

درباره شرکت

شرکت گونش شیمی صنعت یک شرکت بازرگانی در زمینه تهیه و تامین مواد اولیه صنایع روغن و لاستیک می باشد که با توجه به ربع قرن تجربه در زمینه تامین مواد اولیه کارخانجات شناخت بسیار خوبی از نیازهای این صنایع در بازار مصرف ایران دارد ، اولین و مهمترین ماموریت مدیران این شرکت تامین مایحتاج مشتریان با بهترین کیفیت و مناسبترین قیمت ممکن تبیین شده است.

با عنایت به سابقه و تجربه مدیران این شرکت در تولید انواع روغن موتور و روغن های صنعتی در کنار فروش مواد اولیه مشتریان را از مشاوره این شرکت در استفاده بهینه از مواد موجود در بازار در جهت بالا بردن کیفیت و کاهش هزینه های خود بهره مند خواهند کرد.

همچنین این شرکت توانسته با شبکه وسیع تامین کنندگان و مشتریان در فروش محصولات در بازارهای خارج از ایران نیز موفقیت های چشمگیری کسب نماید.

افتخار داریم که در راه تولید برتر در کنار شما باشیم.



Abbreviations

- AAMA** American Automobile Manufacturers Association - formerly the MV MA
(Motor Vehicle Manufacturers Association) – USA
- AAR** Association of American Railroads
- ACEA** Association des Constructeurs European d' Automobiles
- ACS** American Chemicals Society
- AGMA** American Gear Manufacturers Association
- AHEM** Association of Hydraulic Equipment Manufacturers
- ANSI** American National Standards Institute
- APE** Association Petroleum Engineers (USA)
- API** American Society of Mechanical Engineers
- ASLE** American Society for Testing and Materials
- ATC** Technical Committee of Petroleum Additive Manufacturers in Europe
- ATF** Automatic Transmission Fluid
- AVGAS** Aviation Gasoline for use in piston type aero engines
- AVTUR** Aviation Turbine Fuel
- BLF** British Lubricants Federation
- BMEP** Brake Mean Effective Pressure
- BOCL** Ball on Cylinder Lubricant Evaluator (ASTM D 5001)
- BSI** British Standards Institution
- BTC** British Technical Council of the Motor and Petroleum Industries
- CCMC** Comite des Constructeurs automobiles du Marche Common
- CCS** Cold Cranking Simulator
- CEC** Coordinating European Council
- CETOP** European Oil Hydraulic and Pneumatic Committee
- CFCs** Chlorofluorocarbons
- CFPP** Cold filter plugging point
- CFR** Code of Federal Regulations

CIMAC International Council on Combustion Engines
CLR Coordination Lubrication Research
CAFE Corporate Average Fuel Economy (USA)
CCS Cold Cranking Simulator
CFPP Cold Filter Plugging Point
CI Compression Ignition (Engine)
CMA Chemical Manufacturers Association (USA)
CNG Compressed Natural Gas
CRC Coordinating Research Council (USA)
COC Cleveland Open Cup
CONCAWE Conservation of Clean Air and Water Europe
CRC Coordinating Research Council (USA)
CVT Continuously Variable Transmission
DMO Diesel Motor Oil
DI Direct Injection (Diesel)
DIN Department of Transport (USA)
DOHC Double Overhead Camshaft (twin cams)
EEB European Environmental Board
EFTC Engine Fuels Technical Committee (of CEC)
ELTC Engine Lubricant Technical Committee (of CEC)
EMA Engine Manufacturers Association
EOLCS Engine Oil Licensing and Certification System
EP Extreme Pressure
EPA Environmental Protection Agency
ETLP Engine Tests of Lubricants Panel (of IP)
ERBP Equilibrium Reflex Boiling Point
NPRA National Petroleum Refiners Association (USA)
FMVSS Federal Motor Vehicle Safety Standards
FDA Food and Drug Administration

- FZG** Forschungstelle fur Zahnrad und Getriebau
- GFC** Groupement Francais de Coordination (Member CEC)
- HVI** High Viscosity Index
- HDDO** Heavy Duty Diesel Engine Oil
- HDEO** Heavy Duty Engine Oil
- HDEOCP** Heavy Duty Engine Oil Classification Panel
- HTHS** High Temperature High Shear Rate Viscosity
- ICOMIA** International Council of Marine Industry Associations
- ICP** Inductively Coupled Plasma
- IDI** Indirect injection (diesel)
- IEC** International Electro technical Commission
- IChemE** Institute of Chemical Engineers (UK)
- ILSAC** International Lubricant Standardization Advisory Committee
- ILMA** Independent Lubricants Manufacturers Association
- IP** Institute of Petroleum
- ISO** International Standards Organization
- ISOVG** International Organization for Standardization of Viscosity Grade
- JAMA** Japanese Automotive Manufacturers Association
- JARI** Japan Automobile Research Institute
- JASO** Japanese Automobile Standards Organization
- JAST** Japan Society of Tribologists
- JSAE** Japanese Society Of Automotive Engineers
- JIS** Japanese Industrial Standards
- LFG** Landfill Gas
- LFGeo** Landfill Gas Engine Oil
- LRI** Lubricant Review Institute (USA)
- LMOA** Locomotive Maintenance Officers Association
- LNG** Liquefied Natural Gas
- LPG** Liquefied Petroleum Gas
- LVI** Low Viscosity Index

- MCL** Marine Cylinder Lubricants
- MIL** Prefix designation for US Military specification
- MITI** Ministry of International Trade and Industry
- MON** Motor Octane Number
- MRV** Mini Rotary Viscometer
- MSDS** Material Safety Data Sheet
- MSO** Marine System Oil
- MTAC** Multiple Test Acceptance Criteria
- MTBE** Methyl tertiary butyl ether
- MVI** Medium Viscosity Index
- NECO** Natural Gas Engine Oils
- MVMA** Motor Vehicle Manufacturers Association
- NLGI** National Lubricating Grease Institute
- NMMA** National Marine Manufacturers Association
- NPRA** National Petroleum Refiners Association
- OEM** Original Equipment Manufacture
- OPEC** Organization of Petroleum Exporting Countries
- ORI** Octane Requirement Increase
- PAG** Polyalkalene Glycol Synthetic Fluid
- PAH** Polynuclear Aromatic Hydrocarbon
- PAO** Polyalphaolefin
- PAJ** Petroleum Association of Japan
- PCEOCP** Passenger Car Engine Oil Classification
- PCMO** Passenger Car Motor oil
- PDA** Food and Drug Administration
- PIB** Polyisobutylene
- PPD** Pour Point Depressant
- PT** Permanent Type Antifreeze coolants

- PTF** Powershift Transmission Fluid
- QA** Quality Assurance
- RPVOT** Rotary Pressure Vessel Oxidation Test
- RON** Research Octane Number
- RVP** Reid Vapour Pressure
- SAE** Society of Automotive Engineers
- SABS** South African Bureau of Standards
- SHPDO** Super High Performance Diesel Oil
- SI** Spark ignition (engine), or System International d Unites (International System for Units)
- SSI** Shear Stability Index
- SSU/SUS** Saybolt Seconds Universal/Saybolt Universal Seconds
- STLE** Society of Tribologists and Lubrication Engineers
- STP** Standard Temperature and Pressure
- STOU/ STUO** Super Tractor Oil Universal
- TAME** Tertiary Amyl Methyl Ether
- TAN** Total acid number
- TBN** Total base number
- TDH** Transmission, Differential & Hydraulic
- THF** Tractor Hydraulic Fluid
- TOST** Turbine Oil Stability Test
- TPEO** Trunk Piston Engine Oil
- 2T** Two-stroke oil
- UEIL** European Union of Independent Lubricant Manufacturers
- UTTO** Universal Tractor Transmission Oil
- VHVI** Very High Viscosity Index
- VI** Viscosity Index
- VII** Viscosity Index Improver

API Axle and Manual Transmission Lubricant Classifications

The American Petroleum Institute (API), in cooperation with the ASTM, has assigned lubricant services designations to differentiate the various performance levels of automotive transmission and axle lubricants. The API Axle and Manual Transmission Lubricant Classification System include Seven Classes of Service, of which four are in current use. Service Designations in Current Use

API GL-5:

Designates the type of service characteristic of gears, particularly hypoids in automotive axles operated under high-speed and/or low-speed, high torque conditions. Lubricants qualified under U.S. Military Specification MIL-L-2105D (formerly MIL-2105C) satisfy the requirements of the GL-5 designation.

API MT-1:

Designates lubricants intended for non-synchronized manual transmissions used in buses and heavy-duty trucks. Lubricants meeting API MT-1 provide protection against the combination of thermal degradation, component wear and oil seal deterioration which is not provided by lubricants meeting only the requirements of API GL-4 and GL-5.

API GL-4:

Designates the type of service characteristic of spiral-bevel and hypoid gears in automotive axles operated under moderate speeds and loads. These oils may be used in selected manual transmission and transaxle applications. (User should consult axle/transmission manufacturer's specific lubricant recommendations). While this service designation is still used commercially to describe lubricants, some test equipment used for performance verification is no longer available.

API GL-1:

Designates the type of service characteristics of manual transmissions operating under such mild conditions of low unit pressures and minimum sliding velocities, that untreated oil may be used satisfactorily. Oxidation and rust inhibitors, deformers, and pour depressants may be used to improve the characteristics of lubricants intended for this service. Frictional modifiers and extreme pressure additives shall not be utilized. Due to speeds and loads involved, untreated oil without oxidation and rust inhibitor additives is generally not a satisfactory lubricant for many passenger car manual transmissions. For some trucks and tractor manual transmissions, untreated oils may be used successfully. In all cases, the transmission manufacturer's specific lubricant recommendations should be followed. Service Designations Not in Current Use.

