of the lubricant. It is therefore desirable to provide engine oil lubricants and methods of using the same that at least partially mitigate these and possibly other adverse effects of the use of biodiesel fuels.

SUMMARY AND TERMS

[0005a] In one aspect of the present disclosure, there is provided a lubricant composition comprising:
greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition;

a dispersant composition comprising:

i) optionally a first dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine; and

ii) a second dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine; and

at least one ashless antioxidant;

wherein a weight ratio of the second dispersant to the dispersant composition ranges from 0.66:1 to 1:1.

[0005b] In another aspect of the present disclosure, there is provided a method of lubricating an engine fueled with biodiesel, the method comprising supplying the lubricant composition disclosed herein to the engine wherein the lubricant composition is contaminated with the biodiesel during operation of the engine.

[0005c] In a further aspect of the present disclosure, there is provided a lubricant composition comprising:
greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition;

a dispersant composition comprising:

i) optionally a first dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine; and

ii) a second dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine; and

at least one ashless antioxidant;

wherein a ratio of the weight percentage of nitrogen contributed by the second dispersant to the weight percentage of nitrogen of the dispersant composition is from 0.62:1 to 1:1.

[0005d] In another aspect of the present disclosure, there is provided a lubricant composition comprising:
greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition;
at least one antioxidant substantially free of copper; and

a dispersant composition comprising:

i) optionally a first dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine; and

ii) a second dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine;

wherein a weight ratio of the second dispersant to the dispersant composition ranges from 0.42:1 to 1:1.

[0005e] In a further aspect of the present disclosure, there is provided a lubricant composition comprising:
greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition;
at least one antioxidant substantially free of copper; and
a dispersant composition comprising:

i) optionally a first dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine; and

ii) a second dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine;

wherein a ratio of the weight percentage of nitrogen contributed by the second dispersant to the weight percentage of nitrogen of the dispersant composition is from 0.40:1 to 1:1.

[0005f] In another aspect of the present disclosure, there is provided a method of lubricating an engine fueled with biodiesel, the method comprising supplying the lubricant composition disclosed herein to the engine wherein the lubricant composition is contaminated with the biodiesel during operation of the engine.

[0006] The present disclosure also relates to a lubricant composition and method of lubricating an engine fueled with biodiesel, with this lubricant composition. The present disclosure is a lubricant composition comprising:
greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition;

a dispersant composition comprising:

i) optionally a first dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine; and

ii) a second dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine; and

at least one antioxidant;

further defined by at least one of the following ratios (a) and (b):

(a) a weight ratio of the second dispersant to the dispersant composition ranges from about 0.42:1 to 1:1;

(b) a ratio of the weight percentage of nitrogen contributed by the second dispersant to the weight percentage of nitrogen of the dispersant composition is from about 0.40:1 to 1:1;

with the proviso that if the at least one antioxidant substantially free of copper does not comprise a molybdenum-containing antioxidant, then alternative ratio (a) ranges from about 0.66:1 to 1:1 and alternative ratio (b) ranges from 0.62:1 to 1:1.

[0007] In one example, the lubricant composition comprises:

greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition;

a dispersant composition including at least:

i) optionally a first dispersant containing one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine; and

ii) a second dispersant containing one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine; and

at least one ashless antioxidant;

wherein a weight ratio of the second dispersant to a total weight of the dispersant composition ranges from about 0.66:1 to 1:1. The lubricant composition may be free of metal-containing antioxidants.

[0008] In the foregoing examples, the ashless antioxidant may include at least one of a sulfurized antioxidant, a phenolic antioxidant, and an aminic antioxidant. In the foregoing example, the antioxidant may include the phenolic antioxidant and the aminic antioxidant in a ratio of from about 0.3:0.8 to about 0.8:0.3, or more preferably, in a ratio of 0.4:0.8 to 0.8:0.4, or more preferably in a ratio of 0.5:0.8 to 0.8:0.5, or even more preferably a ratio of from 0.5:0.8 to 0.7:0.8, or most preferably a ratio of from 0.5:0.8. In each of the foregoing examples, the ashless antioxidant may be substantially free of copper.

[0009] In each of the foregoing examples, the second dispersant may contain two or more dispersants each having a number average molecular weight greater than 1300.

