Lubricant formulations are provided having a base oil blend, the base oil blend having a first Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between 2.5 and 3.5 cSt and a second Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between 3.5 and 4.5 cSt, wherein the resulting base oil blend has a Noack volatility of less than 15%. The first Fischer-Tropsch derived base oil can be present in an amount up to 12 wt. % and the second Fischer-Tropsch derived base oil can be present in an amount up to 88 wt. %.
LOW VISCOSITY LUBRICANT COMPOSITIONS

[0001] This non-provisional application claims priority from U.S. Provisional Application Ser. No. 61/847692 filed Jul. 18, 2013, which is hereby incorporated by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates to a lubricating composition, in particular a crank case lubricating composition having a low viscosity relative to Group III base oils.

BACKGROUND OF THE INVENTION

[0003] Lubricating oils find use in internal combustion engines, gearboxes and other mechanical devices to promote smoother functioning, to reduce wear at metal-to-metal contact between moving parts, and to remove heat. Lubricating oils used in internal combustion engine (engine oils), in particular, must exhibit a high level of performance under the high-performance, high-output and harsh operating conditions of internal combustion engines. The fuel efficiency performance required of lubricating oils has continued to increase in recent years, and this has led to application of various high viscosity-index base oils or friction modifiers. Various additives such as anti-wear agents, overbased detergents, ashless dispersants, viscosity modifiers, and antioxidants can be added to conventional engine oils to meet such performance demands.

[0004] In many applications, the lubricant compositions require the presence of polymeric viscosity modifier additives to obtain the desired viscometric properties over a broad range of shear and/or temperatures. These additives are usually highly viscous liquids or solids at room temperature. In order to be able to achieve homogenous distribution, avoid handling of solids, and to be able to administer the amount of additives added into lubricant compositions and thus ensure consistent product quality, these additives are usually added as an additive concentrate.

[0005] Fischer-Tropsch derived base oils (hereinafter, gas-to-liquid or “GTL,” base oils) have found increased use in lubricating compositions, such as engine oils, transmission fluids, and industrial lubricants. These compositions benefit from various performance benefits over traditional mineral and base oils, including improved oxidation properties, improved engine cleanliness, improved wear protection, improved emissions, and improved after-treatment device compatibility.

[0006] Mineral based oils have typically been used in the preparation of lubricating compositions. It is problematic, however, to formulate engine oils (including passenger car motor oils and heavy-duty diesel engine oils) with mineral base oils that meet the thinner grades of the SAE 300 Specifications (as revised in April 2013), such as SAE 0W-X. Additionally, mineral based engine oils may suffer from one or more of poor fuel economy, poor wear performance, and low Noack volatility when used in relatively thin engine oils.

[0007] As the demand for ever improving lubricating performance increases, there is a need for developing lower viscosity lubricating compositions demonstrating improved properties.

SUMMARY OF THE INVENTION

[0008] One or more of the above or other objects can be obtained by a lubricating oil composition comprising a blend of base oils, said blend comprising: (a) a GTL 3 base oil; and (b) a GTL 4 base oil. In certain embodiments, the base oil blend can include up to about 12% by weight of the GTL 3 base oil. Alternatively, the base oil blend can include between 1 and 12% by weight of the GTL 3 base oil. In other embodiments, the base oil blend can include at least 88% by weight of the GTL 4 base oil. In other embodiments, the base oil blend can include between 88 and 99% by weight of the GTL 4 base oil.

[0009] In certain embodiments, one or more of the objects can be achieved with a lubricating composition having Fischer-Tropsch derived base oils, wherein a first Fischer-Tropsch derived base oil has a kinematic viscosity at 100°C of between 2.5 and 3.0 cSt and a Noack volatility of greater than 30 wt. % and a second Fischer-Tropsch derived base oil has kinematic viscosity at 100°C of between 3.7 and 4.3 cSt and a Noack volatility of less than 15 wt. %.

[0010] In certain embodiments, one or more of the above or other objects can be obtained by a lubricating composition comprising a blend of base oils, wherein the blend comprises: up to about 12 wt. % of a first Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between 2.5 and 3.5 cSt and at least 88 wt. % of a second Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between 3.5 and 4.5 cSt, base oil, wherein the lubricating composition has a NOACK volatility of less than 15 wt. %.

