. 64742-53-6)

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : The test substance was found to be corrosive to the eyes. (Cornea: 37, Conjunctivae(Chemosis): 19.2, Conjunctivae(Redness): 4.2; GLP)

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Respiratory sensitization

- Distillates (petroleum), hydrotreated heavy paraffinic : No data

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : No data

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Skin sensitization

- Distillates (petroleum), hydrotreated heavy paraffinic : Not sensitising (Guinea Pig)

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : The test substance produced delayed contact hypersensitivity in guinea pigs. (Modified Buehler test, GLP)

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Carcinogenicity

- Distillates (petroleum), hydrotreated heavy paraffinic : EU CLP:1B The classification as a carcinogen need not apply if it can be shown that the sybstance contains less than 3% DMSO extract as measure by IP 346

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : No data

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Germ cell mutagenicity

- Distillates (petroleum), hydrotreated heavy paraffinic : CHO cell - Negative

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : In vivo - Positive (genotoxicity and mutation test)

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Reproductive toxicity

- Distillates (petroleum), hydrotreated heavy paraffinic : Reproductive performance was not adversely affected at any dose level evaluated. (Rat)

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : The maternal NOAEL of test substance is 5 mg/kg/day. Adverse clinical observations, skin reactions and reductions in body weights and feed consumption were observed in the 15 and/or 45 mg/kg/day dose

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Specific target organ toxicity (single exposure)

- Distillates (petroleum), hydrotreated heavy paraffinic : No systemic effects were observed

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : Necropsy of the decedents revealed gastro-intestinal changes: redden ed intestines and clear fluid in the stomach; carcass autolysis was also noted. (Rat(f/m), Oral LD50=552 mg/kg bw; OECD TG 401, GLP

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Specific target organ toxicity (repeated exposure)

- Distillates (petroleum), hydrotreated heavy paraffinic : No systemic effects were observed

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : The histopathological changes seen in the nasal cavities, the NOEL for a four-week nose-only inhalation exposure of test substance was 19 mg/㎥. (Rat(f/m), OECD TG 412, GLP)

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ Aspiration hazard

- Distillates (petroleum), hydrotreated heavy paraffinic : No data

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : No data

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

12. ECOLOGICAL INFORMATION

1) Aquatic toxicity

○ Fish

- Distillates (petroleum), hydrotreated heavy paraffinic : LC50 > 100 mg/L Fish(Pimephales promelas)

- Polyisobutylene : LC50 > 5600 mg/L Fish(Oncorhynchus mykiss)

- tert-Alkyl(C=12-14) amines : ECHA LC50 1.3 ㎎/ℓ 96 hr Oncorhynchus mykiss(NOEC=0.56mg/L, static (OECD Guideline 203,GLP))

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : LC50=0.000189 mg/l(96h)

○ Crustacean

- Distillates (petroleum), hydrotreated heavy paraffinic : LC50 > 10000 mg/L Aquatic invertebrates(Gammarus pulex)

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : ECHA EC50 0.26 ㎎/ℓ ~ 0.24 ㎎/ℓ 48 hr Daphnia magna(Static)

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : LC50=0.000206 mg/l(48h)

○ Acuatic algae

- Distillates (petroleum), hydrotreated heavy paraffinic : NOEC >= 100 mg/L Aquatic algae(Pseudokirchnerella subcapitata)

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : ECHA ErC50 0.44 ㎎/ℓ 72 hr Selenastrum capricornutum(NOErC=0.05mg/L, static, OECD Guideline 201, GLP)

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : EC50=0.002 mg/l(96h)

2) Persistence and degradation

○ Persistence

- Distillates (petroleum), hydrotreated heavy paraffinic : log Kow 6

- Polyisobutylene : No data

- tert-Alkyl(C=12-14) amines : HSDB 2.9 log Kow

- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Log Kow= 1.72 - 2.94

○ Degradation

- Distillates (petroleum), hydrotreated heavy paraffinic : No data
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : ca. 22% (28 d; OECD Guideline 301 D; 1994)
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

○ biodegradation

- Distillates (petroleum), hydrotreated heavy paraffinic : BOD 77 %
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : 22% 28 day
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

3) Bioaccumulative potential

- Distillates (petroleum), hydrotreated heavy paraffinic : No data
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : 31.94
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : BCF=15.71

4) Mobility in soil

- Distillates (petroleum), hydrotreated heavy paraffinic : No data
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : Koc=10232.9299228075
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : 2055000

5) Hazard to the ozone laye

- Distillates (petroleum), hydrotreated heavy paraffinic : Not applicable
- Polyisobutylene : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable

