S-ENERGY

SINOPEC

# Marine Lubricants

# PREFACE

Lubricant Company, Sinopec Corp. (Sinopec Lubricant Company for short), founded on May 29th, 2002 in Beijing, is the largest high-tier lubricant manufacturer and marketer in China. With 5 regional sales center across China, many more sales subsidiaries all over the world, 11 lube oil & grease blending and manufacturing branches domestic and 1 branch company in Singapore,which has the produce ability of 80,000 tons per year, as well as two independent R&D Centers in Beijing and Shanghai, It integrates the function of lubricant manufacturing, research, storage, transportation, sales and service.

In the process of development, Sinopec Lubricant Company has gradually nurtured its unique brand culture and strategy on international development. Insisting in building a high-tech, high-quality, international brand image, Sinopec lubricants have entered into more than 50 countries and regions such as Australia, New Zealand, Malaysia, etc. Service network of marine oil have been set up in Singapore, Hongkong, The United Arab Emirates, South Africa,Greece, Netherland, and Houston of Unite States. In 2012, the brand value of "Great wall Lubricant" boosted 22.3 billion RMB, ranked 52ed in China's most valuable brand list in 2012 and 1st in Chinese lubricant Industry.

Sinopec Lubricant Company in step with the international ships manufacturing and shipping industry development, developed marine trunk piston engine oil, marine cylinder oil and marine system oil suitable for the ship which adapt heavy fuel oil and big power engine. Follows the scientific research development procedure, these products passed engine rig test and field test, and got the approval by famous diesel engine manufactures e.g. MAN, WARTSILA, MAK and DAIHATSU etc..

Sinopec Lubricant Company is able to provide all kinds of lubricants for marine auxiliary machines. These products mainly include gear oil, hydraulic oils, turbine oils, air compressor oils, refrigerator compressor oils, greases and heat transfer oils etc.. Sinopec Lubricant Co. can provide complete lubrication project for every kind of ships.

With the domestic and foreign ship owners’ trust and support, Sinopec Lubricant Company will make SINOPEC (Great Wall) Lubricant to be world famous brand.

**Marine Engine Oil**



**Marine Auxiliary Machines Oil**

**Appendix**

# Marine Cylinder Oil 5070S

SINOPEC marine cylinder oil 5070S is prepared from high-quality base oil with super performance additives. This unique formulation has been specifically developed for latest generation engines，it is recommended for the cylinder lubrication of all kinds of low speed two stroke crosshead diesel engines.

**Advantages:**

- High viscosity index, meet the requirements of latest generation engine designs operating at high-pressure and high-temperature.
- Excellent capability to neutralize acid outgrowths produced in combusting of poor quality fuels, protecting engine from acid corrosion.
- Excellent anti-wear performance to reduce the friction and wear-off of metallic components and extend the life of engine parts.
- Outstanding detergency and dispersancy to prevent carbon deposit on cylinder ring groove and cylinder liner and ensure the cleanness of engine combustion chamber.
- Good diffusivity performance to drive oil quickly reaching and spreading out over the steel surface to form oil films to reduced liner and ring wear-off.
- Excellent integrated performance to provide the engine more comprehensive protection.

**Recommended Application:**

- Fit for lubrication of various low speed two stroke crosshead diesel engine cylinders.
- The best choice cylinder oil for marine low speed cross-head diesel engine cylinders using residual fuel oil with sulfur content over 1.0%.

**Approval Informations:**

- SINOPEC marine cylinder oil 5070S has been approved by MAN through 4,000 hrs field test in VLCC equipped with MAN 6S90ME-C diesel engine.

**Typical Properties**

| Item | SINOPEC Marine Cylinder Oil 5070S |
|---|---|
| SAE Grade | 50 |
| Viscosity@100℃，$mm^2/s$ | 19.00 |
| Viscosity Index | 98 |
| Flash Point (COC), ℃ | 268 |
| Pour Point, ℃ | -18 |
| TBN，mgKOH/g | 70.2 |

# Marine Cylinder Oil 5070

SINOPEC Marine cylinder oil 5070 is prepared from highly refined paraffinic mineral base stock blending with selected super performance additives.

**Advantages:**

- High BN and alkalinity retention can neutralize acid outgrowths produced in combusting of poor quality fuels, protecting engine from acid corrosion.
- Excellent anti-wear performance to reduce the friction and wear-off of metallic components and extend the life of engine parts.
- Outstanding detergency and dispersancy to prevent carbon deposit on cylinder ring groove and cylinder liner and ensure the cleanness of engine combustion chamber.
- Good diffusivity performance to drive oil quickly reaching and spreading out over the cylinder surface to form oil films to reduced liner and ring wear-off.

**Approval Informations:**

- SINOPEC Marine cylinder oil 5070 has been approved by MAN through 6,000hrs field test on MAN6L50MC diesel engine.
- SINOPEC Marine cylinder oil 5070 has approved by WARTSILA Diesel.

**Applications:**

- The best choice cylinder oil for marine low speed cross-head diesel engines using residual fuel oil with sulfur content above 1.0%.
- The product meets the major engine manufacturers' requirements on lubricant performance. It has been applied to many large vessels.

**Typical Properties**

| Item | SINOPEC Marine Cylinder Oil 5070 |
|---|---|
| SAE Grade | 50 |
| Viscosity@100℃，$mm^2/s$ | 19.24 |
| Viscosity Index | 96 |
| Flash Point (COC), ℃ | 267 |
| Pour Point, ℃ | -15 |
| TBN，mgKOH/g | 70.2 |

# Marine Cylinder Oil 5055

SINOPEC marine cylinder oil 5055 is specially designed and formulated for vessels shipping in SECAs or using relatively low sulphur fuels for a long time, it can greatly simplify the oil types and reduce the purchase cost of lubricants.

**Advantages:**

- Mid-BN cylinder oil, fit for both HSFO and LSFO and simplify cylinder oil types and no need to purchase or store two cylinder oils with different BN.
- Good alkalinity retention can neutralize acid outgrowths generated from combustion of poor quality fuel, protecting engine from acid corrosion.
- Excellent anti-wear performance to reduce the friction and wear-off of metallic components and extend the life of engine parts.
- Outstanding detergency and dispersancy to prevent carbon deposit at cylinder ring groove and cylinder liner and ensure the cleanness of engine combustion chamber.
- Good diffusivity performance to drive oil quickly reaching and spreading out over the cylinder surface to form oil film to reduce liner and piston ring wear-off.

**Approval Informations:**

- This product has been approved by MAN

**Recommended Application:**

- Suit for lubrication of marine cross-head diesel cylinder burning fuel with sulfur content between 0.5% and 3.5%.

**Typical Properties**

| Item | SINOPEC Marine Cylinder Oil 5055 |
|---|---|
| SAE Grade | 50 |
| Viscosity@100℃，$mm^2/s$ | 18.5 |
| Viscosity Index | 95 |
| Flash Point (COC), ℃ | 256 |
| Pour Point, ℃ | -12 |
| TBN，mgKOH/g | 55 |

# Marine Cylinder Oil 5040

SINOPEC marine cylinder oil 5040 is prepared from highly refined paraffinic mineral base stock blending with selected super performance additives.

**Advantages:**

- Good capability to neutralize acid outgrowths generated from combustion of poor quality fuel and thereby protecting engine from acid corrosion.
- Good anti-wear performance to reduce the friction and wear-off of cylinder liner and extend the engine life.
- Good detergency and dispersancy to prevent carbon deposit at cylinder ring groove and cylinder liner and ensure the cleanness of engine combustion chamber.
- Good diffusivity performance to drive oil quickly reaching and spreading out over the cylinder surface and form oil film to reduce the liner and piston ring wear-off.
- Lower ash than product with 70TBN, which can reduce abrasive wear caused by calcium carbonate deposition effectively.

**Approval Informations:**

- SINOPEC marine cylinder oil 5040 has been approved by MAN.

**Recommended Application:**

- Premium cylinder oil for marine low speed cross-head diesel engines using the fuel with sulfur content less than 1.5%.

**Typical Properties**

| Item | SINOPEC Marine Cylinder Oil 5040 |
|---|---|
| SAE Grade | 50 |
| TBN，mgKOH/g | 40.1 |
| Viscosity@100℃，$mm^2/s$ | 18.61 |
| Viscosity Index | 97 |
| Flash Point (COC), ℃ | 274 |
| Pour Point, ℃ | -15 |

# Marine System Oil 3008/4008

SINOPEC marine system oil 3008 and 4008 are prepared from paraffinic mineral base stock by blending with selected superior performance additives.

**Advantages:**

- Excellent water separation capability to avoid the oil emulsification.
- Good anti-oxidation and thermal stability to reduce the oil oxidation rate and extend the life of use.
- Good alkalinity retention, detergency and dispersancy to keep the engine in clean state.
- Excellent anti-rusting and corrosion-proof performance to protect individual parts and the whole engine.

**Approval Informations:**

- SINOPEC marine system oil 3008 and 4008 have been approved by MAN.

**Recommended Applications:**

- Marine system oil 3008 is suitable for lubrication of low-speed cross-head diesel engine crankcase,
- Marine system oil 3008 is suitable for lubrication of trunk piston diesel engine using LSFO or other auxiliary equipments, e.g. stern tube etc..