DETAILED DESCRIPTION

[0011] One or more of the objects of the present invention can be achieved by a lubricating composition that includes a blend of Fischer-Tropsch derived base oils. More specifically, a blend of Fischer-Tropsch derived base oils includes a GTL 3 base oil and a GTL 4 base oil. It has been unexpectedly found that by combining the GTL 3 and GTL 4 base oils, a low viscosity lubricating composition for use in high fuel efficiency engines has been provided. In certain embodiments, the lubricating composition can include a GTL 8 base oil that may be added for volatility purposes.

[0012] The term “Fischer-Tropsch derived” refers to a base oil that is, or is derived from, a synthesis product of a Fischer-Tropsch process. A Fischer-Tropsch derived base oil may also be referred to as a GTL (Gas-To-Liquids) base oil. Fischer-Tropsch derived base oils that may be conveniently used as the base oil in the lubricating composition of the present invention are those as for example disclosed in EP 0776959; EP 0668342; WO 1997/21788; WO 2000/15736; WO 2000/14188; WO 2000/14187; WO 2000/14183; WO 2000/14179; WO 2000/08115; WO 1999/41332; EP 1029029; WO 2001/18156; and WO 2001/57166.

[0013] Suitable base oils for use in the lubricating oil composition of the present invention include Group I-III mineral base oils (preferably Group III), Group IV poly-alpha olefins (PAOs), and mixtures thereof.

[0014] As used herein, “Group I,” “Group II,” “Group III” and “Group IV” base oils in the present invention refers to one or more of the above or other objects can be obtained by a lubricating oil composition comprising lubricating oil base oils according to the definitions of American Petroleum Institute (API) for categories I, II, III and IV. (These API catego-
Synthetic oils that can be included in the formulations of the present invention can include hydrocarbon oils such as olefin oligomers (including polyalphaolefin base oils; PAOs), dibasic acid esters, polyol esters, polyalkylene glycols (PAGs), alkyl naphthenes, and dewaxed waxy isomers. Synthetic hydrocarbon base oils sold by the Shell Group under the designation “Shell XHVI” (trade mark) may also be conveniently used in the present invention.

Fischer-Tropsch derived base oils are highly paraffinic API group III base oils (API Base Oil Interchangeability Guidelines) exhibiting very good cold flow properties, high oxidative stability, and high viscosity indices.

The base oil used in the present invention may, in addition to the Fischer-Tropsch derived base oils specified herein, conveniently include mixtures of one or more mineral oils and/or one or more synthetic oils. As used herein, the term “base oil” may refer to a mixture that includes more than one base oil, including the at least one Fischer-Tropsch derived base oils of the present invention. Mineral oils can include liquid petroleum oils and solvent-treated or acid-treated mineral lubricating oil of the paraffinic, naphthenic, or mixed paraffinic/naphthenic type, and which may be further refined by hydrogenating processes and/or dewaxing.

Fischer-Tropsch derived base oils are highly paraffinic API group III base oils (as defined by API Base Oil Interchangeability Guidelines) exhibiting very good cold flow properties, high oxidative stability, and high viscosity indices. However, due to the high paraffin content, the solvency of the base oils is generally low, often resulting in incompatibility with other lubricant components and additives.

Fischer-Tropsch derived base oils are known in the art. In the present context, the term “Fischer-Tropsch derived” means that a material is, or derives from, a product of a Fischer-Tropsch condensation process. The term “non-Fischer-Tropsch derived” may be interpreted accordingly. A Fischer-Tropsch derived base oil will therefore be a hydrocarbon stream of which a substantial portion, except for added hydrogen, is derived directly or indirectly from a Fischer-Tropsch condensation process. A Fischer-Tropsch derived base oil may also be referred to as a GTL, (Gas-To-Liquids) base oil, and includes base oils marketed under the Shell XHVI trademark. Further information on the Fischer-Tropsch derived base oils and the preparation thereof, reference is made to WO 2009/074572, the teaching of which is hereby incorporated by specific reference.