API GL-6:

Designates the type of service characteristic of gears designed with a very high pinion offset.

Such designs typically require (gear) score protection in excess of that provided by API GL-5 gear oils. A shift to more modest pinion offsets, coupled with the obsolescence of original API GL-6 test equipment and procedure, has greatly diminished the commercial need for API GL-6 gear lubricants.

API GL-3:

Designates the type of service characteristic of manual transmissions and spiral-bevel axles operating under mild to moderate to severe conditions of speed and load. The service conditions require a lubricant having load-carrying capacities greater than those that will satisfy API GL-1 service, but below the requirements of lubricants satisfying API GL-4 service. Gearlubricants designated for API GL-3 are not intended for hypoid gear applications.

API GL-2:

Designates the type of service characteristic of automotive type worn-gear axles operating under such conditions of load, temperature and sliding velocities that lubricants satisfactory for API GL-1 will not suffice. Products suited for this type of service contain anti wear or very mild extreme-pressure agents which provide protection for worm gears.

API Diesel Engine Service Classifications

“C” Commercial Classifications:

Six API “C” Service Classifications are current, namely, CJ-4, CI-4, CH-4, CG-4, CF-4, CF-2 and CF. A new proposal PC-10 is being prepared for the heavy-duty engine oils which will be required for engines meeting 2007 emission requirements.

CJ-4 Current

For high speed four stroke cycle diesel engines designed to meet 2010 model year on highway and Tier 4 no inroads exhaust emission standards as well as for previous model year diesel engines. These oils are formulated for use in all applications with diesel fuels ranging in sulfur content up to 500 ppm (0.05% by weight). However, the use of these oils with greater than 15 ppm (0.0015% by weight) sulfur fuel may impact exhaust after treatment system durability and/or drain interval. CJ4 oils are especially effective at sustaining emission control system durability where particulate filters and other advanced after treatment systems are used. Optimum protection is provided for control of catalyst poisoning, particulate filter blocking, engine wear, piston deposits, low and high temperature stability, soot handling properties, oxidative thickening, foaming, and viscosity loss due to shear. API CJ4 oils exceed the performance criteria of API CI4 with CI4 PLUS, CI4, CH4, CG4 and CF4 and can effectively lubricate engines calling for those API Service Categories. When using CJ4 oil with higher than 15 ppm sulfur fuel, consult the engine manufacturer for service interval.

CI-4 Current:

Introduced September 5, 2002. For high-speed, four-stroke engines designed to meet 2004 exhaust emission standards implemented in 2002. CI-4 oils are formulated to sustain engine durability where exhaust gas recirculation (EGR) is used. Accordingly CI-4 required significant increase in oxidation stability, soot control, and control over corrosive wear in comparison with API CH-4 can be used in place of CD, CF-4, CG-4 and CH-4 oils.

CH-4 For Severe-Duty, Four-Stroke-Cycle Diesel Engine Service:

Introduced in 1998 for high speed, four-stroke engines designed to meet 1998 exhaust emission standards. Requires substantially higher levels of control over soot-related wear and viscosity increase. Can be used in place of CD, CE, CF-4 and CG-4 oils.

CG-4 for Medium to Severe-Duty, Four-Stroke-Cycle Diesel Engine Service:

API Service Category CG-4 describes oils for use in high speed, four-stroke-cycle diesel engines used in both heavy-duty, on-highway applications. CG-4 oils provide effective control over high temperature piston deposits, wear, corrosion, foaming, oxidation stability and soot accumulation. These oils are especially effective in engines designed to meet 1994 U.S.A exhaust emission standards and may also be used in engines requiring API Service

Categories CF-4, CE and CD. Engine Test Requirement: IN, T8, IIIE, L-38, GM6.2L (plus some bench testing requirements).

CF-4 Four-Stroke-Cycle Diesel Engine Service:

Service typical of certain high-speed turbocharged and supercharged, four-stroke-cycle diesel engines since 1990. API Service Category CF-4 oils exceed the requirements of the API Service Category CE and provide improved control of oil consumption and engine deposits. Oils meeting API Service Category CF-4 may be used when API Service Categories CE and CD are recommended for diesel engines. Engine Tests Requirements: 1K, L-38, T-6, T-7, NTC-400.

CF-2 Two-Stroke-Cycle Diesel Engine Service:

API Service Category CF-2 denotes service typical of two- stroke-cycle engines requiring highly effective control over cylinder and ring-face scuffing and deposits. Oils designate for this service have been in existence since 1994 and may also be used when API Service category CD-II is recommended. These oils do not necessarily meet the requirements of CF orCF-4 unless passing test requirements of these categories. Engine Test Requirements: 1M-PC, 6V-92TA, L-38.

CF for Indirect-Injected Diesel Engine Service:

API Service category CF denotes service typical of indirect- injected diesel engines, and other diesel engines which use a broad range of fuel types including those using fuel with higher

sulfur content, for example over 0.5% weight. Effective control of piston deposits, wear and copper-containing bearing corrosion is essential for these engines which may be naturally aspirated, turbocharged. Oils designated for this service has been in existence since 1994/andmay also be used when API Service Category CD is recommended. Engine Test Requirements:1M-PC, L-38.

CE for 1983 Diesel Engine Service (Obsolete)

Service typical of certain turbocharged and supercharged heavy-duty diesel engines manufactured since 1983 and operating under high-load conditions for low and high speed operation. Oils designed for this service may be used where API Service Category CD is recommended for diesel engines. Engine Test Requirements: 1-C2, L-38, T-6, T-7, NTC-400.

CD-II for Severe-Duty Two-Stroke-Cycle Diesel Engine Service (Obsolete):

Service typical of Two-stroke-cycle diesel engines requiring highly effective control over wear and deposits. Oils designed for this service also meet all requirements of API Service Category CD. Engine Test Requirements:1-G2, L-38, 6V-53T.

CD for Diesel Engine Service (Obsolete):

Service typical of certain naturally aspirated, turbocharged or supercharged diesel engines where highly effective control of wear and deposits is vital or when using fuels of a wide quality range, including high-sulfur fuels. Oils designed for this service were introduced in 1955 and provide protection from bearing corrosion and form high-temperature deposits in these diesel engines. Engine Test Requirements: 1-G2, L-38

CC for Diesel Engine Service (Obsolete):

Service typical of certain naturally aspirated and lightly supercharged diesel engines operated in moderate to severe service, and certain heavy-duty gasoline engines. Oils designed for this service provided protection from high- temperature deposits and bearing corrosion in these diesel engines, and from rust, corrosion and low-temperature deposits in gasoline engines. These oils were introduced in 1961. Engine Test Requirements: L-38, LTD or Modified LTD; IIC or IID. 1-H2.

CB for Diesel Engine Service (Obsolete)

Service typical of diesel engines operated in mild to moderate duty. Oils designed for this service provided necessary protection from bearing corrosion and high-temperature deposits in normally-aspirated diesel engines with lower quality fuels. Oils of API Service Category CB should not be used in any engine unless specifically recommended by the manufacturer. Engine Test Requirements: L4, or L-38, L-1.

CA for Diesel Engine Service (Obsolete):

Service typical of diesel engines operated in mild to moderate duty with high-quality fuel. Oils designed for this service provided protection from bearing corrosion and from ring belt deposits in some naturally aspirated diesel engines when using such quality fuels that they imposed no unusual requirements for wear and deposit protection. Oils of API Service Category CA should not be used in any engine unless specially recommended by the manufacturer. Engine Test Requirements: L-4 or L-38, L-1.

API Gasoline Engine Service Classifications

The American Petroleum Institute engine oil classification System was set up as a joint effort by API (American Petroleum Institute), ASTM (American Society for Testing and Material) and SAE (Society of Automotive Engineers). The latter classification system is a method of classifying engine oils according to their performance characteristics, and relating this to their intended type of service.

The API system currently includes service classifications for service station/spark ignition engine ("S" series) and for commercial applications/compression ignition engines ("C" series). It also acknowledges the energy conserving properties of engine oils through specific engine test where apply: It is an "open-ended" system which allows for the addition of new designations with little change to existing ones.

"S" Service Station/Spark Ignition Engine Classifications:

Only three API "S" Service Classifications, categories SM, SL and SJ, are current. The API decided to move directly from API Service Classification SH to SJ in order to avoid confusion with the abbreviation SI, which is used for the System International d Unites (International System for Units) and "Spark Ignition". The remaining categories are obsolete due to the introduction of higher performance categories, or the non-availability of test methods:

"SN" Current:

Introduced in October 2010 for 2011 and older vehicles, designed to provide improved high temperature deposit protection for pistons, more stringent sludge control, and seal compatibility. API SN with Resource Conserving matches ILSAC GF5 by combining API SN performance with improved fuel economy, turbocharger protection, emission control system compatibility, and protection of engines operating on ethanol containing fuels up to E85. For 2010 and older automotive engines. For 2004 and older automotive engines

"SM" Current:

For all automotive engines currently in use. Introduced November 30, 2004, SM oils are

designed to provide oxidation resistance, improved deposit protection, better wear protection, and better low-temperature performance over the life of the oil. Some SM oils may also meet the latest ILSAC specification and/or qualify as Energy Conserving

"SL" Current:

For all automotive engines presently in use. Introduced July 1, 2001. SL oils are designed to provide better high-temperature deposit control and lower oil consumption. Some of these oils may also meet the latest ILSAC specification and/or qualify as Energy Conserving.