**Typical Properties:**

| Item | SINOPEC Marine System Oil 3008 | SINOPEC Marine System Oil 4008 |
|---|---|---|
| SAE Grade | 30 | 40 |
| Viscosity@100℃,$mm^2/s$ | 10.74 | 14.05 |
| Viscosity Index | 96 | 95 |
| Flash Point (COC), ℃ | 257 | 278 |
| Pour Point, ℃ | -18 | -15 |
| TBN，mgKOH/g | 8.64 | 8.88 |

# Marine System Oil 3005

SINOPEC marine system oil 3005 is prepared from paraffinic mineral base stock by blending with selected superior performance additives. The product is specially designed and formulated for a new generation engines with EFI system and recommended for crankcase lubrication of low speed two stroke cross-head diesel engines such as Wartsila RT-flex and MAN ME.

**Advantages:**

- Outstanding extreme pressure anti-wear property, meet the requirement of hydraulic servo system, the failed stage of FZG is more than 11 and especially suitable for new EFI engines.
- Excellent detergency and dispersancy to disperse carbon deposit or oil sludge into fine particles suspending in oil and prevent them from gathering large particles.
- Deposit on the surface of machine and oil ways, keep the cleanness of engine and the oil ways.
- Excellent anti-corrosion property, prevent bearings and bearing bushes from corrosion, protect engine parts, prolong life span of machine and reduce maintenance cost.
- Excellent anti-emulsification and water separation properties to ensure that the oil's performance is stable when seawater or fresh water enters oil.
- Good energy saving effect, lower viscosity compared with marine system oil 4008, can reduce friction loss and more suitable for new ships.

**Approval Informations:**

- Sinopec system oil 3005 has been approved by MAN.

**Recommended Applications:**

- Marine system oil 3005 is suitable for lubrication of low-speed cross-head diesel engine crankcase, and other auxiliary equipments, e.g. stern tube etc..

**Typical Properties:**

| Item | SINOPEC<br>Marine System Oil 3005 |
|---|---|
| SAE Grade | 30 |
| TBN，mgKOH/g | 5.68 |
| Viscosity@100℃, $mm^2/s$ | 10.59 |
| Viscosity Index | 98 |
| Flash Point (COC), ℃ | 266 |
| Pour Point, ℃ | -18 |

# Marine Trunk Piston Engine Oil 4050

SINOPEC marine trunk piston engine oil 4050 are prepared from paraffinic mineral base stock by blending with selected multiple additives of superior performance. The product is specially designed and formulated for lubrication in marine medium-speed diesel engine where the working temperature and pressure of medium-speed trunk piston diesel engine increased, the consumption of lubricant reduced and HFO is used.

**Advantages:**

- Outstanding alkalinity retention and neutralization capability to effectively depress the corrosion caused by acidic substance generated from combustion of sulfur-containing fuel and provide engine protection.
- Excellent anti-oxidation ability and thermal stability to reduce the generation of oxides and extend the life of use.
- Excellent detergency and dispersancy to prevent carbon deposit under high temperature and disperse oil sludge into fine particles suspending in oil, thus keep the engine in clean state.
- Good water separation capability to remove the moisture from oil and prevent the oil from being emulsified.
- Excellent anti-rusting performance to protect individual parts and the whole engine.

**Approval Informations：**

- The product has carried out 4000 hours field test in WARTSILA engine with type of W8L46-C2 and got approved by WARTSILA Diesel.

**Applications:**

- Marine trunk piston engine oil 4050 is suitable for lubrication in marine medium-speed trunk piston diesel engine burning fuels with sulfur content exceed 3.0%.

**Typical Properties:**

| Item | SINOPEC Marine Trunk Piston Engine Oil 4050 |
|---|---|
| SAE Grade | 40 |
| Viscosity@100℃, $mm^2/s$ | 14.85 |
| Viscosity Index | 101 |
| Flash Point (COC), ℃ | 257 |
| Pour Point, ℃ | -21 |
| TBN，mgKOH/g | 52 |

# Marine Trunk Piston Engine Oil 4040

SINOPEC marine trunk piston engine oil 4040 are prepared from paraffinic mineral base stock by blending with selected multiple additives of superior performance. The product is specially designed and formulated for lubrication in marine medium-speed diesel engine where the working temperature and pressure of medium-speed trunk piston diesel engine increased, the consumption of lubricant reduced and HFO is used.

**Advantages:**

- Outstanding alkalinity retention and neutralization capability to effectively depress the corrosion caused by acidic substance generated from combustion of sulfur-containing fuel and provide engine protection.
- Excellent anti-oxidation ability and thermal stability to reduce the generation of oxides and extend the life of use.
- Excellent detergency and dispersancy to prevent carbon deposit under high temperature and disperse oil sludge into fine particles suspending in oil, thus keep the engine in clean state.
- Good water separation capability to remove the moisture from oil and prevent the oil from being emulsified.
- Excellent anti-rusting performance to protect individual parts and the whole engine.

**Approval Informations：**

- Marine trunk piston engine oil 4040 has been approved by WARTSILA, DAIHATSU ， Yanmar and MAK.

**Applications:**

- Marine trunk piston engine oil 4040 is suitable for lubrication in marine medium-speed trunk piston diesel engine or diesel fueled generator sets burning fuels with sulfur content about 3.0%.

**Typical Properties:**

| Item | SINOPEC Marine Trunk Piston Engine Oil 4040 |
|---|---|
| SAE Grade | 40 |
| Viscosity@100℃, $mm^2/s$ | 14.35 |
| Viscosity Index | 96 |
| Flash Point (COC), ℃ | 246 |
| Pour Point, ℃ | -12 |
| TBN，mgKOH/g | 40.1 |

# Marine Trunk Piston Engine Oil 3030/4030

SINOPEC marine trunk piston engine oil 3030 and 4030 are prepared from paraffinic mineral base stock by blending with selected multiple additives of superior performance. The product is specially designed and formulated for lubrication in marine medium-speed diesel engine where the working temperature and pressure of medium-speed trunk piston diesel engine increased, the consumption of lubricant reduced and HFO is used.

**Advantages:**

- Good alkalinity retention and anti-rusting to effectively depress the corrosion caused by acidic substance generated from combustion of sulfur-containing fuel and provide engine protection.
- Outstanding anti-oxidation ability and thermal stability to reduce the generation of oxides and extend the life of use.
- Outstanding detergency and dispersancy to prevent carbon deposit under high temperature and oil sludge under low temperature, thus keep the engine in clean state.
- Good water separation capability to rapidly remove the moisture from oil and prevent the oil from being emulsified.

**Approval Informations：**

- Sinopec TPEO 4030 /3030 has been approved by WARTSILA, DAIHATSU, YANMAR and MAK.

**Applications:**

- Marine trunk piston engine oil 3030 and 4030 are suitable for lubrication in marine medium-speed trunk piston diesel engine or stationary diesel fueled generator sets burning fuels with a maximum sulphur level of 3.0%.

**Typical Properties**

| Item | SINOPEC Marine Trunk Piston Engine Oil 3030 | SINOPEC Marine Trunk Piston Engine Oil 4030 |
|---|---|---|
| SAE Grade | 30 | 40 |
| Viscosity@100℃, $mm^2/s$ | 10.90 | 14.37 |
| Viscosity Index | 99 | 100 |
| Flash Point (COC), ℃ | 247 | 270 |
| Pour Point, ℃ | -18 | -15 |
| TBN，mgKOH/g | 30 | 30.7 |

# Marine Trunk Piston Engine Oil 3020/4020

SINOPEC marine trunk piston engine oil 3020 and 4020 are prepared from a paraffinic mineral base stock by blending with selected multiple additives of superior performance.

**Advantages:**

- The product has effective neutralization of acidic products, to provide good anti-rusting and corrosion-proof effect for the engine.
- Good anti-oxidation ability and thermal stability to reduce the generation of oxides and extend the oil life of use.
- Good detergency and dispersancy to keep the engine in clean state.
- Excellent water separation capability to rapidly remove the moisture from oil and prevent the oil from being emulsified.

**Approval Informations:**

- The product has been approved by MAK Diesel.

**Recommended Applications:**

- TPEO 3020 and 4020 are suitable for lubrication in marine medium-speed trunk piston diesel engine or stationary diesel fueled generator sets burning fuels with sulfur content no more than 1.5%.

**Typical Properties**

| Item | SINOPEC Marine Trunk Piston Engine Oil 3020 | SINOPEC Marine Trunk Piston Engine Oil 4020 |
|---|---|---|
| SAE Grade | 30 | 40 |
| Viscosity@100℃, $mm^2/s$ | 11.05 | 14.42 |
| Viscosity Index | 98 | 98 |
| Flash Point (COC), ℃ | 258 | 259 |
| Pour Point, ℃ | -18 | -18 |
| TBN，mgKOH/g | 20.3 | 20.3 |

# Marine Trunk Piston Engine Oil 4015

SINOPEC Marine Trunk Piston Engine Oil 4015 is formulated using paraffinic mineral base stocks and a high-performance additive system.

**Advantages:**

- The alkalinity of the oil neutralises acidic fuel combustion products thereby preventing rusting and corrosion of engine bearings, and corrosive wear of cylinder liners.
- Excellent detergency and dispersancy characteristics keep the engine clean and prevent the formation of piston and ring deposits, protecting components against wear, reducing oil filter blockage, and prolonging engine service life and oil life.
- Excellent antiwear properties prevent adhesive wear of cams, camshafts and bearings, extending component life and reducing maintenance costs.
- Good oxidation and thermal stability reduce oil thickening and extend oil life and engine protection.
- Excellent water separation characteristics prevent water becoming emulsified in the oil, and ensure that any water can be easily separated from the oil in the centrifugal oil/water separator system, to ensure long service life.

**Recommended Applications:**

- Medium-speed, marine trunk piston engines running on 0.5% sulfur fuel.
- Small-bore, high-speed marine engines, for example those used in fishing fleets.
- Newer types of severe-service marine diesel engines.
- Auxiliary diesel engines of large vessels running on 0.5% sulfur fuel.
- Stationary diesel-fuelled generators running on 0.5% sulfur fuel.
- Stern tubes, reduction gears under low-load conditions, and other auxiliary equipment.