6) Other adverse effects

- Distillates (petroleum), hydrotreated heavy paraffinic : Fish: NOEC(Pimephales promelas) >5000 mg/L/7d
- Polyisobutylene : No data
- tert-Alkyl(C=12-14) amines : Fish(Oncorhynchus mykiss) NOErC(96d) = 0.078 mg/L. (OECD Guideline 210, GLP)
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : No data

13. DISPOSAL CONSIDERATIONS

1) Disposal methods

- Every commercial waste producer shall either treat wastes generated from his/her place of business by him/herself or commission the treatment of such wastes to a person who has license for a waste treatment business under Article 26(3), a person who recycles of such wastes under Article 44(2), a person who has installed and operates a waste disposal facility under Article 4 or 5, a person who has completed the registration of a business of discharging wastes into the sea under Article 18 of the Marine Environment Management Act.

2) Precautions (including disposal of contaminated container of package)

- Wear an appropriate Personal protection. (See Exposure Controls/Personal Protection section.)

- Do not allow spill material to enter sewers, storn water drains, soil, etc.
- Empty containers recycled under environmental laws.
- Empty containers may rupture when pressured.
- Empty containers may explode and residues can be ignited when pressured, cut, weld, heated.

14. TRANSPORT INFORMATION

1) UN No.

- Not applicable

2) Proper shipping name

- Not applicable

3) Class or division

- Not applicable

4) Packing group

- Not applicable

5) Marine pollutant

- Not applicable

6) Special safety response for transportation or transportation measure

- Types of Emergency Measures in Case of Fire : Not applicable
- Types of Emergency Measures in Leakage : Not applicable
- This product is not regulated for carriage according to ADR/RID, ADN, IMDG, ICAO/IATA.

15. REGULATORY INFORMATION

1) Occupational Safety and Health Act in Korea - PRODUCT :

- Polyisobutylene : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- Distillates (petroleum), hydrotreated heavy paraffinic : Not applicable
- Business Secret : No data

2) Toxic Chemical Control Act in Korea - PRODUCT :

- Polyisobutylene : Existing Commercial Chemical Substances
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Existing Commercial Chemical Substances
- tert-Alkyl(C=12-14) amines : Existing Commercial Chemical Substances
- Distillates (petroleum), hydrotreated heavy paraffinic : Existing Commercial Chemical Substances
- Business Secret : No data

3) Safety Control of Dangerous Substances Act in Korea - PRODUCT :

- Polyisobutylene : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- Distillates (petroleum), hydrotreated heavy paraffinic : Not applicable
- Business Secret : No data

4) Wastes Control Act in Korea - PRODUCT : 지정 폐기물

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5) Other regulations in KOREA and Abroad regulations

○ U.S.A. management information(OSHA regulation)

- Polyisobutylene : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- Distillates (petroleum), hydrotreated heavy paraffinic : Not applicable
- Business Secret : No data

○ U.S.A. management information(CERCLA regulation)

- Polyisobutylene : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- Distillates (petroleum), hydrotreated heavy paraffinic : Not applicable
- Business Secret : No data

○ EU Classification (CLASSIFICATION)

- Polyisobutylene : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- Distillates (petroleum), hydrotreated heavy paraffinic : Carc. 1B
- Business Secret : No data

○ EU Classification (Risk Phrases)

- Polyisobutylene : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- Distillates (petroleum), hydrotreated heavy paraffinic : H350
- Business Secret : No data

○ EU Classification (Safety Phrases)

- Polyisobutylene : Not applicable
- 2,5-Bis(tert-nonyldithio)-1,3,4-thiadiazole : Not applicable
- tert-Alkyl(C=12-14) amines : Not applicable
- Distillates (petroleum), hydrotreated heavy paraffinic : S:53-45
- Business Secret : No data

16. OTHER INFORMATION

1) Reference

- The information contained herein is believed to be accurate. It is provided independently of any sale of the product for purpose of hazard communication. It is not intended to constitute performance information concerning the product. No express warranty, or implied warranty of merchantability or fitness for a particular purpose is made with respect to the product or the information contained herein.

- This Safety Data Sheet was compiled with data and information from the following sources: KOSHA, NITE, ESIS, NLM, SIDS, IPCS

2) Print date

- 2012-11-30

3) Revision date

○ Number of revised

- 5

○ Date of last revision

- 2018-01-01

○ Last Revision History

- 개정정보없음

4) Other

- This information is based on current available databases to protect the health, environment and safety of workers.