“SJ” for 1996 Gasoline Engine Warranty Maintenance Service:

Service typical of gasoline engines in 1997 and earlier passenger car, van and light truck. This category exceeded the minimum performance requirements of API Service Category SH with as light different simulated distillation and evaporation loss, plus met the requirements of bench tests for wet filterability, gelation index, high temperature foaming, and high temperature deposits. API Service Category SJ also introduced a limit on phosphorus content of 0.1 mass %. API Service Category SJ may be used where API SH, SG and earlier categories have been recommended. Engine Test Requirements: IID, IIIE, VE, L-38 (Plus some bench testing requirements).

“SH” for 1994 Gasoline Engine Warranty Maintenance Service:

Service typical of gasoline engine in 1994 and earlier passenger car, van and light truck. This category exceeds the minimum performance requirements of API Service Category SG in the areas of deposit control, oil oxidation, wear, rust and corrosion. Engine oils meeting API Service Category SH have been tested in accordance with the Chemical Manufacturers Association (CMA) Code of Practice, and be used where API Service Category SG and earlier categories have been recommended. Engine Test Requirements: IID, IIIE, VE, L-38 (Plus some bench testing requirements).

“SG” for 1989 Gasoline Engine Warranty Maintenance Service (Obsolete):

Service typical of gasoline engines in passenger cars, vans and light-duty trucks, and some diesel engines, beginning with 1989 models. Oils developed for API Service Classification SG provide improved control of sludge and varnish, oil oxidation and engine wear relative to engine oils developed for previous categories. These oils also provide protection against rust and corrosion. Oils meeting API Service Category SG may be used when API Service Categories SF, SE and earlier categories are recommended. Engine Test Requirements: IID, IIIE, VE, L-38, 1-H2.

“SF” for 1980 Gasoline Engine Warranty Maintenance Service (Obsolete):

Service typical of gasoline in passenger cars and some trucks beginning with 1980 models. Oils developed for this service provided increased oxidation stability and improved anti wear performance relative to engine oils that met the minimum requirements for API

Service Category SE. These oils provided protection against engine deposits, rust and corrosion. Oils meeting API Service Category SF may be used when API Service Categories CE, SD or SC are recommended. Engine Test Requirements: IID, IIIE, VD, L-38.

“SE” for 1972 Gasoline Engine Warranty Maintenance Service (Obsolete):

Service typical of gasoline engines in passenger cars and some trucks beginning with 1972 and certain 1971 models. Oils designed for this service provided more protection against oil oxidation, high-temperature engine deposits, rust and corrosion in gasoline engines than oils that satisfied API Engine Service Categories SD or SC and may use when either of these

categories is recommended. Engine Test Requirements: IIC or IID, IIIC or IIID, VC or VD, L-38.

“SD” for 1968 Gasoline Engine Warranty Maintenance Service (Obsolete)

Service typical of gasoline engines beginning with 1968 models. Of little relevance to modern gasoline engines. Superseded by API Service Category SE in 1972. Engine Test Requirements: IIB, IIIB,IV, VB, L-38, L-1 or I-H.

“SC” for 1964 Gasoline Engine Warranty Maintenance Service (Obsolete)

Service typical of gasoline engines in 1964 through 1967. Of little relevance to modern gasoline engines. Superseded by API Service Category SD in 1968. Engine Test Requirements: IIB, IIIA, IV,V, L-38, L-1.

“SB” for Minimum-Duty Gasoline Engine Service (Obsolete)

Oils meeting this service provided only mild antis cuff capability, and some resistance to oil oxidation and bearing corrosion. Oils of API Service Category SB should not use in any engine unless specifically recommended by the manufacturer. Engine Test Requirements: L-4 or L-38,IV.

“SA” formerly for Utility Gasoline and Diesel Engine Service (Obsolete)

Oils for such mild service that the category had no performance requirements. Oils of API Service Category SA should not be used in any engine unless specifically recommended by the manufacturer. Engine Test Requirements: None

EMA Engine Oil Classifications

The Engine Manufacturers Association (EMA) in the United States recognizes the engine performance classification systems of other organizations, such as API and ACEA/CCMC. They also define categories for the classification of engine oil for spark- ignited natural gas engines and comment on the operation of natural gas (and other gaseous-fueled) engines. Spark-Ignited (Natural Gas) Engine Oil Specifications

JASO DH-1:

Gaseous-fuelled engines require oils formulated with an additive system specific to these engines. Since no industry standards are available to define performance levels, field test evaluation must be used. The sulfated ash level of an oil is used as an industry guideline as to various categories, but certainly ash alone will not define the performance level of an oil. These ash categories are defined by the EMA as:

Category % Sulfated Ash

Ash less Less than 0.1%

Low Ash 0.1 to 0.5 %

Medium Ash 0.5 to 1.50%

High Ash Greater than 1.5%

Constraints other than sulfated ash may be placed on the oils depending on individual engine manufacturers and the type of engine operation and environmental controls. The use of exhaust catalysts may impose limitations on the use of base metals and other elements such as Zinc, Sulfur and phosphorus in the oil formulation.

The use of other gaseous fuels such as sour gas or landfill gas, etc., has increasing interest today. The increased hydrogen sulfide (H₂S) and total organic halides (chlorine) create additional problems for the engine and lubricating oils. The best approach to this problem would be to remove these corrosives from the fuel before they reach the engine. If the fuel is not treated, higher base number (BN) engine oil, used oil analysis, reduced oil-change periods and increased jacket water temperatures are necessary. But engine life is usually sacrificed, even with all these additional requirements.

ILSAC Engine Service Classifications

The American Automobile Manufacturers Association (AAMA) and the Japan Automobile Manufacturers Association (JAMA), through an organization called the International Lubricant Standardization and Approval Committee (ILSAC), jointly developed and approved a "Minimum Performance Standard for Passenger Car Motor Oils". The standard known as ILSAC GF-1 was issued in October 1990 and revised in October 1992. An upgraded standard known as ILSAC GF-2 was commercially released in October 1996. The latest standard ILSAC GF-3 was introduced in 2001. Engine Oils meeting ILSAC GF-3 may be licensed to be labeled using the ILSAC "Star bust" certification mark on packaging.

ILSAC GF-3:

Comprises all of the requirements of API Service Category SL.

ILSAC GF-2:

Comprises all of the requirements of API Service Category SJ plus bench tests for high temperature/high shear viscosity, volatility, filterability, foaming, flash point, shear stability, high temperature deposits and phosphorus content. As well ILSAC GF-2 requires and Energy Conserving Rating from the Sequence VIA test.

ILSAC GF-1:

Comprises all of the requirements of API Service Category SH plus bench tests for volatility, filterability, foaming, flash point, high temperature/high shear viscosity, shear stability and phosphorus content. As well ILSAC GF-1 requires a minimum of 2.7% fuel economy in the Sequence VI test and is restricted to oils which meet the low temperature viscosity grade 0W,5W and 10W.

The ILSAC "Star bust" may no longer be used on packaging of GL-1 oils.

U.S. Military Specifications

A wide range of U. S. Military (MIL) Specifications exist for the use of the U. S. Department of Defense and other Government agencies. The approval and maintenance of a MIL – lubricant qualification not only requires manufacture and testing of a fixed additive and base oil formulation, but a “Manufacturing Facility Survey” is also required. All U.S. Military specifications are now issued as Performance Specifications designated as MIL-PRF.

MIL-PRF-2104G

SAE 10W, 30, 40 & 15W-40

APICG-4, CF, CF-2 & Allison C-4

Most commercial HDMO's meeting these requirements would also meet API SJ.

MIL-L-2104F (Superseded February 1997)

Obsolete specification for crankcase oils intended for spark- ignition and compression-ignition engines used in all types of military combat/tactical ground equipment and for power transmissions, hydraulic systems and non-hypoid gear units of engineering and construction equipment and material handling equipment. Oils of this specification met API Service Classification CD-II, and testing in spark-ignition engine tests suggests a gasoline engine performance in the area of API SF. The specification covered SAE 10W-30, 40 & 15W-40 viscosity grades.

MIL-L-2104E (Superseded March 1992)

Approximate equivalent of API Service Classification CD-II in diesel engine performance, while testing in spark-ignition engine tests suggests a petrol engine performance in the area of API SF.

MIL-L-2104D (Superseded August 1988)

Appropriate equivalent of API Service Classification CD with gasoline engine performance which fell between API SD and SE. Passing performance in DDA 6V-53T, Caterpillar TO-2 and Allison C-3 tests also required.

MIL-L-2104C (Superseded April 1983)

Approximate equivalent of API Service Classification CD/SD. MIL-L-2104B (Superseded November 1970) Required performance in the 1-H, L-38 and LTD engine tests Prior to MIL-L-2104A, several Military Ordnance and U.S. Army Specifications were in place. Details are as follows:

MIL-O-2014 (ORD) - issued August 1950, Superseded by MIL-L-2104A, February 1954. U.S. Army 2-104B - issued May 1943, Superseded by MIL-O-2104 (ORD), August 1954. Supplement 1 applied to U.S. Army 2-104B but was never written into the specification itself. This "Qualified Products List" (QPL) listed oils which were tested against higher sulfur fuel. Supplement 2 applied to U.S. Army 2-104B but was never written into the specification itself. This OPL listed oils which were also approved under Caterpillar Superior Lubricants (Series 2).