Typically, the aromatics content of a Fischer-Tropsch derived base oil (as generally determined by ASTM D 4629), will be less than 1 wt. %, preferably less than 0.5 wt. %, and more preferably less than 0.1 wt. %. The base oil typically has a total paraffin content of at least 80 wt. %, preferably at least 85 wt. %, more preferably at least 90 wt. %, yet more preferably at least 95 wt. %, and most preferably at least 99 wt. %. Additionally, the Fischer-Tropsch derived base oil typically has a saturates content (as measured by IP-368, ASTM D2007, ASTM D7419, or any other chromatographic method that will yield similar results) of greater than 98 wt. %, preferably greater than 99 wt. %, and more preferably greater than 99.5 wt. %. The Fischer-Tropsch derived base oil can have a maximum alpha-paraffin content of 0.5 wt. %. The Fischer-Tropsch derived base oil can have a content of aromatic compounds of up to about 20 wt. %, alternatively between 0.1 and 20 wt. %, and alternatively between 0.5 to 10 wt. %, alternatively between 5 and 15 wt. %, and alternatively between 5 and 10 wt. %.

Typically, the Fischer-Tropsch derived base oil has a kinematic viscosity at 100°C (as measured by ASTM D 7042) of from 2 to 8 mm²/s (cSt), preferably greater than 2.5, and more preferably greater than 3.0 mm²/s. Preferably, the Fischer-Tropsch derived base oil has a kinematic viscosity at 100°C, of less than 5.0 mm²/s, preferably less than 4.5 mm²/s, and more preferably less than 4.2 mm²/s. In certain embodiments, the Fischer-Tropsch derived base oil has kinematic viscosity at 100°C between 2.5 to 5 mm²/s (cSt), alternatively between 3 to 4.5 mm²/s (cSt), alternatively between 4.0 to 4.2 mm²/s (cSt).

Further, the Fischer-Tropsch derived base oil typically has a kinematic viscosity at 40°C (as measured by ASTM D 7042) of from 10 to 100 mm²/s (cSt), alternatively from 15 to 50 mm²/s (cSt).

Also, the Fischer-Tropsch derived base oil preferably has a pour point (as measured according to ASTM D 5950) of less than −30°C, more preferably less than −40°C, and most preferably less than −45°C. In certain embodiments, the pour point is between −30°C and −40°C, alternatively between −40°C and −45°C.

The flash point (as measured by ASTM D 92) of the Fischer-Tropsch derived base oil is greater than 120°C, preferably greater than 130°C, more preferably even greater than 140°C. Alternatively the flash point can be between 120°C and 130°C, alternatively between 130°C and 140°C.

The Fischer-Tropsch derived base oil preferably has a viscosity index (a measured according to ASTM D 2270) in the range of from 100 to 200. Preferably, the Fischer-Tropsch derived base oil has a viscosity index of at least 125, preferably at least 130. Also, it is preferred that the viscosity index is less than 180, preferably less than 150, in certain embodiments, the viscosity index is between 125 and 180, alternatively between 130 and 150.

In the event the Fischer-Tropsch derived base oil contains a blend of two or more Fischer-Tropsch derived base oils, the above values apply to the blend of the two or more Fischer-Tropsch derived base oils.

As used herein, a GTL 3 base oil refers to a Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between about 2 and 4 cSt, alternatively between 2.2 and 3.2 cSt, alternatively between 2.6 and 2.9 cSt, a saturates content of at least about 98.5 wt. %, an aromatics content of not greater than about 0.7 wt. %, and a Noack volatility of about 42 wt. %.

As used herein, a GTL 4 base oil refers to a Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between about 3.5 and 5 cSt, alternatively between 4 and 4.2 cSt, a saturates content of at least about 99 wt. %, an aromatics content of not greater than about 0.7 wt. %, and a Noack volatility of about 13.5 wt. %.