**Typical Properties**

| Item | SINOPEC<br>Marine Trunk Piston Engine Oil 4015 |
|---|---|
| SAE Grade | 40 |
| Viscosity@100℃, $mm^2/s$ | 14.06 |
| Viscosity Index | 97 |
| Flash Point (COC), ℃ | 259 |
| Pour Point, ℃ | -18 |
| TBN，mgKOH/g | 15.6 |

# Marine Trunk Piston Engine Oil 3012/4012

SINOPEC marine trunk piston engine oil 3012 and 4012 are prepared from a paraffinic mineral base stock by blending with selected multiple additives of superior performance. The product has high detergent-dispersant efficiency and anti-oxidation ability, while ensuring top performance in engines.

**Advantages:**

- The product has effective neutralization of acidic products, to provide good anti-rusting and corrosion-proof effect for the engine.
- Good anti-oxidation ability and thermal stability to reduce the generation of oxides and extend the oil life of use.
- Good detergency and dispersancy to keep the engine in clean state.
- Excellent water separation capability to rapidly remove the moisture from oil and prevent the oil from being emulsified.

**Approval Informations:**

- TPEO 4012/3012 has been approved by DAIHATSU and YANMAR

**Recommended Applications:**

- TPEO 3012 and 4012 are suitable for lubrication in marine medium-speed trunk piston diesel engine or stationary diesel fueled generator sets burning fuels with sulfur content around 0.5%.
- The products are also suitable for lubrication of auxiliary equipment, e.g. stern tube or low-load gear etc..

**Typical Properties**

| Item | SINOPEC Marine Trunk Piston Engine Oil 3012 | SINOPEC Marine Trunk Piston Engine Oil 4012 |
|---|---|---|
| SAE Grade | 30 | 40 |
| Viscosity@100℃, $mm^2/s$ | 10.15 | 14.94 |
| Viscosity Index | 99 | 99 |
| Flash Point (COC), ℃ | 256 | 268 |
| Pour Point，℃ | -18 | -15 |
| TBN，mgKOH/g | 13.4 | 14 |

# CH-4 Diesel Engine Oil

SINOPEC CH-4 Diesel Engine Oil is a high-performance diesel engine oil. Manufactured from high-quality base stock by blending with selected multiple additives of superior performance. It meets the specification of API CH-4.The product provides outstanding lubrication for high-speed diesel engines under severe operating conditions.

**Advantages:**

- Outstanding detergency and dispersancy to prevent carbon deposit.
- Excellent anti-oxidation ability and thermal stability to reduce the generation of oxides and extend the life of use.
- Outstanding alkalinity retention and good corrosion-proof properties to effectively prevent the corrosion from acidic substance generated from combustion of sulfur-containing fuel.
- Excellent lubricating property to reduce the friction and sediment under severe conditions.
- Specifically designed for diesel engines with environmental performance, suitable for Euro Ⅲ emission standard requirements.

**Recommended Applications:**

- CH-4 Diesel Engine Oil is suitable for lubrication of heavy duty and high pressure generator，life boat，emergency generator, small marine high-speed diesel engine and so on.
- The best choice for high-speed marine diesel engines and generator sets which need engine oil to meet API CH-4 or lower than API CH-4 specification and use diesel fuel or distillated fuel with sulfur content lower than 0.2%.

**Typical Properties**

| Item | SINOPEC CH-4 Diesel Engine Oil |
|---|---|
| SAE Grade | 15W-40 |
| Viscosity@100℃，mm2/s | 14.83 |
| Pour Point，℃ | -34 |
| HTHS（150℃，106s-1）/mPa．s | 4.12 |
| TBN，mgKOH/g | 11.0 |

# HANGXING 500 Series Diesel Engine Oil

SINOPEC high-speed Marine Diesel Engine Oil HANGXING 580 is based on automotive diesel oil which meets API service classification CF-4. The product is prepared from an excellent mineral base stock by blending with additives of superior performance, specifically designed for high-speed and high-power marine diesel engines.

**Advantages:**

- High-alkaline, effective neutralization of acidic products, to provide good anti-rusting and corrosion-proof effect for the engine.
- Outstanding detergency and dispersancy to prevent oil sludge and sediment，thus keep the engine in clean state.
- Excellent anti-oxidation ability and thermal stability to reduce the generation of oxides and extend the life of use.
- Excellent anti-wear performance to reduce the friction and wear-off of metallic components and extend the engine life.

**Recommended Applications:**

- The best choice for high-speed marine diesel engines and generator sets which need engine oil to meet API CF-4 or lower than API CF-4 specification and use diesel fuel or distillated fuel with sulfur content lower than 0.2%.

**Typical Properties**

| Item | SINOPEC HANGXING 580 |
|---|---|
| SAE Grade | 15W-40 |
| Viscosity@100℃，$mm^2/s$ | 15.28 |
| Viscosity Index | 142 |
| Flash Point (COC), ℃ | 228 |
| Pour Point, ℃ | -24 |
| TBN，mgKOH/g | 10.5 |

# HANGXING 300 Series Diesel Engine Oil

SINOPEC high-speed Marine Diesel Engine Oil HANGXING 300 series are based on automotive diesel oil which meets API service classification CD, specifically designed for high-speed and high-power marine diesel engines. The product is prepared from a paraffinic mineral base stock by blending with selected multiple additives of superior performance. It meets high-speed marine diesel engines'requirements under severe operating conditions.

**Advantages:**

- High-alkaline and good detergent-dispersant properties to keep the engine in clean state.
- Good anti-oxidation ability and anti-wear performance to reduce the friction and wear-off of metallic components and extend the engine life.
- Specifically designed for high-speed and high-power marine diesel engines, suitable for lubrication under severe operating conditions.

**Recommended Applications:**

- The best choice for high-speed marine diesel engines and generator sets which need engine oil meet API CD specification and use diesel fuel or distillated fuel with sulfur content lower than 0.2%.

**Typical Properties**

| Item | HANGXING 340 | HANGXING 380 |
|---|---|---|
| SAE Grade | 40 | 15W-40 |
| Viscosity@100℃，$mm^2/s$ | 85 | 139 |
| Viscosity Index | 8.59 | 8.57 |
| Flash Point (COC), ℃ | 258 | 232 |
| Pour Point, ℃ | -14 | -30 |
| TBN，mgKOH/g | 14.76 | 14.38 |

# HV Low Temperature Hydraulic Oil

SINOPEC HV low temperature hydraulic oil is prepared from deep-processed base stock of high viscosity index, added with multiple additives of superior performance by a blending process of the world advanced technology level.

## Advantages

◎ Provide excellent starting power and fluidity at lower temperature and better protection at higher temperature as well as anti- emulsifying performance, to effectively extend the life of use

◎ Outstanding thermo-viscosity performance, shear stability, oxidation stability and less change in viscosity, to ensure steady operation of the hydraulic system

◎ Excellent anti-wear property and anti-rusting/corrosion-proof performance to prolong the life of hydraulic equipment

◎ Excellent anti-foaming, air-releasing and anti-emulsifying performances to minimize the probability of oil aging caused by air/water contamination

◎ Excellent sealing part adaptability to effectively prevent oil leakage

## Recommended Applications:

◎ Suitable for in hydraulic and transmission systems of anchor windlass, unloading machines, cable hoisters, anti-shakers, emergency fire pumps, bottom valves, hatches, scuttles and gangplank connectors etc, also in lubrication of gear transmission, bearings and other industrial machinery of general load

## Typical Properties

| Items | HV Low Temperature Hydraulic Oil | | | | | |
|---|---|---|---|---|---|---|
| ISO Viscosity Grade | 15 | 22 | 32 | 46 | 68 | 100 |
| Viscosity@40℃, $mm^2/s$ | 15.17 | 20.83 | 32.17 | 47.23 | 68.40 | 100.7 |
| Viscosity Index | 171 | 171 | 170 | 165 | 158 | 155 |
| Flash Point (C.O.C), ℃ | 173 | 178 | 210 | 216 | 221 | 240 |
| Pour Point, ℃ | -51 | -45 | -42 | -39 | -39 | -36 |

# HM Anti-Wear Hydraulic Oil

SINOPEC HM anti-wear hydraulic oil is prepared from deep-processed base stock of high quality by blending with superior additives. Showing great performance, the product meets the requirements of many international and OEM standards, and is widely used for lubrication of industrial, marine and mobile hydraulic and transmission systems.

## Advantages

◎ Outstanding anti-wear performance demonstrated in a series of hydraulic pump tests. which can effectively extend the life of pumps and systems

◎ Excellent water separation capability to rapidly remove the moisture from oil and prevent the oil from being emulsified

◎ Excellent filterability to minimize the plugging of filter especially in the presence of water, calciumion and other pollutants

◎ Excellent anti-rusting/corrosion-proof performances, protecting metal parts effectively

◎ Excellent thermo-viscosity performance and shear stability to provide effective lubrication protection under elevated temperature

◎ Recognized and recommended by many hydraulic pump manufacturers on the globe

## Recommended Applications:

◎ HM anti-wear hydraulic oil can be used in hydraulic and transmission systems of anchor windlass, unloading machines, cable hoisters, anti-shakers, emergency fire pumps, bottom valves, hatches, scuttles and gangplank connectors etc, also in lubrication of gear transmission, bearings and other industrial machinery of general load

## Typical Properties

| Items | HM Anti-Wear Hydraulic Oil | |
|---|---|---|
| ISO Viscosity Grade | 32 | 46 |
| Viscosity@40℃, $mm^2/s$ | 33.26 | 45.88 |
| Viscosity Index | 103 | 103 |
| Flash Point (C.O.C), ℃ | 230 | 240 |
| Pour Point, ℃ | -15 | -15 |

# L-CKD Heavy Duty Industrial Gear Oil

SINOPEC L-CKD heavy duty industrial gear oil is prepared from super quality base stock of high viscosity index, blended with a multiple-purpose super additive. The product shows the best load capability to ensure smooth running of heavy duty gears, reduce the scratch on gear teeth and the noise during operation.