[0010] In each of the foregoing examples, the lubricant composition may further include a molybdenum containing compound.

[0011] In each of the foregoing examples, a ratio of the number average molecular weight of the second dispersant to the number average molecular weight of the dispersant composition may be from about 0.72:1 to 1:1 or 0.75:1 to 1:1. In each of the foregoing examples, the first dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1290 or less than or equal to 1250. Preferably, it is greater than 500, more preferably greater than 900 or even 1100.

In each of the foregoing examples, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is greater than 1320. Preferably, it is greater than 1350, more preferably at least 1400. An upper limit may be 3500, preferably 3000. In one example, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight in the range of greater than 1300 to 3500, preferably 1320 to 3000 or 1350 to 2500. Or, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight in the range of from greater than 1300 to 2300, in particular in the range of from 1400 to 1600.

[0012] In the foregoing examples, the second dispersant may comprise from about 0.1 wt.% to about 10 wt.%, based on the total weight of the lubricant composition. In each of the foregoing examples, the total dispersant comprises about 0.1 wt.% to about 20 wt.%, based on the total weight of the lubricant composition.

[0013] In another example, the present disclosure relates to a method of lubricating an engine fueled with biodiesel, comprising supplying the lubricant composition of any of the foregoing examples to

the engine, and wherein the lubricant composition is contaminated with biodiesel during operation of the engine.

[0014] In an alternative example, the present disclosure relates to a lubricant composition comprising:
greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition;
a dispersant composition comprising:

i) a first dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine;

ii) a second dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine; and

at least one antioxidant;

wherein a ratio of the weight percentage of nitrogen contributed by the second dispersant to the weight percentage of nitrogen of the dispersant composition is from about 0.62:1 to 1:1, or from 0.70:1 to 1:1.

[0015] Herein, the first dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1290 or less than or equal to 1250. Preferably, it is greater than 500, more preferably greater than 900 or even 1100.

[0016] In each of the foregoing examples, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is greater than 1320. Preferably, it is greater than 1350, more preferably at least 1400. An upper limit may be 3500, preferably 3000. In one example, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight in the range of greater than 1300 to 3500, preferably 1320 to 3000 or 1350 to 2500. Or, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight in the range of from greater than 1300 to 2300, in particular in the range of from 1400 to 1600.

[0017] In this example, the at least one antioxidant may be an ashless antioxidant. The lubricant composition may be free of metal-containing antioxidants.

[0018] In an alternative example, the present disclosure relates to a lubricant composition comprising:
greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition; at least one antioxidant substantially free of copper; and

a dispersant composition including:

i) a first dispersant containing one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine; and

ii) a second dispersant containing one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine;

wherein the weight ratio of the second dispersant to the total weight of the dispersant composition ranges from about 0.42:1 to 1:1, or from 0.61:1 to 1:1 or from 0.66:1 to 1:1 or even 0.75:1 to 1:1.

[0019] In the foregoing alternative example, the antioxidant may comprise a molybdenum-containing antioxidant, preferably it may comprise a phenolic antioxidant, an aminic antioxidant, and a molybdenum-containing antioxidant in a ratio of approximately 0.5:1:0.1.

[0020] In each of the foregoing alternative examples, a ratio of the number average molecular weight of the second dispersant to the number average molecular weight of the dispersant composition may be from about 0.5:1 to 1:1.

[0021] In each of the foregoing alternative examples, the first dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1290 or less than or equal to 1250. Preferably, it is greater than 500, more preferably greater than 900 or even 1100.

In each of the foregoing alternative examples, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is greater than 1320. Preferably, it is greater than 1350, more preferably at least 1400. An upper limit may be 3500, preferably 3000. In one example, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight in the range of greater than 1300 to 3500, preferably 1320 to 3000 or 1350 to 2500. Or, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight in the range of from greater than 1300 to 2300, in particular in the range of from 1400 to 1600.

[0022] In each of the foregoing alternative examples, the second dispersant may comprise from about 0.1 wt.% to about 10 wt.%, based on the total weight of the lubricant composition. In each of the foregoing alternative examples, the total dispersant comprises about 0.1 wt.% to about 20 wt.%, based on the total weight of the lubricant composition.