In addition to the Fischer-Tropsch derived base oil, the additive concentrate may include one or more non-Fischer-Tropsch derived base oils, such as mineral derived base oils and so-called synthetic base oils (such as PAOs) including Group I-V base oils according to the definitions of American Petroleum Institute (API). These API categories are defined in API Publication 1509, 15th Edition, Appendix E, July 2009.
In certain embodiments, the lubricant composition of the present invention includes a blend of two Fischer-Tropsch derived base oils, the blend including: a first Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between 2.5 and 3.5 cSt and a second Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between 3.5 and 4.5 cSt. In certain embodiments, blend of two Fischer-Tropsch derived base oils will include up to 12 wt. % of the first Fischer-Tropsch derived base oil and at least 88 wt. % of the second Fischer-Tropsch derived base oil, alternatively between 0.5 and 3 wt. % of the first Fischer-Tropsch derived base oil and between 97 and 99.5 wt. % of the second Fischer-Tropsch derived base oil, alternatively between 3 and 6 wt. % of the first Fischer-Tropsch derived base oil and between 94 and 97 wt. % of the second Fischer-Tropsch derived base oil, alternatively between 6 and 9 wt. % of the first Fischer-Tropsch derived base oil and between 91 and 94 wt. % of the second Fischer-Tropsch derived base oil, or alternatively between 9 and 12 wt. % of the first Fischer-Tropsch derived base oil and between 88 and 91 wt. % of the second Fischer-Tropsch derived base oil. In certain embodiments blend of two Fischer-Tropsch derived base oils will include between 1 and 12 wt. % of the first Fischer-Tropsch derived base oil and between 88 and 99 wt. % of the second Fischer-Tropsch derived base oil, alternatively between 0.5 and 4 wt. % of the first Fischer-Tropsch derived base oil and between 96 and 99.5 wt. % of the second Fischer-Tropsch derived base oil, alternatively between 4 and 8 wt. % of the first Fischer-Tropsch derived base oil and between 92 and 96 wt. % of the second Fischer-Tropsch derived base oil, alternatively between 8 and 12 wt. % of the first Fischer-Tropsch derived base oil and between 88 and 92 wt. % of the second Fischer-Tropsch derived base oil.

The resulting lubricant composition will have a NOACK volatility (as tested according to ASTM D-5890) of less than 15 wt. %, alternatively less than 14 wt. %, alternatively less than 13 wt. %, alternatively less than 12 wt. %.

The resulting lubricant composition will have a kinematic viscosity at 100°C (as tested according to ASTM D445) of between 3 and 10 cSt, alternatively between 3 and 5 cSt, alternatively between 4 and 6 cSt, alternatively between 5 and 8 cSt, and alternatively between 6 and 9 cSt. In certain other embodiments, the kinematic viscosity at 100°C does not exceed 8 cSt, alternatively it does not exceed 5 cSt.

The resulting lubricant composition will have a cold cranking viscosity at −30°C (as tested according to ASTM D5893) of between 900 cP and 6600 cP, alternatively between 900 cP and 3000 cP, alternatively between 900 cP and 2000 cP. In certain embodiments, the cold cranking viscosity at −30°C will be less than 6600 cP, alternatively less than 2000 cP, alternatively less than 1400 cP, alternatively less than 1200 cP. In certain embodiments, the cold cranking viscosity at −30°C no greater than 2000 cP, alternatively no greater than 1500 cP.

The resulting lubricant composition will have a cold cranking viscosity at −35°C (as tested according to ASTM D5893) of between about 1400 cP and 6200 cP, alternatively between 1400 cP and 2500 cP, alternatively between 1500 cP and 2000 cP. In certain embodiments, the cold cranking viscosity at −35°C will be not greater than 2500 cP, alternatively not greater than 2000 cP. In certain embodiments, the cold cranking viscosity at −35°C will be less than 6200 cP, alternatively less than 2500 cP, alternatively less than 2000 cP, alternatively less than 1900 cP.

The resulting lubricant composition will have a high temperature high shear (HTHS) viscosity at 150°C of between 1.4 and 3.0 cP, alternatively between 1.7 and 2.2 cP, alternatively between 1.7 and 1.9 cP. In certain embodiments, the HTHS viscosity at 150°C is not greater than 2.2 cP, alternatively not greater than 1.9 cP.