## Advantages

◎ Outstanding extreme pressure load carrying ability and anti-wear characteristics, prevents seizure, scuffing or spalling of gear teeth and bearing surfaces under shock-loaded conditions, extend the useful life of equipment

◎ Excellent thermal stability and anti-oxidation performance, minimizes build-up of harmful sludge and varnish deposits and so reduces wear

◎ Good anti-rust and anti-corrosion characteristics, prevents iron parts from rusting, protects copper-containing bearings, bushings from corrosive attack

◎ Good anti-foaming resistance, ensures a continuous lubricant film present at all times, and prevents overflow from gear-boxes and oil reservoirs

◎ Excellent water separability, prevents emulsion formation and sustains effective lubrication

## Recommended Applications:

◎ It is the best choice for use in lubrication of gears under heavy or shock load, or boundary lubricated gears running at lower velocity

◎ Specific marine applications include main propulsion, centrifuges, deck machinery such as winches, windlasses, cranes, pumps and elevators. Non-gear applications include heavily loaded bearings operating at slow speeds

## Typical Properties

| Items | L-CKD Heavy Duty Industrial Gear Oil | | | |
|---|---|---|---|---|
| ISO Viscosity Grade | 100 | 150 | 220 | 320 |
| Viscosity@40℃, mm2/s | 99.16 | 149.9 | 217 | 313.0 |
| Viscosity Index | 96 | 95 | .0 93 | 92 |
| Flash Point (C.O.C), ℃ | 246 | 249 | 242 | 250 |
| Pour Point, ℃ | -17 | -14 | -12 | -9 |
| Copper Strip Corrosion (3hrs, 100℃) | 1b | 1b | 1b | 1b |
| Rust protection, Sea Water | Pass | Pass | Pass | Pass |
| 4-Ball EP test, Weld load, kg | 250 | 250 | 315 | 315 |

# L-CKT Fully Synthetic Heavy Duty Industrial Gear Oil

SINOPEC Fully Synthetic Heavy Duty Industrial Gear Oil is blended with synthetic type (PAO type) base oil with super high viscosity index and super level multi-functional additive by internationally advanced process. Its performance reaches world level. Even in severe conditions, it demonstrates outstanding performance unmatchable for the mineral type oil.

**Advantages**

♦Outstanding carrying ability and anti-wear performance, prolonging service life of equipment
♦Outstanding anti-corrosion and anti-rust performance, effectively inhibiting occurrence of corrosion and wear on parts
♦ Excellent detergency, more suitable for lubrication of high-precision equipment
♦Outstanding high/low temperature performance, providing overall protection for equipment in severe conditions

**Recommended Applications:**

♦Suitable for various heavy duty industrial gear units and other gears likely to cause vibration load, and suitable for both in circulation system and splash lubrication system
♦Suitable for lubrication of closed gearboxes under extreme temperature conditions, ensuring startup and operation of gear unit in extremely low temperature conditions

**Typical properties**

| Items | L-CKT fully synthetic heavy duty industrial gear oil | |
|---|---|---|
| ISO viscosity grade | 220 | 320 |
| Kinematic viscosity (100 ℃), $mm^2/s$ | 25.38 | 33.68 |
| Kinematic viscosity (40 ℃), $mm^2/s$ | 219.3 | 318.6 |
| Viscosity index | 147 | 149 |
| Flash point (COC), ℃ | 248 | 252 |
| Pour point, ℃ | -48 | -42 |

# TSA/LF Long Life Turbine Oil

SINOPEC TSA/LF long life turbine oil is prepared from hydrogenation base oil by blending with multiple-purpose additives, showing outstanding oxidation stability to provide protection on turbine equipment for long period.

## Advantages

◎ Long life turbine oil shows outstanding oxidation stability with over 10,000 hrs of oxidation test period, to effectively prolong the oil life

◎ Excellent anti-emulsifying performances to ensure the rapid removal of moisture entering system through different passages and good lubrication

◎ Excellent air releasing, anti-foaming, prevents cavitation

◎ Excellent anti-rusting and corrosion-proof performances to prevent rust/corrosion of equipment

## Approval Informations

◎ Alstom Power HTGD 90117

◎ Siemens TLV 901304

## Recommended Applications:

◎ Long life turbine oil is suitable for bearings and reduction gears of propulsion and auxiliary turbines or shaft bearing and stern tubes.

## Typical Properties

| Items | TSA/LF Long Life Turbine Oil | | |
|---|---|---|---|
| ISO Viscosity Grade | 32 | 46 | 68 |
| Viscosity@40℃, $mm^2/s$ | 32.2 | 43.6 | 63 |
| Viscosity Index | 131 | 113 | 112 |
| Flash Point (C.O.C), ℃ | 228 | 232 | 225 |
| Pour Point, ℃ | -10 | -13 | -13 |
| TOST (ASTM D943), hrs | >10000 | >10000 | >10000 |

# TSA Turbine Oil

SINOPEC TSA turbine oil is prepared from deep processed super quality base stock by blending with multiple-purpose additives, showing outstanding anti-rusting and corrosion-proof performances.

## Advantages

◎ Outstanding anti-rusting and corrosion-proof performances to protect equipment and prevent rust and corrosion

◎ Excellent oxidation stability, air releasing, anti-foaming and anti-emulsifying performance to ensure prolongs life of the oil

## Approval Informations

◎ Siemens TLV 901304
◎ Alstom Power HTGD 90117
◎ Shanghai Electric Power Generation Equipment Co. Ltd. Turbine Works
◎ Dong Fang Turbine Co. Ltd
◎ Hang Zhou Steam Turbine Co. Ltd
◎ Turbine Company of Nan Jing Turbine & Electric Machinery (Group) Co. Ltd

## Recommended Applications:

◎ TSA turbine oil is suitable for bearings, reduction gears or hydraulic systems lubrication and sealing of general marine mechanical equipment

## Typical Properties

| Items | TSA Turbine Oil | | |
|---|---|---|---|
| ISO Viscosity Grade | 32 | 46 | 68 |
| Viscosity@40℃, mm2/s | 33.8 | 45.2 | 68.9 |
| Viscosity Index | 115 | 102 | 108 |
| Flash Point (C.O.C), ℃ | 200 | 218 | 222 |
| Pour Point, ℃ | -7 | -7 | -7 |

# Synthetic Refrigerator Oil 4524

SINOPEC synthetic refrigerator oil 4524 is formulated from synthetic POE base stocks and a well-chosen additives package. According to Viscosity of 40℃, Synthetic Refrigeration Oil 4524 can be classified as: ISO VG32, 46, 68, 100.

## Advantages

◎ Low pour point
◎ High flash point
◎ Very low Content of water
◎ Excellent heat stability, hydrolyze stability
◎ Optimum metal and nonmetal material compatibility in compressor
◎ Outstanding lubricating capability
◎ Biodegradable

## Recommended Applications:

◎ The product is recommended for compressors using R134a, R410, R407 as agent and of reciprocating piston or rotary screw/vane types

## Typical Properties

| Items | Synthetic Refrigerator Oil 4524 | | | |
|---|---|---|---|---|
| ISO Viscosity Grade | 32 | 46 | 68 | 100 |
| Appearance | Clear and homogeneous liquid | | | |
| Viscosity@40℃, mm2/s | 31.71 | 45.32 | 67.16 | 100.5 |
| Flash Point (C.O.C), ℃ | 244 | 256 | 275 | 258 |
| Pour Point, ℃ | -52 | -45 | -42 | -37 |
| Density (20℃), kg/m3 | 986 | 960 | 965 | 962 |

# Synthetic Compressor Oil 4502

SINOPEC synthetic compressor oil 4502 is prepared by blending of synthesized oil as base stock, with various well-chosen functional additives.

## Advantages

◎ Outstanding oxidation stability under high-temperature to extend drain interval up to 4,000hrs～8,000hrs

◎ Excellent performance under high/low temperatures performance

◎ Higher flash point and ignition point and lower volatility

◎ Less tendency of carbon residue/deposition to ensure safe operation of the compressor

◎ Good compatibility with the sealing materials such as: butdiene-acrylonitrile elastomer, fluorinated elastomer and silicone elastomer

## Recommended Applications:

◎ 4502 synthetic compressor oil is recommended for lubrication of rotary type compressors or reciprocating type compressors

## Typical Properties

| Items | Synthetic Compressor Oil 4502 | | |
|---|---|---|---|
| ISO Viscosity Grade | 46 | 68 | 100 |
| Viscosity@40℃, mm2/s | 46.7 | 69.3 | 105.32 |
| Flash Point (C.O.C), ℃ | 229 | 246 | 253 |
| Pour point, ℃ | -30 | -27 | -26 |

# L-QB300 Heat Transfer Oil

SINOPEC L-QB300 heat transfer oil is manufactured from the highly refined narrow fraction mineral base oil and detergent dispersant, high-temp oxidation resistant additive, suitable for closed heat transmission system of forced circulation or unforced circulation not more than 300℃.