U.S. Army 2-104A and 2-104 were issued between 1941 and 1943, and were superseded by U.S. Army 2-104B, May 1943.

Note: U.S. Army 2-104B, Supplement 1 was a higher performance level than the subsequent MIL-O-2104 (ORD) and MIL-L-2104A Specifications and "Supplement 1" became an accepted industry guideline until the issue of MIL-L-2104B in December 1964.

MIL-PRF-2105E:

Current specification for multipurpose gear oil intended for automotive gear units, heavy-duty industrial type enclosed gear units, steering gears and fluid lubricated universal joints of automotive equipment. The specification covers SAE 75W, 80W/90 and 85W-140 viscosity grades and the use of re-refined base oil is allowed. Gear Lubricants covered by this specification meet API Service Classifications GL-5 and MT-1.

Glossary of Terms

Absolute viscosity

The ratio of shear stress to shear rate. It is a fluid's internal resistance to flow. The common unit of absolute viscosity is the poise (see viscosity). Absolute viscosity divided by the fluid's density equals kinematic viscosity.

Acid number

The number of milligrams of potassium hydroxide required to neutralize one gram of an oil sample. ASTM D664 uses a potentiometric titration; D 974 uses a color-indicator titration. Also known as neutralization number.

Additive

A chemical substance added to impart or improve certain properties. Common petroleum product additives are: antifoam agent, anti-wear additive, corrosion inhibitor, demulsified, detergent, dispersant, emulsifier, EP additive, oiliness agent, oxidation inhibitor, pour point depressant, rust inhibitor, tackiness agent, viscosity index (VI.) improver. Different ones can be required depending on the application

AGMA

American Gear Manufacturers Association - as one of its activities, establishes and promotes standards for gears and gear lubricants. AGMA specification covers gear lubricants. The viscosity ranges of the AGMA numbers (or grades) conform to the International Standards Organization (ISO) viscosity classification system (see ISO viscosity classification system).

Aniline Point

Lowest temperature at which equal volumes of aniline (a benzene derivative) is soluble in a specified quantity of a petroleum product, as determined by test method ASTM D 611; hence, an empirical measure of the solvent power of a hydrocarbon – the lower the aniline point, the greater the solvency. Paraffinic hydrocarbons have higher aniline points than aromatic types.

ANSI

American National Standards Institute - An organization of industrial firms, trade associations, technical societies, consumer organizations, and government agencies, intended to establish definitions, terminologies, and symbols; improve methods of rating, testing, and analysis; coordinate national safety, engineering and industrial standards; and represent U.S. interests in international standards work.

Antifoam agent

An additive used to reduce foaming in petroleum products. Typically either a silicone oil to break up large surface bubbles, or various kinds of polymers that decrease the amount of small bubbles entrained in the oils.

Antioxidant

A chemical additive which increases a lubricant's oxidation resistance, which lengthens its service and storage life.

Anti-wear Additive

Additive in a lubricant that reduces friction and excessive wear.

API

American Petroleum Institute - A trade association of petroleum producers, refiners, marketers, and transporters, organized for the advancement of the petroleum industry by conducting research, gathering and disseminating information, and maintaining cooperation between government and the industry on all matters of mutual interest.

ASTM

American Society for Testing and Materials - An organization devoted to "the promotion of knowledge of the materials of engineering, and the standardization of specifications and methods of testing. In North America most data used to describe, identify, or specify petroleum products is determined in accordance with ASTM test methods.

ATF

Automatic Transmission Fluid - A functional fluid for automatic transmissions in motor vehicles. Automatic transmission fluids must have a suitable coefficient of friction, good low-temperature viscosity, and anti-wear properties. Other necessary properties are: high oxidation stability, anti-corrosion, anti-foaming, and compatibility with synthetic rubber seals.

Base Number

The number of milligrams of acid required to neutralize one gram of an oil sample. ASTM D974 uses hydrochloric acid and a color indicator titration; D 2896 uses perchloric acid in a potentiometric titration.

Base Stock

A primary refined petroleum fraction, usually lubricating oil, into which additives and other products are blended to produce finished products.

Bearing

Basic machine component designed to reduce friction between moving parts and to support a moving load.

Bleeding

Separation of a liquid from lubricating grease.

Boundary Lubrication

A form of lubrication between two rubbing surfaces without development of a full-fluid lubricating film.

Brookfield Viscosity

A measure of the viscosity characteristics of a lubricant under low temperature and low shear conditions. The apparent viscosity of oil, usually determined by test method ASTM D 2983.

Carbon Residue

The measure of the coke forming tendency of oils at high temperatures.

Carcinogen

A cancer-causing substance. Certain petroleum products are classified as potential carcinogens under OSHA criteria. Suppliers are required to identify such products as potential carcinogens on package labels and Material Safety Data Sheets.

Catalyst

A Substance That Contributes To A Chemical Reaction Without, itself, undergoing any change.

Chlorinated Wax

Certain solid hydrocarbons treated with chlorine gas to form straight-chain hydrocarbons with a relatively high chlorine component. Chlorinated waxes are used primarily as polyvinyl chloride plasticizers, extreme-pressure additives for lubricants, and formulation components for many cutting fluids.

CLS

Circulating Lubrication System - A system in which oil is recirculated from a sump or tank to the lubricated parts, in most cases requiring a pump to maintain circulation. Circulating lubrication makes possible extended lubricant use, and usually requires a high-quality rust and oxidation inhibited (R&O) oil.

Cloud Point

The temperature at which a lubricant appears hazy because of wax formation when a sample is cooled under standard conditions. See also pour point.

CCS

Cold Cranking Simulator - A viscometer used to predict the ability of an engine lubricant to allow cranking during cold starts.

Compounded Oil

A mixture of petroleum oil with animal or vegetable fat or oil. Compounded oils have a strong affinity for metal surfaces; they are particularly suitable for wet-steam conditions and for applications where lubricity and extra load-carrying ability are needed. They are not generally recommended where long-term oxidation stability is required.

Consistency (Grease)

A basic property describing the softness or hardness of a grease, i.e., the degree to which a grease resists deformation under the application of force. Consistency is usually measured by means of a cone penetration test.

Corrosion

A chemical attack on a metal or other solid by contaminants in a lubricant. Common corrosive contaminants are: (1) water, which causes rust of ferrous materials, and (2) acids, which may form as oxidation products in a deteriorating oil, or may be introduced into the oil as combustion by-products in piston engines.

Corrosion Inhibitor

An additive for protecting lubricated metal surfaces against chemical attack by water or other contaminants. There are several types of corrosion inhibitors. Polar compounds wet the metal surface preferentially, protecting it with a film of oil. Other compounds may absorb water by incorporating it in a water-in oil emulsion so that only the oil touches the metal surface. Another type of corrosion inhibitor combines chemically with the metal to present a non-reactive surface.

Cylinder Oil

A lubricant for independently lubricated cylinders, such as those of steam engines and air compressors; also for lubrication of valves and other elements in the cylinder area. Steam cylinder oils are available in a range of grades with high viscosity's to compensate for the thinning effect of high temperatures; of these, the heavier grades are formulated for superheated and high-pressure steam, and the lighter grades for wet, saturated, or low-pressure steam. Some grades are compounded for service in excessive moisture; see compounded oil. Cylinder oils lubricate on a once-through basis.

Demulsifier

An additive that promotes oil water separation in lubricants that are exposed to water or steam.

Density

Mass per unit volume of a material.

Detergent

An important component of engine oils and some industrial lubricants, such as paper machine oils and hydraulic fluids; helps control deposits by preventing contaminants of combustion from directly contacting metal surfaces and, in some cases, by neutralizing

acids. A detergent is usually a metallic (commonly barium, calcium or magnesium) compound, such as a sulfonate, phosphate, thiophosphonate, phenate, or salicylate. Because of its metallic composition, a detergent leaves a slight ash when the oil is burned. A detergent is normally used in conjunction with a dispersant.

Dispersant

An additive that helps prevent deposits by holding the insoluble products of oil oxidation and fuel combustion in suspension in the oil.

Dropping Point

The temperature at which a drop of fluid or grease separates and drops as specified under ASTM D556.

EIO

Electrical Insulating Oil - A high-quality oxidation-resistant oil refined to give long service as a dielectric and coolant for electrical equipment, most commonly transformers. Insulating oil must resist the effects of elevated temperatures, electrical stress, and contact with air, which can lead to sludge formation and loss of insulation properties. It must be kept dry, because water is detrimental to dielectric strength - the minimum voltage required to produce an electric arc through an oil sample, as measured by test method ASTM D 877.

Emulsifier

An additive that promotes the formation of a stable mixture, or emulsion of oil and water. Common emulsifiers are: metallic soaps, certain animal and vegetable oils, and various polar compounds (having molecules that are water-soluble at one extremity of their structures and oil-soluble at the other).

Emulsion

A two-phase liquid system in which small droplets of one liquid are immiscible in, but uniformly dispersed throughout, a second, continuous phase. Generally of a milky or cloudy appearance, emulsions may be of two types; oil-in-water (where water is the continuous phase) and water-in-oil (where water is the discontinuous phase).