Typically the base oil (or blend of base oils) as used according to the present invention has a kinematic viscosity at 100°C of between 2.5 and 8 cSt, alternatively between about 3 and 5 cSt. According to a preferred embodiment of the present invention the base oil has a kinematic viscosity at 100°C (according to ASTM D445) of between 3.5 and 4.5 cSt. In the event the base oil contains a blend of two or more base oils, it is preferred that the blend has a kinematic viscosity at 100°C of between 3.5 and 4.5 cSt.

Preferably, the dynamic viscosity at −35°C (according to ASTM D5293) of the lubricant composition according to the present invention is less than 6200 cP (wherein 1 cP equals 1 mPas), preferably less 5500 cP, preferably less than 5000 cP, even more preferably less than 4500 cP, or in certain embodiments less than 4000 cP, or less than 3500 cP. Typically, the dynamic viscosity at −35°C is greater than 2000 cP. In certain embodiments, the dynamic viscosity is between about 2000 and 4000 cP, alternatively between about 4000 and 6000 cP, or alternatively between about 5000 and 6200 cP.

Preferably, the high temperature, high shear viscosity ("HTHS", according to ASTM D4683) of the composition according to the present invention is less than 2.6 cP, preferably less than 2.0 cP, more preferably less than 1.9 cP. Typically, the HTHS is greater than 1.5 cP. In certain embodiments, the HTHS is between 1.5 and 2.6 cP, alternatively between about 1.5 and 1.9 cP.

The lubricant composition according to the present invention has a Noack volatility (according to ASTM D5890) of less than 15 wt. %. Typically, the Noack volatility (according to ASTM D5890) of the lubricant composition is between 1 and 15 wt. %, alternatively between 10 and 14 wt. %, alternatively between 11 and 13.5 wt. %. In certain embodiments, the Noack volatility is less than 14.6 wt. %, alternatively less than 14 wt. %, alternatively less than 13.5 wt. %, or alternatively less than 13 wt. %. In certain embodiments, the Noack volatility of the lubricant composition is less than 12.5 wt. %, alternatively less than 12 wt. %, and alternatively less than 11.5 wt. %, alternatively less than 11 wt. %, and alternatively less than 10 wt. %.

The lubricating composition according to the present invention can further include one or more additives, such as anti-oxidants, anti-wear additives, dispersants, detergents, overbased detergents, extreme pressure additives, friction modifiers, viscosity index improvers, pour point depressants, metal passivators, corrosion inhibitors, demulsifiers, anti-foam, agents, seal compatibility agents, and additive diluent base oils, etc. As the person skilled in the art is familiar with the above and other additives, these are not further discussed here in detail. Specific examples of such additives are described in for example Kirk-Othmer Encyclopedia of Chemical Technology, third edition, volume 14, pages 477-526. Anti-oxidants that may be conveniently used include phenyl-naphthylamines (such as "IRGANOX L-06") available from Ciba Specialty Chemicals and diphenylamines (such as "IRGANOX L-57") available from Ciba Specialty.
Chemicals), as e.g. disclosed in WO 2007/045629 and EP 1058720, phenolic anti-oxidants, etc. The teachings of WO 2007/045629 and EP 1058720 are hereby incorporated by reference.

**[0041]** Anti-wear additives that can be added include zinc-containing compounds, such as zinc dithiophosphate compounds selected from zinc dialkyl-, diaryl- and/or alkylaryl-dithiophosphates, molybdenum containing compounds, boron containing compounds, and ashless anti-wear additives such as substituted and unsubstituted thiophosphoric acids, and salts thereof. Examples of molybdenum containing compounds can include molybdenum disilicates, tri-nuclear molybdenum compounds (as described in WO 1998/26030), molybdenum sulphides, and molybdenum dithiophosphate. Boron containing compounds that can be used include borate esters, borated fatty amines, borated epoxides, alkali metal (or mixed alkali metal or alkaline earth metal) borates, and borated overbased metal salts. The dispersant used is preferably an ashless dispersant. Suitable ashless dispersants can include polybutylene succinimide polyamides, and Mannich base type dispersants.