**Advantages**

◎ Narrow fraction, high Initial Boilling Point
◎ Excellent thermal oxidation stability, long service life
◎ Less evaporation, high flash point
◎ High specific heat capacity, good heat transfer performance
◎ Good low-temperature fluidity
◎ Good compatibility with the material of the system, no corrosion

**Recommended Applications:**

◎ Suitable for closed heat transfer system of forced circulation or unforced circulation,

**Typical Properties**

| Items | L-QB300 heat-transfer oil |
|---|---|
| Initial Boilling Point, ℃ | 348 |
| Flash Point, ℃ | 226 |
| Pour Point, ℃ | -12 |
| Corrosion (100℃, 3hrs), Grade | 1 |
| Density（20℃）, kg/m ³ | 868.5 |

# Extreme Pressure Lithium Base Grease

SINOPEC Extreme Pressure Lithium Base Grease is an extreme pressure grease, formulated with a lithium soap thickener and high-quality mineral base oil. It contains rust and oxidation inhibitors, and extreme pressure and antiwear additives to ensure excellent performance and long life, even in severe service conditions where high temperatures, shock loading and water contamination are possible.

**Advantages:**

- Excellent extreme pressure and antiwear properties protect heavily loaded or shock-loaded bearings from wear, extending equipment life.
- Lithium soap thickener ensures good mechanical stability, so the grease structure does not soften or break down in service.
- High-quality base oil ensures a good oil film thickness is maintained, even in high-temperature applications, protecting components from wear.
- Excellent protection against rust and corrosion ensures long component life, and extends maintenance intervals.
- Good thermal and oxidation stability ensure longer grease life under high-temperature conditions, providing optimum lubrication, extending equipment life and reducing maintenance requirements.
- Grease adheres strongly to metal surfaces, sealing out dirt and abrasive materials, to ensure longer lubricating intervals.
- Available in NLGI grades 00, 0, 1 and 2 to meet the requirements of specific applications.

**Recommended Applications:**

Sinopec Extreme Pressure Lithium Base Grease is suitable for use in:

- Bearings and gears of medium to heavily loaded mechanical equipment, where an extreme pressure/antiwear grease is required for extra protection.
- Applications where the temperature range is from –20 ℃ to 120 ℃.

## Typical Properties

| **Sinopec Extreme Pressure Lithium Base Grease** | | | | |
|---|---|---|---|---|
| NLGI grade | 00 | 0 | 1 | 2 |
| Appearance, visual | Smooth, puce, buttery | | | |
| Thickener type | Lithium | | | |
| Base fluid type | Mineral | | | |
| Kinematic viscosity, ASTM D 445 | | | | |
| cSt @ 100 ℃ (range) | 9–12 | 9–12 | 9–12 | 9–12 |
| Cone penetration, ASTM D 217 | | | | |
| W×60, $mm^{-1}$ | 414 | 374 | 323 | 293 |
| W×100,000, $mm^{-1}$ | 440 | 400 | 350 | 317 |
| Dropping point, ℃, ASTM D 566 | 173 | 178 | 184 | 196 |
| Oil separation, 24 h @ 100 ℃, %, FTMS 791C-321.3 | – | – | 8.0 | 3.2 |
| Corrosion prevention, 48 h @ 52 ℃, rating, ASTM D 1743 | pass | pass | pass | pass |
| Copper corrosion, T2 copper strip, 24 h @ 100 ℃, rating, ASTM D 4048 | pass | pass | pass | pass |
| Timken OK load, N, ASTM D 2509 | 156 | 156 | 156 | 156 |
| Four ball EP, $P_B$, N, ASTM D 2596 | 618 | 618 | 618 | 618 |
| Apparent viscosity, –10 ℃, 10 $s^{-1}$, Pas, GOST 7163 | 58 | 114 | 126 | 349 |
| Impurities, quantity/$cm^3$, JIS K 2220 5.9 | | | | |
| 25 μm or larger | 240 | 240 | 200 | 280 |
| 75 μm or larger | 80 | 80 | 0 | 80 |
| 125 μm or larger | 0 | 0 | 0 | 0 |

These data are given as an indication of typical values and not as exact specifications.

# Lithium Grease with Molybdenum Disulfide

SINOPEC Lithium Grease with Molybdenum Disulfide is an extreme pressure/antiwear grease, formulated with a lithium soap thickener and high-quality mineral base oil. It contains selected additives and molybdenum disulfide (MoS2 or 'moly'). It has outstanding extreme pressure/antiwear properties and mechanical stability. Available as NLGI grades 1, 2 and 3.

**Advantages:**

- Excellent extreme pressure and antiwear properties protect heavily loaded or shock-loaded bearings and gears from wear, extending equipment life.
- Solid molybdenum disulfide provides an additional measure of residual lubrication, which protects metal surfaces against wear in applications where vibrating or oscillating movement tends to squeeze out the grease from between the surfaces.
- Lithium soap thickener ensures good mechanical stability, so the grease structure does not soften or break down in service.
- Good water resistance properties ensure the grease is not easily washed out of bearings or off gear surfaces, so ensuring optimum protection.
- Good adhesive properties ensure the grease sticks to the metal surfaces sealing out dirt and abrasive materials, and so allows longer lubricating intervals.
- Provides good protection against rust and corrosion, extending component life and relubrication intervals.
- Available in NLGI grades 1, 2 and 3 to meet the requirements of specific applications.

**Recommended Applications:**

- Bearings and gears of heavily loaded equipment operating under vibrating/oscillating conditions, such as those used in the steel and mining industries, where a robust extreme pressure/antiwear grease is required.
- Applications where the temperature range is from –20 ℃ to +120 ℃.

## Typical Properties

| **Sinopec Lithium Grease with Molybdenum Disulfide** | | | |
|---|---|---|---|
| NLGI grade | 1 | 2 | 3 |
| Appearance, visual | Smooth, black, buttery | | |
| Thickener type | Lithium | | |
| Base fluid type | Mineral | | |
| Kinematic viscosity, ASTM D 445 | | | |
| cSt @ 100 ℃ (range) | 9–12 | 9–12 | 9–12 |
| Cone penetration, ASTM D 217 | | | |
| W×60, $mm^{-1}$ | 329 | 289 | 240 |
| W×100,000, $mm^{-1}$ | 340 | 314 | 280 |
| Dropping point, ℃, ASTM D 566 | 194 | 199 | 200 |
| Oil separation, 24 h @ 100 ℃, %, FTMS 791C-321.3 | 6.6 | 2.8 | 0 |
| Apparent viscosity, –15 ℃, 10 $s^{-1}$, Pas, GOST 7163 | 198 | 320 | 891 |
| Oxidation stability, 100 h @ 99 ℃ & 758 kPa, pressure drop, kPa, ASTM D 942 | 19 | 30 | 49 |
| Corrosion prevention, 48 h @ 52 ℃, rating, ASTM D 1743 | pass | pass | pass |
| Water washout,1 h @ 38 ℃, %, ASTM D1264 | 3.5 | 1.25 | 1.25 |
| Four ball EP, maximum non-seizure load $P_B$, N, ASTM D 2596 | 618 | 618 | 618 |

These data are given as an indication of typical values and not as exact specifications.

# SINOPEC Super Grease

SINOPEC Super Grease is an extreme pressure grease, formulated with Calcium Sulfonate Complex soap thickener and high-quality mineral base oil. It has excellent performance and long life, even in severe service conditions such as high temperatures, outstanding EP and applications with a lot of a water spray, even with salt water.

**Advantages:**

- Excellent high temperature performance. Maintain certain degree of consistency even at high temperature and have long service life, Super Greases ensures a high dropping point, which means that the grease can be used at higher temperatures in severe service applications (operating temperature range is from –20 ℃ to +180 ℃.
- High-quality base oil ensures a good oil film thickness is maintained, even in high-temperature applications, protecting components against wear.
- Outstanding EP and anti-wear properties. The spherical thickener can form micro-rolling particle layer on contact surface, effectively reduce friction coefficient between metal surface and extend service life.
- Very good rust and corrosion resistant property. Resist metal surface corrosion even with seawater presented.
- Do not contain any heavy metal, nitrite and other chemicals that will do harm to human's health and pollute environment.

**Recommended Applications:**

Sinopec Super Grease is suitable for use in:

- roll bearing at hot rolling mill in metallurgical industry, continuous casting equipments, such as ladle turret, mould, the second cooling area, sector section, withdrawal straightening machine roll bearing, rocking shears and transportation roll etc.

## Typical Properties

| **Sinopec Super Grease** | |
|---|---|
| NLGI grade | 1–3 |
| Appearance, visual | Smooth, orange, buttery |
| Thickener type | Calcium Sulfonate Complex |
| Base fluid type | Mineral |
| Dropping point, ℃, ASTM D 2265 | 330 |
| Four ball wear, 60 min @ 392 N, mm, ASTM D 2266 | 0.45 |
| Timken OK load, N, ASTM D 2509 | 222 |
| Oil separation, 24 h @ 100 ℃, %, FTMS 791C-321.3 | 1.4 |
| Water washout, 1 h @ 79 ℃, %, ASTM D 1264 | 2 |
| Corrosion prevention, 48 h @ 52 ℃, rating, ASTM D 1743 | pass |
| Copper corrosion, T2 copper strip, 24 h @ 100 ℃, rating, ASTM D 4048 | pass |
| EP （four ball method） PD, N, SH/T0202 | 3923 |

These data are given as an indication of typical values and not as exact specifications.