EP Additive

A lubricant additive that prevents sliding metal surfaces from seizing under conditions of extreme pressure (EP). At the high local temperatures associated with metal to-metal contact, an EP additive combines chemically with the metal to form a surface film that prevents the welding of opposing asperities, and the consequent scoring that is destructive to sliding surfaces under high loads. Reactive compounds of sulfur, chlorine, or phosphorus are used to form these inorganic films.

EP Oil

A lubricating oil formulated to withstand extreme pressure (EP) operating conditions.

Fire Point

The temperature rating at which a lubricant will catch fire continuously.

Fire-Resistant Fluid

A lubricant used especially in high-temperature or hazardous hydraulic applications, such as steel mills and underground mining. Three common types of fire-resistant fluids are: (1) water petroleum oil emulsions, in which the water prevents burning of the petroleum constituent; (2) water-glycol fluids; and (3) non-aqueous fluids of low volatility, such as phosphate esters, silicones, and polyesters.

Flash Point

The minimum temperature at which a fluid will support instantaneous combustion (flash) but before it will burn continuously (fire).

Flow Improver

An additive designed to modify wax crystal growth, thereby lowering the pour point and improving low temperature fluidity.

Foaming

A frothy mixture of air and a petroleum product (e.g., lubricant, fuel oil) that can reduce the effectiveness of the product, and cause sluggish hydraulic operation, air binding of oil pumps, and overflow of tanks or sumps. Foaming can result from excessive agitation, improper fluid levels, air leaks, cavitation, or contamination with water or other foreign materials. Foaming can be inhibited with an antifoam agent. The foaming characteristics of a lubricating oil can be determined by blowing air through a sample at a specified temperature and measuring the volume of foam, as described in test method ASTM D 892.

Fretting

Form of abrasive wear resulting from small-amplitude oscillations or vibrations that cause the removal of very finely divided particles from rubbing surfaces (e.g., the vibrations imposed on the wheel bearing of an automobile when transported by rail car).

Friction A the resistance to the motion of one surface over another.

Friction Modifier

An additive designed to affect the frictional properties of rubbing surfaces.

FFFL

Full-Fluid-Film Lubrication The presence of a continuous lubricating film sufficient to completely separate two surfaces, as distinct from boundary lubrication. Full-fluid-film lubrication is normally hydrodynamic lubrication, whereby the oil adheres to the moving part and is drawn into the area between the sliding surfaces, where it forms a pressure, or hydrodynamic, wedge. A less common form of full-fluid lubrication is hydrostatic

lubrication, wherein the oil is supplied to the bearing area under sufficient external pressure to separate the sliding surfaces.

Gear

A machine part that transmits motion and force by means of successively engaging projections, called teeth.

Gearbox (Gear Housing)

A casing for gear sets that transmit power from one rotating shaft to another. A gear box has a number of functions: it is precisely bored to control gear and shaft alignment, it contains the gear oil or grease, and it protects the gears and lubricant from water, dust, and other environmental contaminants

Gear Oil

High quality oil with good oxidation stability, load-carrying capacity, rust protection, and resistance to foaming, for service in gear housings and enclosed chain drives. Specially formulated industrial EP gear oils are used where highly loaded gear sets or excessive sliding action (as in worm gears) is encountered.

Grease (Lubricating)

A mixture of a fluid lubricant (usually petroleum oil) and athickener (usually soap) dispersed in the oil. Because greases do not flow readily, they are used where extended lubrication is required and where oil would not be retained.

Hydraulic Fluid

A fluid serving as the power transmission medium in a hydraulic system. The most commonly used fluids are petroleum oils, synthetic lubricants, oil-water emulsions, and water-glycol mixtures.

Hydraulic System

A system designed to transmit power through a liquid medium, permitting multiplication of force in accordance with Pascal's law.

Hydrolytic Stability

The ability of a lubricant to resist chemical decomposition(hydrolysis) in the presence of water.

Industrial Lubricant

Any petroleum or synthetic-base fluid or grease commonly used in lubricating industrial equipment, such as gears, turbines, and compressors.

Infra-red (IR) Analysis

A form of absorption spectroscopy that identifies organic functional groups present in a used lubricant.

MRL

Mold Release Lubricant - A compound, often of petroleum origin, for coating the interiors of molds for glass and ceramic products. The mold lubricant facilitates removal of the molded object from the mold, protects the surface of the mold, and reduces or eliminates the need for cleaning it.

RV Viscosity

The measure of viscosity at low temperature and shear rate using a mini rotary viscometer and designed to determine the ability of an engine oil to pump to critical locations immediately following a cold start.

Naphthenic

Petroleum fluid derived from naphthenic crude oil, characterized by a high proportion of cyclo-paraffinic structures or by absence of wax molecules.

NN

Neutralization Number - A number used as a measure of the acidic or basic constituents. This term is ambiguous and now obsolete. (See acid/base number, TAN/TBN)

Newtonian Fluid

Any fluid, such as a straight mineral oil, whose viscosity does not change with rate of flow.

NAGC

NLGI Automotive Grease Classifications - Automotive lubricating grease quality levels established jointly by SAE, ASTM, and NLGI. There are several categories in two classifications: Chassis Lubricants and Wheel Bearing Lubricants. Quality or performance levels within each category are defined by ASTM tests.

NLGI

National Lubricating Grease Institute - Trade association whose main interest is grease and grease technology. NLGI is best known for its system of classifying greases by penetration.

NCG

NLGI Consistency Grades - Simplified system established by the National Lubricating Grease Institute (NLGI) for assigning a single numerical value for a consistency range of grease. This ranges from 000 to 6.

Non-Newtonian Fluid

Fluid, such as a grease or a polymer-containing oil (e.g., multi grade oil), in which shear stress is not proportional to shear rate.

Normal Paraffin

A hydrocarbon consisting of molecules in which any carbon atom is attached to no more than two other carbon atoms; also called straight chain paraffin and linear paraffin.

Open Gear

A gear that is exposed to the environment, rather than being housed in a protective gearbox.

Organic Compound

A chemical substance containing carbon and hydrogen. Other elements, such as nitrogen or oxygen, may also be present.

OSHA

Occupational Safety & Health Administration

Oxidation

The chemical combination of a substance with oxygen. All petroleum products are subject to oxidation, with resultant degradation of their composition and performance. The process is accelerated by heat, light metal catalysts (e.g., copper), and the presence of water, acids, or solid contaminants.

Oxidation Inhibitor

A substance added in small quantities to a petroleum or other product to increase its oxidation resistance, thereby lengthening its service or storage life; also called antioxidant.

Oxidation Stability

The resistance of a petroleum product to oxidation; hence, determine the oxidation stability of a lubricant or fuel.

Paraffin

Any hydrocarbon identified by saturated straight (normal) or branched (ISO) carbon chains; also called an alkane.

Particulates

Particles made up of a wide range of natural materials (e.g., pollen, dust, resins), combined with man-made pollutant (e.g., smoke particles, metallic ash); in sufficient concentrations, particulates can be a respiratory irritant.

pH

A measure of the acidity or alkalinity of an aqueous solution. The pH scale ranges from 0 (very acidic) to 14 (very alkaline), with a pH of 7 indicating a neutral solution equivalent to the pH of distilled water. This is not the same as Acid Number.

Phenol

A white, crystalline compound (C_6H_5OH) derived from benzene, used in the manufacture of phenolic resins, weed killers, plastics, disinfectants; also used in solvent extraction, a petroleum refining process. Phenol is a toxic material; skin contact must be avoided.

NA

Any of numerous complex hydrocarbon compounds consisting of three or more benzene rings in a compact molecular arrangement. Some types of PNA's are formed in fossil fuel combustion and other heat processes, such as catalytic cracking.

Poise

A unit of measurement of absolute (or dynamic) viscosity.

Polar Compound

A chemical compound whose molecules exhibit electrically positive characteristics at one end and negative characteristics at the other end. Polar compounds are used as additives in many petroleum products.

Poly-glycols

Polymers of ethylene or propylene oxides used as a synthetic lubricant base. Properties include very good hydrolytic stability, high viscosity index (VI), and low volatility. Used particularly in water emulsion fluids

Poly-olefin

A polymer derived by polymerization of relatively simple olefins. Polyethylene and polyisoprene are important polyolefin.

Polyol Ester

A synthetic lubricant base, formed by reacting fatty acids with a polyol (such as a glycol) derived from petroleum. Properties include good oxidation stability at high temperatures and low volatility. Used in formulating lubricants for turbines, compressors, jet engines, and automotive engines.

Pour Point

The lowest temperature under which an oil will flow when cooled under prescribed conditions.

PPD

Pour Point Depressant - An additive used to lower the pour point of a petroleum product.

PPB Parts per billion.

PPM

Parts per million. A 1000 ppm is equivalent to 0.1%

Process Oil

An oil that serves as a temporary or permanent component of a manufactured product. Aromatic process oils have good solvency characteristics; their applications include proprietary chemical formulations, ink oils, and extenders in synthetic rubbers. Naphthenic

process oils are characterized by low pour points and good solvency properties. Paraffinic process oils are characterized by low aromatic content and light color.

Pump

A mechanism through which force is applied to continuously move a liquid. There are two basic categories of pumps: positive displacement and centrifugal

Quenching Oil

A high-quality, oxidation-resistant petroleum oil used to cool metal parts during their manufacture, and is often preferred to water because the oil's slower heat transfer lessens the possibility of cracking or warping of the metal.

R&O

Rust & oxidation inhibited. A term applied to highly refined industrial lubricating oils formulated for long service in circulating lubrication systems, compressors, hydraulic systems, bearing housing, gear boxes, etc. The finest R&O oils are often referred to as turbine oils.