**[0042]** Examples of viscosity index improvers that can be used in the lubricating compositions of the present invention include styrene-butadiene stellate copolymers, styrene-isoprene stellate copolymers, and the polymethacrylate copolymer and ethylene-propylene copolymers (also known as olefin copolymers) of the crystalline and non-crystalline type. Dispersant-viscosity index improvers can also be used in the lubricating composition of the present invention. Preferably the compositions according to the present invention include less than 1.0 wt. % of a Viscosity Index improver concentrate (i.e., VI improver plus “carrier oil” or “diluent”), based on the total weight of the composition, preferably less than 0.5 wt. %. Most preferably, the composition is free of Viscosity Index improver concentrate.

**[0043]** In certain embodiments, the composition according to the present invention includes at least 0.1 wt. % of a pour point depressant. For example, alkylated naphthalene and phenolic polymers, polymethacrylates, and maleate/fumarate copolymer esters can be used as pour point depressants. Preferably, not more than 0.3 wt. % of the pour point depressant is used. In certain embodiments, compounds such as alkynyl succinic acid, or esters thereof, benzotriazole-based compounds, and thiodiazole-based compounds can be used as corrosion inhibitors in the lubricating composition of the present invention.

**[0044]** Compounds such as polysiloxanes, dimethyl poly-cyclohexane, and polyacrylates can be used in the lubricating composition of the present invention as defoaming agents.

**[0045]** In certain embodiments, a pour point depressant can be added, such as a conventional polypropylene glycol pour point depressant, commercially available from Infinium Additives (Abingdon, United Kingdom) under the trade designation “Infinium 351”.

**[0046]** Compounds that can be used in the lubricating composition of the present invention as seal fix or seal compatibility agents include, for example, commercially available aromatic esters. The lubricating compositions of the present invention can be prepared by admixing the one or more additives with the base oil(s).

**[0047]** In general, additives present in the compositions of the present invention are present in an amount in the range from 0.01 to 35.0 wt. %, based on the total weight of the lubricating composition, preferably in an amount in the range of from 0.05 to 25.0 wt. %, and more preferably from 1.0 to 20.0 wt. %. Preferably, the composition contains at least 9.0 wt. %, preferably at least 10.0 wt. %, more preferably at least 11.0 wt. % of an additive package comprising an anti-wear additive, a metal detergent, an ashless dispersant and an anti-oxidant. Alternatively, the compositions of the present invention include between 10 and 35 wt. % of additives, alternatively between 10 and 25 wt. %, alternatively between 10 and 20 wt. %. In certain embodiments, the lubricating compositions according to the present invention may be so-called “low SAPS” (SAPS = sulphonated ash and phosphorus and sulphur), “mid SAPS” or “regular SAPS” formulations.

**[0048]** In one embodiment, the lubricant composition of the present invention includes a base oil blend, wherein the base oil blend includes a first Fischer-Tropsch derived base oil, said first Fischer-Tropsch derived base oil having a kinematic viscosity at 100 °C of between 2.5 and 3.5 cSt and a second Fischer-Tropsch derived base oil, said second Fischer-Tropsch derived base oil having a kinematic viscosity at 100 °C of between 3.5 and 4.5 cSt, wherein the base oil blend has a Noack volatility of below 15 wt. %. Optionally, the lubricant composition according to the present invention can include an additive package. The optional additive package can include a combination of additives, such as anti-oxidants, a zinc-based anti-wear additives, an ashless dispersant, an overbased detergent mixture, and an anti-foaming agent.

**EXAMPLES**

**[0049]** The properties of 3 base oils are provided in Table 1.

**[0050]** Base oil 1 is a commercially available Group III mineral based base oil having a kinematic viscosity at 100 °C (ASTM D445) of approximately 4.3 cSt. Base oil 1 is commercially available from e.g. SK Energy (Ulsan, South Korea) under the trade designation Yubase 4.

**[0051]** Base oil 2 was a Fischer-Tropsch derived base oil having a kinematic viscosity at 100 °C (ASTM D445) of approximately 3.89 cSt. Base oil 2 may be conveniently manufactured by the process described in e.g. WO2002/070631, the teaching of which is hereby incorporated by reference.