# Application Case of SINOPEC Marine Oil

OWNER: XXXXX SHIP: XXXXX Date：XX-XX-XX

| No. | Equipment | Lubrication Parts | Recommendation |
|---|---|---|---|
| Main Engine | | | |
| 1 | Main Engine | Cylinder | Marine Cylinder Oil 5070S （For HSFO） |
| | | | Marine Cylinder Oil 5040 （For LSFO） |
| | | System | Marine System Oil 3008 |
| 2 | Turbocharger | Bearing | Marine System Oil 3008 |
| 3 | Governor | Grease Point | SINOPEC Super Grease 2 |
| 4 | M/E Turning Gear | Enclosed Gear | L-CKD 220 Heavy Duty Industrial Gear Oil |
| | | Chain | $MoS_2$ EP Lithium-Base Grease №2 |
| 5 | Intermediate Shaft Bearing | Bearing | Marine System Oil 3008 |
| 6 | Stern Tube | Bearing &Sealing | Marine System Oil 3008 |
| AUXILIARY MACHINERY | | | |
| 1 | Generator Engine | Cylinder & Bearing | Marine Trunk Piston Engine Oil 4040 |
| 2 | E. G. Engine | Cylinder & Crankcase | CH-4 15W-40 Diesel Engine Oil |
| 3 | Main Air Compressor | Cylinder & System | 4502（100）Synthetic Compressor Oil |
| 4 | Emergency Air Compressor | Cylinder & System | 4502（100）Synthetic Compressor Oil |
| 5 | M/E LO Purifiers | Gear Box | L-HV 68 Low Temperature Hydraulic Oil |
| 6 | G/E LO Purifiers | Gear Box | L-CKD 220 Heavy Duty Industrial Gear Oil |
| 7 | HFO Purifiers | Gear Box | L-HV 100 Low Temperature Hydraulic Oil |
| 8 | Air Conditioning Compressor | Crankcase | 4524（68）Synthetic Refrigerator Oil |
| 9 | Provision Refrigerator Compressor | Crankcase | 4524（68）Synthetic Refrigerator Oil |
| 10 | Incinerator | Burner Gearbox | L-CKD 220Heavy Duty Industrial Gear Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| 11 | Engine Room Crane | Hoisting Gearbox &Traveling Gear | L-CKD 320Heavy Duty Industrial Gear Oil |
| | | Grease Points | SINOPEC Super Grease 2 |
| | | Open Gears | MoS2 EP Lithium-Base Grease №2 |
| | | Wire Ropes | SINOPEC Super Grease 2 |
| 12 | Misc. Pumps, Electric Motors and Fans | Grease Points | SINOPEC Super Grease 2 |
| | | Oil Point | L-HV 68 Low Temperature Hydraulic Oil |
| CARGO MACHINERY | | | |
| 1 | Cargo Oil Pump Turbine | Turbine Bed & Governor | TSA 68 Turbine Oil |
| 2 | Cargo Oil Pump | Grease Point | SINOPEC Super Grease 2 |
| | | Gear Coupling | L-CKT 320 Synthetic Industrial Gear Oil |
| 3 | Ballast Pump Turbine | Turbine Bed & Governor | TSA 68 Turbine Oil |

# Application Case of SINOPEC Marine Oil

OWNER: XXXXX SHIP: XXXXX Date：XX-XX-XX

| No. | Equipment | Lubrication Parts | Recommendation |
|---|---|---|---|
| 4 | Ballast Pump | Grease Point | SINOPEC Super Grease 2 |
| | | Gear Coupling | L-CKT 320 Synthetic Industrial Gear Oil |
| 5 | Stripping Pump | Gear Coupling | L-CKT 320 Synthetic Industrial Gear Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| 6 | Automatic Unloading System | Gear Coupling | L-CKT 320 Synthetic Industrial Gear Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| 7 | Valve Remote Control System | Hydraulic System | L-HV22 Low Temperature Hydraulic Oil |
| DECK MACHINERY | | | |
| 1 | Steering Gear | Hydraulic Fluid | L-HV 68 Low Temperature Hydraulic Oil |
| 2 | Rudder Carrier | Grease Point | SINOPEC Super Grease 2 |
| 3 | Deck Machinery | Hydraulic System | L-HV 46 Low Temperature Hydraulic Oil |
| | | Enclosed Gear | L-CKD 220 Heavy Duty Industrial Gear Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| | | Open Gears | MoS2 EP Lithium-Base Grease №2 |
| 4 | Accommodation Ladder& Pilot Ladder Reel | Hoisting Winch | L-CKD 220 Heavy Duty Industrial Gear Oil |
| | | Shifting Winch Gearbox | L-CKD 220 Heavy Duty Industrial Gear Oil |
| | | Air Motor Oiler | L-HV 32 Low Temperature Hydraulic Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| | | Wire Ropes | SINOPEC Super Grease 2 |
| 5 | Hose Handling Crane | Winch Gearbox& Slewing Gear | L-CKD 220 Heavy Duty Industrial Gear Oil |
| | | Hydraulic System | L-HV46 Low Temperature Hydraulic Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| | | Wire Rope & Open Gear | MoS2 EP Lithium-Base Grease №2 |
| 6 | Provision Crane | Enclosed Gear | L-CKD 220 Heavy Duty Industrial Gear Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| 7 | Life Boat Davit | Gear Box | L-HV 68 Low Temperature Hydraulic Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| | | Wire Ropes | SINOPEC Super Grease 2 |
| 8 | Life Boat | Cylinder & Crankcase | CH-4 15W-40 Diesel Engine Oil |
| MISCELLANEOUS | | | |
| 1 | Universal Machine | Oil Point | L-HV 68 Low Temperature Hydraulic Oil |
| | | Grease Point | SINOPEC Super Grease 2 |
| | | Open Gear | MoS2 EP Lithium-Base Grease №2 |
| | | Wire Rope & Spare Parts | SINOPEC Super Grease 2 |

Note: The Application Case of SINOPEC Marine Oil is based on the available information and it is considered to be accurate. Different lubricants may be recommended for different equipments and vessels. SINOPEC does in no case assume any liability for any unauthorized using the information above.

MAN Diesel

Lubricant Company, Sinopec Corporation
No.6, Anningzhuang West Road
Haidian District
Beijing, China
Postcode: 100085
Phone: +86-10-6294-9882
Att.: Mr Zhang Chunhui

LDF4/CXR/BAN/83598-2008 3 December 2008

**No Objection Letter for cylinder oil, Sinopec Marine Cylinder Oil 5070S**

Dear Mr Zhang,

Based on 4,000 hours of testing of Sinopec Marine Cylinder Oil 5070S, MAN Diesel has no objection to use the Sinopec Marine Cylinder Oil 5070S cylinder oil on a MAN B&W two-stroke engine.

The Sinopec Marine Cylinder Oil 5070S field test has been carried out on a 6S90ME-C engine with supervision of MAN Diesel and inspection of engine condition at the start and end of tests in accordance with the guidelines stated in the MAN Diesel document "Cylinder & System Lubricating Oil Qualities and New Engine Development".

As the lube oil is neither produced nor sold by MAN Diesel, MAN Diesel cannot be kept responsible for any damage to engines or engine components that may be caused by the use of lube oil.

Best regards,
MAN Diesel

Charlotte Røjgaard
Lube/Fuel Oil Projects

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German Reg. No.: HRB 23338
Amtsgericht Augsburg

MAN Diesel – a member of the MAN Group

长城船用气缸油 5070S 获得 MAN 认证

MAN Diesel

MAN Diesel A/S · Denmark

**BY COURIER SERVICE**
Lubricant Company, Sinopec Corp

No 6, Anningzhuang West Road
Haidian District, Beijing
China 100085
Tel: +86-10-62941011

Att.: Ms Liu Hong

2420/CXR/39189-2006 20 November 2006

**No Objection Letter for Great Wall Cylinder Oil 5070 (case 39189-2006)**

Dear Ms Liu Hong,

Based on 4,000 hours of testing of Great Wall Cylinder Oil 5070 with supervision of MAN Diesel and inspection of engine condition at the start and end of tests, MAN Diesel has no objection to use the Great Wall Cylinder Oil 5070 on a two-stroke engine.

The Great Wall Cylinder Oil 5070 field test has been carried out on an 6L50MC engine in accordance with the guidelines stated in the MAN Diesel document "Cylinder & System Lubricating Oil Qualities and New Engine Development".

According to MAN Diesel standard procedure, oil testing should be performed on large bore engines as those engines stresses the oil the most. As this test was performed on a medium bore engine, the oil performance must also be monitored first time the oil is put into a large bore engine (80 bore or larger). Such monitoring requires a scavenge port inspection before the oil is added to the engine and a scavenge port inspection after 4000hrs. Both inspections require MAN Diesel supervision.

As the lube oil is neither produced nor sold by MAN B&W, MAN B&W cannot be kept responsible for any damage to engines or engine components that may be caused by the use of lube oil.

Yours faithfully
MAN Diesel A/S

Charlotte Røjgaard

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MAN Diesel A/S
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Reg. No.: 30861214



长城船用气缸油 5070 获得 MAN 认证

Wärtsilä Switzerland Ltd

WÄRTSILÄ

Ms. YU Qiaozhen
Lubricant Company, SINOPEC Corp.
No.6, West Road of Anning Zhuang,Haidian
District,Beijing, P.R. China
Postcode: 100085

Your Reference / Date
Ihr Referenz / Datum

Our Reference
Unser Zeichen

Direct Dialing
Durchwahl
Tel. +41 52 262 2324
Fax +41 52 262 0380

Date / Datum: 15 November 2010
Page / Seite: 1 / 1
Document: Approval SINOPEC 5070
Dokument:

**Subject: Letter of approval for SINOPEC Cylinder Oil 5070 (SAE50, BN70)**

Dear Madam,

This letter is to confirm that the abovementioned cylinder oil is approved by Wärtsilä Switzerland Ltd for use in all Wärtsilä two-stroke engines which were built before 1995.