Rheology

The study of the deformation and flow of matter in terms of stress, strain, temperature, and time. The rheological properties of a grease are commonly measured by penetration and apparent viscosity.

Rolling Oil

An oil used in hot or cold-rolling of ferrous and non-ferrous metals to facilitate feed of the metal between the work rolls, improve the plastic deformation of the metal, conduct heat from the metal, and extend the life of the work rolls. Because of the pressures involved, a rolling oil may be compounded or contain EP additives. In hot rolling, the oil may also be emulsifiable.

Rust Inhibitor

A type of corrosion inhibitor used in lubricants to protect surfaces against rusting.

Rust Preventive

A compound for coating metal surfaces with a film that protects against rust; commonly used for the preservation of equipment in storage

SUV

Say bolt Universal Viscosity (SUS) - The time in seconds for 60 milliliters of a petroleum product to flow through the calibrated orifice of a Say bolt Universal viscometer, under carefully controlled temperature, as prescribed by test method ASTM D 88. In the petroleum industry, this method has largely been replaced by the kinematic viscosity method ASTM D 455.

Scuffing

Localized distress marks on sliding metallic surfaces, appearing as a matte-finished area rather than as individual score marks.

Semi-Synthetic

A metal removal fluid typically composed of a translucent micro emulsion of water, chemicals and a small percentage of oil. A lubricant consisting of a blend of conventional mineral oil and a synthetic hydrocarbon

Shear Rate

The rate at which adjacent layers of a fluid move with respect to each other, usually expressed as reciprocal seconds (also see shear stress). When the fluid is placed between two parallel surfaces moving relative to each other: Shear rate (seconds)⁻¹ = relative velocity of surface (meters/second) Distance between surfaces (meters).

Shear Stress

The frictional force overcome in sliding one "layer" of fluid along another, as in any fluid flow. The shear stress of a petroleum oil or other Newtonian fluid at a given temperature varies directly with shear rate (velocity).

SI

From the French name, *Système International d'Unités*, the international system of units developed and maintained by the General Conference on Weights and Measures. This is the modern metric system based on the fundamental units of meters, kilograms, and seconds (MKS). The fundamental units of the older (CGS) metric system are centimeters, grams and seconds (See ASTM E 380).

Soluble Oil

A metal removal fluid typically composed of a stable milky emulsion of water, oil, emulsifiers and other functional additives. Commonly used where cooling is of primary importance.

Solvent

A material with a strong capability to dissolve a given substance. The most common petroleum solvents are mineral spirits, xylene, toluene, hexane, heptane, and naphtha's. Aromatic-type solvents have the highest solvency for organic chemical materials, followed by naphthenic and paraffin. In most applications, the solvent disappears, usually by evaporation, after it has served its purpose. The evaporation rate of a solvent is very important in manufacture.

Solvent Extraction

A refining process used to separate components (unsaturated hydrocarbons) from lube distillates in order to improve the oil's oxidation stability, viscosity index, and response to additives. The oil and the solvent extraction media are mixed in an extraction tower, resulting in the formation of two phases: a heavy phase consisting of the undesirable unsaturated dissolved in the solvent and a lighter phase consisting of a high quality oil with

some solvent dissolved in it. The phases are separated and the solvent recovered from each by distillation.

Spindle Oil

A low-viscosity oil of high quality for the lubrication of high-speed textile and metal-working (grinding) machine spindles. In addition to the rust and oxidation inhibitors needed for prolonged service in humid environments, spindle oils are often fortified with antiwear additives to reduce torque load and wear, especially at startup.

Stick-Slip Motion

Erratic, noisy motion characteristic of some machine ways, due to the starting friction encountered by a machine part at each end of its back-and-forth (reciprocating) movement. This undesirable effect can be overcome with a way lubricant, which reduces starting friction.

STLE

Society of Tribologists & Lubrication Engineers - A technical organization intended to advance the knowledge and application of lubrication and related sciences. Formerly known as the American Society of Lubrication Engineers (ASLE).

Straight Mineral Oil

Petroleum oil containing no additives. Straight mineral oils include such diverse products as low-cost once-through lubricants and thoroughly refined white oils. Most high-quality lubricants, however, contain additives.

Straight Oil

A metal removal fluid typically composed of mineral or vegetable oil or esters and functional additives. Commonly used where lubricity is of primary importance.

Sulfated Ash

Ash content determination by ASTM D874, in which the oil is burned and treated with sulfuric acid. Indicates level of metallic additives in the oil.

Sulfonate

A hydrocarbon in which a hydrogen atom has been replaced with the highly polar (SO₂OX) group, where X is a metallic ion or alkyl radical. Petroleum sulfonate are refinery by-products of the sulfuric acid treatment of white oils. Sulfonate has important applications as emulsifiers and chemical intermediates in petrochemical manufacture, and substituted sulfonate are widely used as corrosion inhibitors. Synthetic sulfonate can be manufactured from special feed stocks rather than from white oil base stocks.

Sulfur

A common natural constituent of petroleum and petroleum products. While certain sulfur compounds are commonly used to improve the EP, or load-carrying, properties of an oil, high sulfur content in a petroleum product may be undesirable as it can be corrosive and

create an environmental hazard when burned. For these reasons, sulfur limitations are specified in the quality control of fuels, solvents, etc.

SMWF

Synthetic Metal Working Fluid - A metal removal fluid composed of a transparent solution of chemical lubricants (typically glycols or esters) in water with functional additives.

Synthetic Lubricant

A lubricating fluid made by chemically reacting materials of a specific chemical composition to produce a compound with planned and predictable properties; the resulting base stock may be supplemented with additives to improve specific properties.

Tackifier

A high molecular weight, fluid polymer added to greases to improve adhesiveness.

TAN

Total acid number.

TBN

Total base number.

Thermal Stability

The ability to resist chemical degradation at high temperatures.

Thixotropy

The tendency of grease or other material to soften or flow when subjected to shearing action. Grease will usually return to its normal consistency when the action stops. Thixotropic is also an important characteristic of drilling fluids, which must thicken when not in motion so that the cuttings in the fluid will remain in suspension.

Turbine Oil

A high quality rust & oxidation inhibited (R&O) oil that meets the rigid requirements traditionally imposed on steam-turbine lubrication. Quality turbine oils are also distinguished by good demulsibility, a prerequisite of effective oil-water separation.

Viscosity

A fluid's resistance to flow. The common metric unit of absolute viscosity is the poise, which is defined as the force in dynes required to move a surface one square centimeter in area past a parallel surface at a train mechanisms (such as the camshaft and cam followers) from excessive wear.

ZDDP (also ZDTP)

Zinc Dialkyl-Dithio-Phosphate - A common oil and grease additive. It is also used as an anti-wear agent in hydraulic fluids and certain other products. ZDTP is also an effective oxidation inhibitor. Oils containing ZDTP should not be used in machines that have silver alloy or silver coated bearings.

ANSI/AGMA 9005 - D 94

American National Standard - Industrial Gear Lubrication This standard provides lubricant classifications and generalized application and servicing guidelines for industrial gearing which has been designed and rated in accordance with applicable American Gear Manufacturers Association (AGMA) Standards.

Rust & Oxidation Inhibited Gear Oil AGMA Lubricant No.	Viscosity Range -(1) mm ² /s @40°C	Equivalent ISO Grade (1)	EP Gear Lubricants (2) AGMA Lubricant No.	Synthetic Gear Oils (3) AGMA Lubricant No.
0	28.8 to 35.2	32	-	0S
1	41.4 to 50.6	46	-	1S
2	61.2 to 74.8	68	2EP	2S
3	90 to 110	100	3EP	3S
4	136 to 165	150	4EP	4S
5	198 to 242	220	5EP	5S
6	288 to 352	320	6EP	6S
7.7 Comp (4)	414 to 506	460	7EP	7S
8.8 Comp (4)	612 to 748	680	8EP	8S
8A Comp (4)	900 to 1100	1000	8AEP	-
9	1350 to 1650	1500	9EP	9S
10	2880 to 3520	-	10EP	10S
11	4140 to 5060	-	11EP	11S
12	6120 to 7480	-	12EP	12S
13	190 to 220 mm ² /s @ 100°C (5)	-	13EP	13S

Residual Compound (6), AGMA Lubricant No.
14R
15R

Viscosity Range (5), mm ² /s @ 100°C
428.5 to 857.0
857.0 to 1714.0

1. Per ISO 3448, Industrial Liquid Lubricants - ISO Viscosity Classification.
2. Extreme Pressure Lubricants should be used only when recommended by the gear manufacturer.
3. Synthetic Gear Oil 9S to 13S are available but not yet in wide use.
4. Oils marked Comp are compounded with 3% to 10% fatty or synthetic fatty oils.
5. Viscosities of AGMA Lubricant No. 13 and above are specified at 100°C as measurement of viscosities of these heavy lubricants at 40°C would not be practical.

ISO Viscosity System for Industrial Lubricants

ISO (International Standards Organization) viscosity classification

The ISO viscosity classification uses mm^2/s (cSt) units and relates to viscosity at 40°C . It consists of a series of 18 viscosity brackets between $1.98 \text{ mm}^2/\text{s}$ and $1650 \text{ mm}^2/\text{s}$, each of which is defined by a number. The numbers indicate to the nearest whole number, the mid points of their corresponding brackets. For example, ISO viscosity grade 32 relates to the viscosity bracket 28.8 to $35.2 \text{ mm}^2/\text{s}$, the midpoint of which is $32.0 \text{ mm}^2/\text{s}$. This is illustrated in the table below.