**[0052]** Base oil 3 is a Fischer-Tropsch derived base oil having a kinematic viscosity at 100 °C (ASTM D445) of approximately 2.70 cSt. Base oil 3 may be conveniently manufactured by the process described in e.g. WO2002/070631, the teaching of which is hereby incorporated by reference.

**TABLE 1**

<table>
<thead>
<tr>
<th></th>
<th>Base oil 1</th>
<th>Base oil 2</th>
<th>Base oil 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GTL 4)</td>
<td>(Yubase 4)</td>
<td>(GTL 3)</td>
<td></td>
</tr>
<tr>
<td>Kinematic viscosity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 40 °C [cSt]</td>
<td>16.91</td>
<td>19.49</td>
<td>9.930</td>
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<tr>
<td>Kinematic viscosity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 100 °C [cSt]</td>
<td>3.89</td>
<td>4.3</td>
<td>2.707</td>
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<td>VI Index</td>
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</tr>
<tr>
<td>[°C]</td>
<td>127</td>
<td>126</td>
<td>112</td>
</tr>
<tr>
<td>Pour point</td>
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<tr>
<td>[°C]</td>
<td>–39</td>
<td>–18</td>
<td>–39</td>
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<tr>
<td>Noack volatility</td>
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<td></td>
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<tr>
<td>(wt. %)</td>
<td>11.2</td>
<td>14.2</td>
<td>46.8</td>
</tr>
<tr>
<td>Saturates</td>
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<td></td>
<td></td>
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<tr>
<td>(wt. %)</td>
<td>99.2</td>
<td>99.3</td>
<td>99.9</td>
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<tr>
<td>Tertiary Carbon (%)</td>
<td>18.1</td>
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<td>n.d.</td>
</tr>
<tr>
<td>Secondary Carbon (%)</td>
<td>66.7</td>
<td>n.d.</td>
<td>n.d.</td>
</tr>
<tr>
<td>Primary Carbon (%)</td>
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<td>n.d.</td>
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<tr>
<td>Epilog carbon content</td>
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<td>n.d.</td>
</tr>
<tr>
<td>n- and iso-paraffins</td>
<td>92.35</td>
<td>n.d.</td>
<td>n.d.</td>
</tr>
</tbody>
</table>
TABLE 1-continued

<table>
<thead>
<tr>
<th>Base oil 1</th>
<th>Base oil 2</th>
<th>Base oil 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GTL 4)</td>
<td>(Yubase 4)</td>
<td>(GTL 3)</td>
</tr>
<tr>
<td>Mono-naphthenics&lt;sup&gt;7&lt;/sup&gt;</td>
<td>6.85</td>
<td>n.d.</td>
</tr>
<tr>
<td>Di- and poly- naphthenics&lt;sup&gt;7&lt;/sup&gt;</td>
<td>0.87</td>
<td>n.d.</td>
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<tr>
<td>Aromatics&lt;sup&gt;5&lt;/sup&gt;</td>
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<td>n.d.</td>
</tr>
<tr>
<td>Dynamic viscosity at –20°C,&lt;sup&gt;8&lt;/sup&gt;</td>
<td>n.d.</td>
<td>713</td>
</tr>
<tr>
<td>[cP]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic viscosity at –25°C,&lt;sup&gt;8&lt;/sup&gt;</td>
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<tr>
<td>[cP]</td>
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<td></td>
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<tr>
<td>Dynamic viscosity at –30°C,&lt;sup&gt;8&lt;/sup&gt;</td>
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<td>n.d.</td>
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<td>[cP]</td>
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<td></td>
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<td>Dynamic viscosity at –35°C,&lt;sup&gt;8&lt;/sup&gt;</td>
<td>1580</td>
<td>n.d.</td>
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<sup>1</sup>According to ASTM D4485
<sup>2</sup>According to ASTM D2270
<sup>3</sup>According to ASTM D9850
<sup>4</sup>According to CEC 1-40-A-93/ASTM D9800
<sup>5</sup>According to IP 368 (modified)
<sup>6</sup>According to 13C NMR
<sup>7</sup>According to FIMS
<sup>8</sup>According to ASTM D5293

n.d. = not determined

Accordingly, the scope of the present invention should be determined by the following claims and their appropriate legal equivalents.