The approval is based on the recent submission of physical and chemical properties and bench test data, and on the satisfactory result of a 4000 hour field test in an oil tanker equipped with a 6RTA72 engine.

The application must comply with Wärtsilä lubricating oil requirements and recommendations. Lubricants should be used as recommended in the Wärtsilä Service Bulletin RT-18.4 and manuals. The supplying Oil Company is responsible for the performance of the oil in service, to the exclusion of any liability of Wärtsilä Switzerland Ltd.

Yours faithfully,
Wärtsilä Switzerland Ltd

K. Räss
General Manager Materials and Tribology

G. Bleimscheln
Export Engine Fluids

Wärtsilä Switzerland Ltd
Wärtsilä Schweiz AG
Wärtsilä Suisse SA

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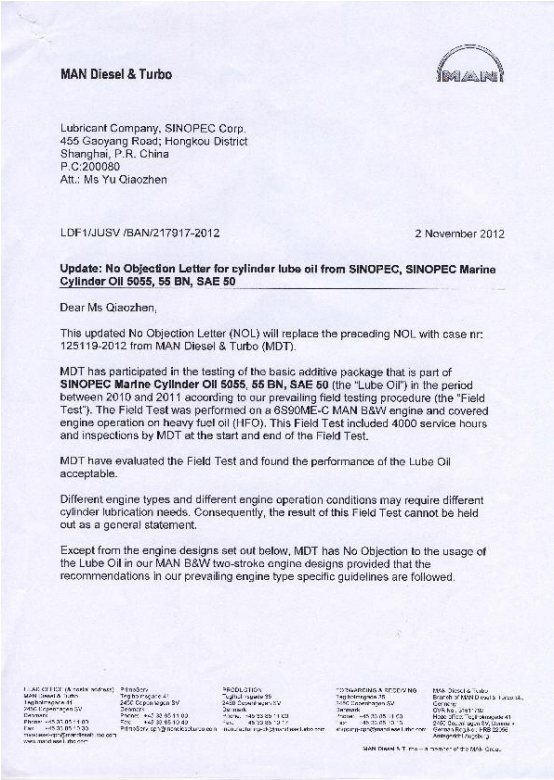
长城船用气缸油 5070 获得 WARTSILA 认证



MAN Diesel & Turbo

Lubricant Company, SINOPEC Corp.
455 Gaoyang Road; Hongkou District
Shanghai, P.R. China
P.C:200080
Att.: Ms Yu Qiaozhen

LDF1/JUSV /BAN/217917-2012 2 November 2012

**Update: No Objection Letter for cylinder lube oil from SINOPEC, SINOPEC Marine Cylinder Oil 5055, 55 BN, SAE 50**

Dear Ms Qiaozhen,

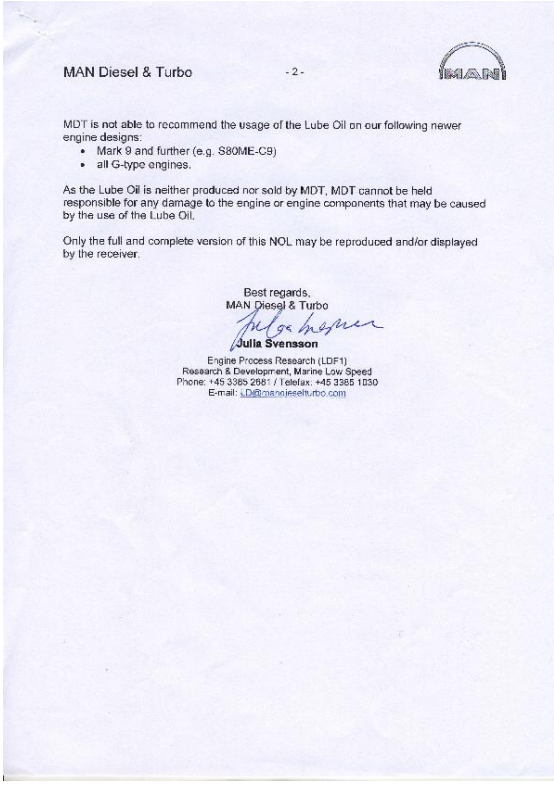
This updated No Objection Letter (NOL) will replace the preceding NOL with case nr: 125119-2012 from MAN Diesel & Turbo (MDT).

MDT has participated in the testing of the basic additive package that is part of **SINOPEC Marine Cylinder Oil 5055**, **55 BN, SAE 50** (the "Lube Oil") in the period between 2010 and 2011 according to our prevailing field testing procedure (the "Field Test"). The Field Test was performed on a 6S90ME-C MAN B&W engine and covered engine operation on heavy fuel oil (HFO). This Field Test included 4000 service hours and inspections by MDT at the start and end of the Field Test.

MDT have evaluated the Field Test and found the performance of the Lube Oil acceptable.

Different engine types and different engine operation conditions may require different cylinder lubrication needs. Consequently, the result of this Field Test cannot be held out as a general statement.

Except from the engine designs set out below, MDT has No Objection to the usage of the Lube Oil in our MAN B&W two-stroke engine designs provided that the recommendations in our prevailing engine type specific guidelines are followed.



MAN Diesel & Turbo - 2 -

MDT is not able to recommend the usage of the Lube Oil on our following newer engine designs:

- Mark 9 and further (e.g. S80ME-C9)
- all G-type engines.

As the Lube Oil is neither produced nor sold by MDT, MDT cannot be held responsible for any damage to the engine or engine components that may be caused by the use of the Lube Oil.

Only the full and complete version of this NOL may be reproduced and/or displayed by the receiver.

Best regards,
MAN Diesel & Turbo

**Julia Svensson**

Engine Process Research (LDF1)
Research & Development, Marine Low Speed
Phone: +45 3385 2681 / Telefax: +45 3385 1030
E-mail: sLDf@manbeselturbo.com

长城船用气缸油 5055 获得 MAN 认证

MAN Diesel

MAN Diesel A/S · Denmark

BY COURIER SERVICE
Lubricant Company, Sinopec Corp

No 6, Anningzhuang West Road
Ha'dian District, Beijing
China 100085
Tel: +86-10-62941011

Att.: Att.: Ms Liu Hong

2420/CXR/CEN/39146-2006 20 November 2006

**No Objection Letter for Great Wall System Oil 4008 (case 39146-2006)**

Dear Ms Liu Hong,

The Great Wall System Oil 4008 has been tested 4000hrs with supervision of MAN Diesel and inspection of engine condition at the start and end of tests. The performance of the lube oil was found acceptable for which reason MAN Diesel has no objection to use the Great Wall System Oil 4008 lube oil on a two-stroke engine.

The Great Wall System Oil 4008 field test has been carried out on a 6L50MC engine in accordance with the guidelines stated in the MAN B&W document "Cylinder & System Lubricating Oil Qualities and New Engine Development".

As the lube oil is neither produced nor sold by MAN B&W, MAN B&W cannot be kept responsible for any damage to engines or engine components that may be caused by the use of lube oil.

Best regards,
MAN B&W Diesel A/S

Charlotte Røjgaard

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MAN Diesel A/S
Denmark
Reg. No. 3661 1314

MAN Diesel a member of the MAN Group

长城船用系统油 4008 获得 MAN 认证

**MAN Diesel & Turbo**

Lubricant Company, Sinopec Corporation
No. 455 Gaoyang Road,
Honglou District
Shanghai, P.R. China
P.C. 200080
Attn. Mr. Zheng Jinhua

LDF1/DOJA/BAN/24314-2012 30 March 2012

**No Objection Letter for system oil, System Oil 3005**

Dear Mr Jinhua,

Based on the information supplied to MAN Diesel & Turbo on the System Oil 3005 system lube oil, MAN Diesel & Turbo has no objection that the System Oil 3005 is used in a MAN B&W two-stroke engine.

The performance of the basic additive package has been tested on a 6S90MC-C engine with supervision of MAN Diesel & Turbo and inspection of the engine condition at the start and end of test in accordance with the guidelines stated in the MAN Diesel document "Cylinder & System Lubricating Oil Properties and New Engine Development".

As the lube oil is neither produced nor sold by MAN Diesel & Turbo, MAN Diesel & Turbo cannot be held responsible for any damage to the engine or engine components that may be caused by the use of the lube oil.

Best regards,
MAN Diesel & Turbo

Dorthe Jacobsen

Engine Process Research (LDF1)
Research & Development, Marine Low Speed
Phone: +45 3385 1143 / Telefax: +45 3385 1030
E-mail: LD@mandieselturbo.com

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MAN Diesel & Turbo
Branch of MAN Diesel & Turbo SE,
Germany
CVR No. 819 1752
Holdbrook Teglholmsgade 41
2450 Copenhagen SV Denmark
Germany Reg No. HRB 22256
Amtsgericht Augsburg

MAN Diesel & Turbo – a member of the MAN Group

长城船用系统油 3005 获得 MAN 认证

WÄRTSILÄ

Wärtsilä Finland Oy | Industrial Operations

| Handled by | Reference | Date | Revision | Page |
|---|---|---|---|---|
| K Juoperi | NoL Sinopec TPEO.doc | 12 September 2012 | | 1 (2) |

Sinopec Corp.
Att: Ms. Huiqing Yang

**NO OBJECTION LETTER: SINOPEC TPEO SERIES LUBRICATING OILS**

Dear Madam,

The Sinopec lubricating oil TPEO 4050, has gone through a 3978 -hour validation test on the Wärtsilä® 8L46 PAA 040544 engine on board the vessel M/V Africaborg. Based on the results of the engine inspection and lubricating oil analyses, Wärtsilä has no objection to the use of the following Sinopec products.

| Product | SAE grade | Base Number | Fuel category, ISO 8217:2010(E) |
|---|---|---|---|
| TPEO 3030 | 30 | 30 | ISO-F-DMX, DMA, DMZ, DMB, ISO-F-RMA 10 – RMK 700, CRO **) |
| TPEO 4030 | 40 | 30 | ISO-F-DMX, DMA, DMZ, DMB, ISO-F-RMA 10 – RMK 700, CRO **) |
| TPEO 3040 | 30 | 40 | ISO-F-RMA 10 – RMK 700, CRO **) |
| TPEO 4040 | 40 | 40 | ISO-F-RMA 10 – RMK 700, CRO **) |
| TPEO 3050 | 30 | 50 | ISO-F-RMA 10 – RMK 700, CRO **) |
| TPEO 4050 | 40 | 50 | ISO-F-RMA 10 – RMK 700, CRO **) |

*) LBF stands for liquid bio fuel, for which fuel quality an internal fuel specification is released.
**) CRO stands for crude oil, for which fuel quality an internal fuel specification is released.