It shows the ISO viscosity grade numbers, the mid-points of each bracket, and the viscosity limits. This system is now used to classify all industrial lubricating oils where viscosity is an important criterion in the selection of the oil. Cutting oil and some other specialized products are more important in relation to grade selection.

VISCOSITY System Grade Identification	KINEMATIC VISCOSITY AT 40°C (mm^2/s)		
	Midpoint Viscosity cSt (mm^2/s) at 40°C	Midpoint Viscosity cSt (mm^2/s) at 40°C Kinematic Viscosity Limits cSt (mm^2/s) at 40°C	
		Minimum	Maximum
ISO VG 2	2.2	1.98	2.42
ISO VG 3	3.2	2.88	3.52
ISO VG 5	4.6	4.14	5.06
ISO VG 7	6.8	6.12	7.48
ISO VG 10	10	9	11
ISO VG 15	15	13.5	16.5
ISO VG 22	22	19.8	24.2
ISO VG 32	32	28.8	35.2
ISO VG 46	46	41.4	50.6
ISO VG 68	68	61.2	74.8
ISO VG 100	100	90	110
ISO VG 150	150	135	165
ISO VG 220	220	198	242
ISO VG 320	320	288	352
ISO VG 460	460	414	506
ISO VG 680	680	612	748
ISO VG 1000	1000	900	1100
ISO VG 1500	1500	1350	1650

SAE Viscosity Grades for Engine Oils

SAE J 300 Effective June, 2001

SAE Viscosity Grade	Low Temp Cranking Viscosity max Cp, @ °C	Low Temperature Pumping Viscosity max no yield stress Cp @ °C	Low-Shear Rate Viscosity Kinematic cSt @ 100°C		High shear-Rate Viscosity (Cp) @ 150°C, Min.
			min.	max.	
0 W	6,200 at -35	60,000 at -40	3.8	-	-
5 W	6,600 at -30	60,000 at -35	3.8	-	-
10 W	7,000 at -25	60,000 at -30	4.1	-	-
15 W	7,000 at -20	60,000 at -25	5.6	-	-
20 W	9,500 at -15	60,000 at -20	5.6	-	-
25 W	13,000 at -10	60,000 at -15	9.3	-	-
20	-	-	5.6	<9.3	2.6
30	-	-	9.3	<12.5	2.9
40	-	-	12.5	<16.3	2.9 ^E
40	-	-	12.5	<16.3	3.7 ^F
50	-	-	16.3	<21.9	3.7
60	-	-	21.9	<26.1	3.7

A. CCS (Cold Cranking Simulator, ASTM D-5293).

B. MRV (Mini Rotary Viscometer, ASTM D-4684).

C. Kinematic viscosity, ASTM D-445.

D. ASTM D-4683, ASTM D-4741.

E. Only for 0W-40, 5W-40 and 10W-40 grades

F. Only for 15W-40, 20W-40, 25W-40 multigrade and SAE 40 monograde.

SAE AXLE and Manual Transmission Lubricants Viscosity Classification (SAE J306 JUL 98)

SAE Viscosity Grade	Maximum Temperature for a viscosity of 150,000 Cp (°C)	Minimum Viscosity at (cSt) @ 100°C	Maximum Viscosity at (cSt) @100°C
	ASTM D 2983	ASTM D 445	
70W	-55	4.1	--
75W	-40	4.1	--
80W	-26	7	--
85W	-12	11	--
80	--	7	<11.0
85	--	11	<13.5
90	--	13.5	<18.5
110	--	18.5	<24.0
140	--	24	<32.5
190	--	32.5	<41.0
250	--	41	--

SAN 323

1. Description

SAN323 additive is a mixed primary/secondary zinc dialkyldithiophosphate which acts as an outstanding inhibitor of wear, oxidation and bearing corrosion.

SAN323 additive is recommended for use primarily in the formulation of automotive and marine engine lubricants. It may also be used in industrial fluids such as hydraulic oils.

2. Physical Characteristic

Characteristic	Specification	Target	Test Method
Appearance	Clear Yellow		
Flash Point, °C	Minimum 135	160	ASTM D93
Phosphorus, % wt	7-9	8	ASTM D4951
Zinc, % wt	8.5-10	9.25	ASTM D4951
Density at 15 °C	1-1.2	1.12	ASTM D4052

3. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long-term storage the proposed temperature is lower than 50°C. Packed in 200lit metal drums.

SAN 323T

1. Description

SAN323T additive is a high-quality; over-base Synthetic Calcium Alkyl Benzene Sulphonate. It provides the lubricant with good high-temperature detergency, acid neutralizing ability and anti-rust performance. Better compatibility could be obtained by adding with ashless-dispersant, anti-oxidant and corrosion inhibitor. Formulation of high-performance lubricants for all types of Automotive and Marine engines, which use fuel with high-sulfur content.

2. Physical Characteristic

Characteristic	Specification	Target	Test Method
Total Base Number, mgKOH/g	Minimum 395	412	ASTM D2896
Flash Point, °C	Minimum 180	208	ASTM D93
Calcium, %wt	Minimum 14	14.8	ASTM D4927
Density 15° C	1-1.3	1.2	ASTM D445

3. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C. Packed in 200lit metal drums.

SAN 400

1. Description

SAN 400 Pour Point Depressant is a viscous Solution of Alkyl Methacrylate Polymer in Neutral Oils or use as a Pour Point Depressant for Lubricating Base Oils, Pour Point Depressant is completely soluble in all Petroleum Oils at any temperature and concentration. In finished Lubricants they are compatible with other commonly used additive; Pour Point Depressant is used for Pour Point depressing Industrial and gear lubricants and engine oils.

2. Physical Characteristic

Items	Specification	Test Method
Colour	Pale Yellow to Amber	
Flash point, °C	135 Minimum	ASTM D 93
Viscosity 100 °C	50-600 CST	ASTM D 445
Density 20 °C	0.9 Typical	ASTM D 1298
Pour Point Depression Degree, °C	18	ASTM D 97

3. Recommended dosage

The recommended dosage: 0.1-1%.

4. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long-term storage the proposed temperature is lower than 50°C. Packed in 200lit metal drums.

SAN 1013

SAN1013 is a package which can be used for blending a range of high quality engine oil meeting API performance level, designed to provide strong performance and treat efficiency against both passenger car and heavy duty Engines requirements.

1. Physical & Chemical Properties

Characteristic	Specification	Target	Test Method
Appearance	brown viscous liquid		
Density 15 °C	0.880-0.950	0.931	ASTM D4052
Flash Point, °C	Min 170	195	ASTM D93
Kinematic Viscosity 100 °C	115-175	141	ASTM D445
TBN, mgKOH/g	Min 40	44	ASTM D2896

2. Dosage

Performance	SAN 2033C	SAN 1013	SAN 323T
SF/CF	4	-	1
SG/CD	3.85	1.65	-
SJ/CF	4.45	1.8	-
SL/CF-4	5.6	2.25	-

3. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C, Packed in 200lit metal drum

SAN 2022

1. Description

SAN2022 has been developed for formulating premium quality super high performance duty diesel engine oils, which provides economic treat rates for low ash formulations.

2. Performance

Performance	Monograde	Multigrade
CC/SC	2.8	3
CD	4.5	5
CF(TBN 11)	5.5	6

3. Physical Characteristic

Characteristic	Specification	Target	Test Method
Flash Point, °C	Min 150	190	ASTM D93
Calcium, %wt	6-7	6.5	ASTM D4927
Zinc, %wt	1.5-2.1	1.8	ASTM D4927
Phosphorus, %wt	1.3-1.8	1.5	ASTM D4927
Total Base Number, mgKOH/g	Min 180	200	ASTM D2896

4. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C. Packed in 200lit metal drums.

SAN 2022A

1. Description

SAN2022A has been developed for formulating premium quality super high performance duty diesel engine oils, which composed metal detergent, high molecular weight ashless dispersant, antioxidant and anti-wear etc., which has excellent high-temperature detergency, dispersant, anti-oxidation, anti-corrosion and anti-wear properties.

2. Performance

Performance	Monograde	Multigrade
CF-4/SG	6.0	6.0
SG/CD/CC	5.0	5.0
CF/SF(TBN10)	4.5	4.5
CD/SF(TBN8)	3.6	3.6
SD/CC	2.4	2.4
SC/CC	2.1	2.1

3. Physical Characteristic

Characteristic	Specification	Target	Test Method
Apearance	Brown Viscous Liquid		
Density 20 °C		1040	
Flash Point, °C	Min 150	200	ASTM D93
Calcium, %wt	7-8	7.5	ASTM D4927
Zinc, %wt	2-2.3	2.15	ASTM D4927
Phosphorus, %wt	1.5-2	1.75	ASTM D4927
Total Base Number, mgKOH/g	Min 210	225	ASTM D2896

4. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C. Packed in 200lit metal drum.

SAN 2022C

1. Description

SAN2022C has been developed for formulating premium quality super high performance duty diesel engine oils, which composed metal detergent, high molecular weight ashless dispersant, antioxidant and anti-wear etc., which has excellent high-temperature detergency, dispersant, anti-oxidation, anti-corrosion and anti-wear properties.