What is claimed is:

1. A lubricating composition for use in the crankcase of an engine comprising a base oil blend and one or more additives, wherein the base oil blend comprises a Fischer-Tropsch derived base oil and wherein the lubricating composition has a first Fischer-Tropsch derived base oil, said first Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between 2.5 and 3.5 cSt and a second Fischer-Tropsch derived base oil, said second Fischer-Tropsch derived base oil having a kinematic viscosity at 100°C of between 3.5 and 4.5 cSt, wherein the resulting base oil blend has a Noack volatility of less than 15 wt. %.

2. The lubricating composition of claim 1, wherein the composition comprises up to 12 wt. % of the first Fischer-Tropsch derived base oil and at least 88 wt. % of the second Fischer-Tropsch derived base oil.

3. The lubricating composition of claim 1, wherein the composition comprises between 1 and 12 wt. % of the first Fischer-Tropsch derived base oil and between 88 and 99 wt. % of the second Fischer-Tropsch derived base oil.

4. The lubricating composition of claim 1, wherein the composition comprises between 8 and 12 wt. % of the first Fischer-Tropsch derived base oil and between 88 and 92 wt. % of the second Fischer-Tropsch derived base oil.

5. The lubricating composition of claim 1, wherein the composition comprises between 4 and 8 wt. % of the first Fischer-Tropsch derived base oil and between 92 and 96 wt. % of the second Fischer-Tropsch derived base oil.

6. The lubricating composition of claim 1, wherein the composition comprises between 0.5 and 4 wt. % of the first Fischer-Tropsch derived base oil and between 96 and 99.5 wt. % of the second Fischer-Tropsch derived base oil.

7. The lubricating composition of claim 1, wherein the first Fischer-Tropsch derived base oil has a kinematic viscosity at 100°C of between 2.6 and 2.9 cSt.

8. The lubricating composition of claim 1, wherein the second Fischer-Tropsch derived base oil has a kinematic viscosity at 100°C of between 3.7 and 4.

9. The lubricating composition of claim 1, wherein the NOACK volatility of the lubricating composition is less than 15%.

10. The lubricating composition of claim 1, wherein the NOACK volatility of the lubricating composition is less than 14%.

11. The lubricating composition of claim 1, wherein the NOACK volatility of the lubricating composition is less than 13%.

12. The lubricating composition of claim 1, wherein the NOACK volatility of the lubricating composition is less than 12%.

13. The lubricating composition of claim 1, wherein the NOACK volatility of the lubricating composition is less than 11%.

14. The lubricating composition of claim 1, wherein the NOACK volatility of the lubricating composition is less than 10%.

15. The lubricating composition of claim 1, the composition further comprising a lubricant additive package, said lubricant additive package comprising one or more of the

[0054] As used herein, the words “include” and “comprise” and variants thereof may be used interchangeably.

[0055] The singular forms “a”, “an” and “the” include plural referents, unless the context clearly dictates otherwise. Optional or optionally means that the subsequently described event or circumstances may or may not occur. The description includes instances where the event or circumstance occurs and instances where it does not occur.

[0056] Ranges may be expressed herein as from about one particular value, and/or to about another particular value. When such a range is expressed, it is to be understood that another embodiment is from the one particular value and/or to the other particular value, along with all combinations within said range.

[0057] Throughout this application, where patents or publications are referenced, the disclosures of these references in their entireties are intended to be incorporated by reference into this application, in order to more fully describe the state of the art to which the invention pertains, except when these reference contradict the statements made herein.

[0058] Although the present invention has been described in detail, it should be understood that various changes, substitutions, and alterations can be made hereupon without departing from the principle and scope of the invention.
additives selected from the group consisting of anti-oxidants, anti-wear additives, viscosity modifiers, detergents, dispersants and anti-foaming agents.

16. A method of lubricating an engine, the method comprising the step of supplying a lubricating composition of claim 1 to an engine.