The statement is valid for the engine types Wärtsilä® Vasa 22 / 22/26, Wärtsilä® Vasa 32 / 32LN, Wärtsilä® 20, Wärtsilä® 26, Wärtsilä® 32, Wärtsilä® 38, Wärtsilä® 46, Wärtsilä® 46F, Wärtsilä® 64, Wärtsilä® 20DF, Wärtsilä® 32DF Wärtsilä® 34DF, Wärtsilä® 50DF and Sulzer® Z40 / ZA40 / ZA40S provided that fuel quality also fulfils the fuel specifications of Wärtsilä and that the engine type specific lubrication requirements are taken into account.

Instructions for other older engine types manufactured by Wärtsilä can be requested from Wärtsilä Services units being in response of a particular engine type in question.

Use of SAE 30 lubricating oils is allowed only in the engine types Wärtsilä® Vasa 22 / 22/26 and Wärtsilä® Vasa 32 / 32LN. In these engine types the suitability of SAE 40 grade lubricating oils

WÄRTSILÄ

Wärtsilä Finland Oy | Industrial Operations

| Handled by | Reference | Date | Revision | Page |
|---|---|---|---|---|
| K Juoperi | NoL Sinopec TPEO.doc | 12 September 2012 | | 2 (2) |

depends on the capacity of the lubricating oil cooler used in the installation.

In the engine types Wärtsilä® Vasa 32, Wärtsilä® 20, Wärtsilä® 26, Wärtsilä® 32, Wärtsilä® 38, Wärtsilä® 46, Wärtsilä® 46F and Wärtsilä® 64 the use of BN 50-55 lubricants in heavy fuel installations is recommended in the first place, especially if fuel sulphur content is above 2,0 % mass. BN 40 lubricants can be used as well as if experience shows that the lubricating oil BN equilibrium remains at an acceptable level. BN 30 lubricants are recommended to be used only in special cases. Concerning the engine type Sulzer Z40 / ZA40 / ZA40S the use of BN 50-55 lubricating oils is recommended only in the engines being equipped with piston skirt lubrication and having the anti-polishing rings installed.

In the first place on distillate fuel operation BN 10 – 20 lubricating oils are recommended to be used, but the use of BN 30 lubricating oils is also allowed.

These lubricating oils will be included in Wärtsilä's list of lubricating oils having passed Wärtsilä's lubrication oil testing criteria.

Sinopec Corp. undertakes all responsibility for the performance of the lubricating oils in service of the above mentioned engine types to the exclusion of any liability of any Wärtsilä company belonging to Wärtsilä group. Sinopec Corp. along with other possible manufacturers and distributors of the products in question shall indemnify, compensate and hold harmless Wärtsilä and companies belonging to Wärtsilä group from and against any claims, damages and losses caused by the lubricating oils in question.

Sinopec Corp. undertakes to inform the undersigned / responsible representatives of Wärtsilä of any subsequent changes in the formulation of the lubricating oil brands in question.

Yours faithfully,

Wärtsilä Finland Oy
Industrial Operations / R&D

Kai Juoperi
Manager, Engine Fluids

Stefan Saario
General Manager, T & P Expertise

长城船用中速机油 3030/3040/3050/4030/4040/4050 获得 WARTSILA 认证

DAIHATSU

Ms. Yang Hui Qing
Department Chief
Engine Oil Department
SINOPEC CORP.
No.455 Gaoyang Road,
Hongkou District,
Shanghai P.R.China

21st September, 2012

**LETTER OF NO OBJECTION - SINOPEC PRODUCT LINE**

The Purpose of this document is to provide SINOPEC CORP. with a Letter of No Objection regarding the use of the SINOPEC product line in DAIHATSU engines.

| | | |
|---|---|---|
| Class III - | SINOPEC TPEO 4030 | (SAE 40, 30 mgKOH/g) |
| | SINOPEC TPEO 3030 | (SAE 30, 30 mgKOH/g), when ambient temp is <20°C |
| Class IV - | SINOPEC TPEO 4030 | (SAE 40, 30 mgKOH/g) |
| | SINOPEC TPEO 3030 | (SAE 30, 30 mgKOH/g), when ambient temp is <20°C |
| Class V - | SINOPEC TPEO 4030 | (SAE 40, 30 mgKOH/g) |
| | SINOPEC TPEO 4040 | (SAE 40, 40 mgKOH/g) |
| | SINOPEC TPEO 3030 | (SAE 30, 30 mgKOH/g), when ambient temp is <20°C |
| | SINOPEC TPEO 3040 | (SAE 30, 40 mgKOH/g), when ambient temp is <20°C |

It is mutually understood that any changes in the formulation would necessitate a new Letter of No Objection to be issued following prerequisite certification steps as outlined by DAIHATSU.

It is further understood that all liability for the performance of the product and any associated cost that could result, are undertaken by SINOPEC CORP. DAIHATSU assumes no responsibility for any damage that was caused by the use of the lubricating oil.

Yours Sincerely,

Kohei Shoji
Engine Design Section
Technical Department
DAIHATSU DIESEL MFG. CO., LTD.

Masaru Takeuchi
Manager of Engine Design Section
Technical Department
DAIHATSU DIESEL MFG. CO., LTD.

长城船用中速机油 4030/4040/3030/3040 获得 DAIHATSU 认证

YANMAR

QUALITY ASSURANCE DEPT. LARGE POWER PRODUCTS OPERATIONS DIVISION
ADD.: 1-1, 1-CHOME HIGASHI-DORI NAGASU AMAGASAKI, HYOUGO, JAPAN

YLQ NOL12-001
28th Jan, 2013

Professor Yang Hui Qing
Department Chief
Engin Oil Department
Shanghai Reserch &
Department Center
Lubricant Company
SINOPEC Corp.

## Letter of No Objection – SINOPEC

The purpose of this document is to provide SINOPEC with a Letter of No Objection regarding the use of the SINOPEC grade range in Yanmar engines.

| Fuel Oil Spec. Division | H.F.O |
|---|---|
| Sulfur content (mass %) | More than 1.5 and 3.5 or less |
| SINOPEC | #30:SINOPEC TPEO 3030<br>SINOPEC TPEO 3040<br>#40:SINOPEC TPEO 4030<br>SINOPEC TPEO 4040 |

Only the Yanmar Amagasaki Plant production organization applies.

It is mutually understood that any changes in the formulation would necessitate a new Letter of No Objection to be issued following prerequisite certification steps as outlined by Yanmar.

It is further understood that all liability for the performance of the product and any associated costs that could result, are undertaken by SINOPEC. Yanmar assumes no responsibility for any damage that was caused by the use of the lubricating oil.

Yours Sincerely,

Signature: N. Matsunaga .

Nobuhiro Matsunaga
Senior Manager
Quality Assurance Dept.
Large Power Products Operations Div.
YANMAR CO., LTD

长城船用中速机油 4030/4040/3030/3040 获得 YANMAR 认证

CATERPILLAR®

**Caterpillar Motoren GmbH & Co. KG**

Copies to:

Shanghai R&D Center, Lubricant Company, Sinopec Corp.
Mrs. Huiqing Yang
455 Gaoyang Road
Hongkou District,
Shanghai
China
P.C. 200080

| Your Reference | Our Reference | Telephone | 24157 Kiel |
|---|---|---|---|
| | Rts | Direct dialling | 21.1.13 |
| Meeting Oct2012 | | +49 (0) 431 | 3995-3793 |
| | | Fax | 3995-5793 or 3995- |
| | | E-mail | Rautenstrauch_malte@CAT.com |

Dear Mrs. Huiqing Yang

This is to confirm that the lubricating oil SINOPEC TPEO 4012 and TPEO 4020 are free for use in CAT MaK engines working on destillate fuel and SINOPEC TPEO 4030 and TPEO 4040 are free for use in CAT MaK engines working on HFO-fuel.

Best regards,

Caterpillar Motoren GmbH & Co. KG

M. Rautenstrauch i.A.

Caterpillar Motoren GmbH & Co. KG
Falckensteiner Straße 2, 24159 Kiel
P. O. Box, 24157 Kiel
Registered Seat: Kiel
Register of Companies: Local Court of Kiel HRA
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http://www.cat.com

General Partner:
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Registered Seat: Kiel
Register of Companies: Local Court of Kiel HRB 4621
Management Board: Elizabeth A. Miles, Chairwoman
Oswald Schöffel

长城船用中速机油 4012/4020/4030/4040 获得 MAK 认证