2. Performance

Performance	Monograde	Multigrade
CF-4	-	8.5
CD	5	5.5

3. Physical Characteristic

Characteristic	Specification	Target	Test Method
Flash Point, °C	Min 150	190	ASTM D93
Calcium, %wt	3.9-4.5	4.3	ASTM D4927
Zinc, %wt	1.1-1.5	1.3	ASTM D4927
Phosphorus, %wt	0.8-1.2	1	ASTM D4927
Total Base Number, mgKOH/g	Min 110	120	ASTM D2896

4. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C. Packed in 200lit metal drums.

SAN 2033

1. Description

SAN2033 was developed to produce an economical engine oil additive package with minimum recommended dosage, contain high quality basic components.

2. Performance

Performance	Monograde	Multigrade
SB/CB	1.8	2.1
SC/CC	1.8	2.1
SD/CC	3.5	4
SE/CC	3.7	4.1
SF/CC	4	4.2

3. Physical Characteristic

Characteristic	Specification	Target	Test Method
Apearance	Brown Viscous Liquid		
Density 20 °C	1040		
Flash Point, °C	Min 170	180	ASTM D93
Calcium, %wt	5-6	5.5	ASTM D4927
Zinc, %wt	1.9-2.5	2.2	ASTM D4927
Phosphorus, %wt	1.5-2	1.7	ASTM D4927
Total Base Number, mgKOH/g	Min 140	155	ASTM D2896

4. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C. Packed in 200lit metal drums.

SAN2033A

1. Description

This product was developed to produce an economical engine oil additive package with recommended dosage, has been designed to provide strong performance and treat efficiency against both passenger car and heavy duty Engines requirements.

2. Physical & Chemical Properties

Characteristic	Specification	Target	Test Method
Appearance	Dark brown oily liquid		
Density 15 °C	0.98-1.2	1.017	ASTM D4052
Flash Point, °C	Min 170	180	ASTM D93
Calcium, %wt	3.9-4.5	4.19	ASTM D4927
Zinc, %wt	1.9-2.5	2.26	ASTM D4927
Phosphorus, %wt	1.5-2	1.76	ASTM D4927
Nitrogen, %wt	0.28-0.36	0.33	ASTM D5291
TBN, mgKOH/g	Min 100	119	ASTM D2896
Sulfated Ash	Min 15	23.91	ASTM D874

3. Dosage

Performance	Monograde	Multigrade
SB/CB	1.8	2.1
SC/CC	1.8	2.1
SD/CC	3.5	4
SE/CC	3.7	4
SF/CC	4	4.1
SF/CD	4	4.1

4. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C, Packed in 200lit metal drums.

SAN 2033C

This product was developed to produce an economical engine oil additive package with recommended dosage, has been designed to provide strong performance and treat efficiency against both passenger car and heavy duty Engines requirements.

1. Physical & Chemical Properties

Characteristic	Specification	Target	Test Method
Appearance	Dark brown oily liquid		
Density 15 °C	0.98-1.2	1.017	ASTM D4052
Flash Point, °C	Min 150	180	ASTM D93
Calcium, %wt	3.4-4.4	4	ASTM D4927
Zinc, %wt	1.8-2.3	2.05	ASTM D4927
Phosphorus, %wt	1.5-1.9	1.76	ASTM D4927
Nitrogen, %wt	0.27-0.32	0.3	ASTM D5291
TBN, mgKOH/g	Min 100	119	ASTM D2896
Sulfated Ash	Min 10	15.3	ASTM D874

2. Dosage

Performance	Monograde	Multigrade
SB/CB	1.8	2.1
SC/CC	1.8	2.1
SD/CC	3.5	4
SE/CC	3.7	4
SF/CC	4	4.1
SF/CD	4	4.1

3. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C, Packed in 200lit metal drums.

SAN 2033F

This product was developed to produce an economical engine oil additive package with recommended dosage, has been designed to provide strong performance and treat efficiency against both passenger car and heavy duty Engines requirements.

Physical & Chemical Properties

Characteristic	Specification	Target	Test Method
Appearance	Dark brown oily liquid		
Viscosity at 100°C	Min 40		ASTM D445
Density 15 °C	0.98-1.2	1.017	ASTM D4052
Flash Point, °C	Min 150		ASTM D93
Calcium, %wt	Min 4.0	4.3	ASTM D6595
Zinc, %wt	1.8-2.3	1.97	ASTM D6595
Phosphorus, %wt	1.6-2.1	1.78	ASTM D6595
TBN, mgKOH/g	Min 110	123	ASTM D2896

Dosage

Performance	Monograde/Multigrade
SB/CB	2
SC/CC	3.1
SD/CC	3.5
SE/CC	3.8
SF/CC	4
SF/CD	4.4

Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long-term storage the proposed temperature is lower than 50°C, Packed in 200lit metal drums.

SAN 2033G

SAN 2033G is a new generation of engine oil additive packages, designed to provide API performance claims from SC/CC through to the SL/CF, without the need for a booster package, has been designed to provide strong performance and treat efficiency against passenger car Engines requirements.

Physical & Chemical Properties

Characteristic	Specification	Target	Test Method
Appearance	Dark brown oily liquid		
Viscosity at 100°C	Min 40		ASTM D445
Density 15 °C	0.98-1.15	0.99	ASTM D4052
Flash Point, °C	Min 150		ASTM D93
Calcium, %wt	Min 3.3	3.6	ASTM D6595
Zinc, %wt	Min 1.5	1.60	ASTM D6595
Phosphorus, %wt	Min 1.3	1.45	ASTM D6595
TBN, mgKOH/g	Min 95	109	ASTM D2896

Dosage

Performance	Monograde/Multigrade
SC/CC	2.9
SD/CC	3.2
SE/CC	3.5
SF/CC	3.7
SF/CD	3.8
SG/CD	4.5
SJ/CD	5.0
SL/CF	6.8
SM	9.9

Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long-term storage the proposed temperature is lower than 50°C, Packed in 200lit metal drums.

SAN 2610

SAN 2610 Gear Oil additive package is prepared by referring to the elemental compositions and performances of the petrochemical industry scientific research institution's Gear Oil additive package, using phosphoric extreme pressure, anti-wear additive and organic sulfur compounds as additives multi-functional additives.

SAN 2610 major performances meet API universal gear oil additive performance level. It is used to formulate vehicle gear oils and industrial gear oils.

4. Physical Characteristic

Characteristic	Specification	Target	Test Method
Appearance	Appearance Brown	viscous clear liquid	
N, %wt	0.3-0.5	0.4	
P, % wt	2.2-2.7	2.5	ASTM D4951
S, % wt	25-32	28	ASTM D4951
Density at 20 °C	1-1.15	1.06	ASTM D4052

5. Dosage

1. GL-5 vehicle gear oil: 4.4%
2. GL-4 vehicle gear oil: 2.2%
3. Heavy load industrial gear oil: 2.0%

6. Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 60°C. For long- term storage the proposed temperature is lower than 50°C. Packed in 200lit metal drums.

SAN 3055

SAN 3055 hydraulic additive is a premium package designed to meet the performance requirements of all major hydraulic equipment manufacturers specifications, it's blended with a variety of excellent additives such as EP anti-wear additives, antioxidant and corrosion inhibitors. It can be used for blending high-pressure and anti-wear hydraulic oil of low zinc content. The products have the stable quality, excellent extreme pressure and anti-wear property, greater energy saving potential, excellent oxidation stability and the oil change period lengthened obviously.

Physical & Chemical Properties

Characteristic	Specification	Target	Test Method
Appearance	Dark brown oily liquid		
Viscosity at 100°C	Min 25		ASTM D445
Density 15 °C	0.9-1.12	1.01	ASTM D4052
Flash Point, °C	Min 150	200	ASTM D93
Sulfur, %wt	Min 6	7.83	ASTM D6595
Zinc, %wt	Min 2	2.38	ASTM D6595
Phosphorus, %wt	Min 3	3.64	ASTM D6595
Mechanical impurities, %(m/m)	Max 0.06	0.01	

Dosage

The dosages of SAN 3055 hydraulic oil additive package recommended are 0.35-0.6%.

Handling and Packing

Please refer to the corresponding material safety data sheet for handling and blending precautions and maximum recommended temperatures. Please keep the temperature not higher than 70°C. For long-term storage the proposed temperature is lower than 40°C, Packed in 200lit metal drums.

SAN 4030

Viscosity Index Improver

Shear Stable Solid For Engine Oil Applications

SAN 4030 additive use as a Viscosity Index Improver for engine oils.

SAN 4030 additive imparts excellent shear stability and low temperature properties to passenger car motor oils and heavy duty engine oils.

- **Excellent low temperature properties**
- **Pellet form, easy to dissolve in base oils**
- **Applicable in a wide range of base oils**

Typical Characteristic Properties

Appearance : White Pellet
Density at 15°C 0.87

Properties of 1% wt.SAN 4030 dissolved in 500N:

Colour: 2
Density at 15°C: 0.87
Flash point, °C: 232
Kinematic Viscosity 100°C 20.87
SSI 17

	Function	WT%
SAN 4030	Viscosity Index Improver	1.2%
SN 150	Base Oil	70%
SN 500	Base Oil	28.77%
SN 400	Pour Point Dispersant	0.03%

	Standard Spec.	Test Result
Kinematic V 100°C	16.3-21.9	21.1
CCs -15°C	9500	8350
Pour Point	-21	-27

Handling Information

Dissolving Temp.:100-150

Packing :25Kg bag's or 11 Kg bucket's