[0023] In a further alternative example, the present disclosure relates to a lubricant composition comprising:

greater than 50 percent by weight of a base oil, based on a total weight of the lubricant composition;
at least one of an antioxidant substantially free of copper; and
a dispersant composition comprising:
i) a first dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1300, and at least one polyamine; and
ii) a second dispersant comprising one or more reaction products of at least one polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight greater than 1300, and at least one polyamine;
wherein a ratio of the weight percentage of nitrogen contributed by the second dispersant to the weight percentage of nitrogen of the dispersant composition is from about 0.40:1 to 1:1 or from about 0.62:1 to 1:1, or even from 0.70:1 to 1:1.

[0024] In the foregoing second alternative example, the antioxidant may comprise a molybdenum-containing antioxidant, preferably it may comprise a phenolic antioxidant, an aminic antioxidant, and a molybdenum-containing antioxidant in a ratio of approximately 0.5:1:0.1.

[0025] In each of the foregoing second alternative examples, a ratio of the number average molecular weight of the second dispersant to the number average molecular weight of the dispersant composition may be from about 0.5:1 to 1:1.

[0026] In each of the foregoing alternative examples, the first dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is less than or equal to 1290 or less than or equal to 1250. Preferably, it is greater than 500, more preferably greater than 900 or even 1100.

[0027] In each of the foregoing alternative examples, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight that is greater than 1320. Preferably, it is greater than 1350, more preferably at least 1400. An upper limit may be 3500, preferably 3000. In one example, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight in the range of greater than 1300 to 3500, preferably 1320 to 3000 or 1350 to 2500. Or, the second dispersant may include at least one dispersant obtained from a polyisobutenyl succinic acid or anhydride having a polyisobutenyl group with a number average molecular weight in the range of from greater than 1300 to 2300, in particular in the range of from 1400 to 1600.

[0028] In each of the foregoing alternative examples, the second dispersant may comprise from about 0.1 wt.% to about 10 wt.%, based on the total weight of the lubricant composition. In each of the

foregoing alternative examples, the total dispersant comprises about 0.1 wt.% to about 20 wt.%, based on the total weight of the lubricant composition.

[0029] In another example, the present disclosure relates to a method of lubricating an engine fueled with biodiesel, the method comprising supplying a lubricant composition to an engine wherein the lubricant composition is contaminated with the biodiesel during operation of the engine; wherein the lubricant composition may be any of the foregoing alternative examples.

[0030] The following definitions of terms are provided in order to clarify the meanings of certain terms as used herein.

[0031] The terms “oil composition,” “lubrication composition,” “lubricating oil composition,” “lubricating oil,” “lubricant composition,” “lubricating composition,” “fully formulated lubricant composition,” “lubricant,” “crankcase oil,” “crankcase lubricant,” “engine oil,” “engine lubricant,” “motor oil,” and “motor lubricant” are considered synonymous, fully interchangeable terminology referring to the finished lubrication product comprising a major amount of a base oil plus a minor amount of an additive composition.

[0032] As used herein, the terms “additive package,” “additive concentrate,” “additive composition,” “engine oil additive package,” “engine oil additive concentrate,” “crankcase additive package,” “crankcase additive concentrate,” “motor oil additive package,” “motor oil concentrate,” are considered synonymous, fully interchangeable terminology referring the portion of the lubricating oil composition excluding the major amount of base oil stock mixture. The additive package may or may not include the viscosity index improver or pour point depressant.

[0033] The term “overbased” relates to metal salts, such as metal salts of sulfonates, carboxylates, salicylates, and/or phenates, wherein the amount of metal present exceeds the stoichiometric amount. Such salts may have a conversion level in excess of 100% (i.e., they may comprise more than 100% of the theoretical amount of metal needed to convert the acid to its “normal,” “neutral” salt). The expression “metal ratio,” often abbreviated as MR, is used to designate the ratio of total chemical equivalents of metal in the overbased salt to chemical equivalents of the metal in a neutral salt according to known chemical reactivity and stoichiometry. In a normal or neutral salt, the metal ratio is one and in an overbased salt, MR, is greater than one. They are commonly referred to as overbased, hyperbased, or superbased salts and may be salts of organic sulfur acids, carboxylic acids, salicylates, and/or phenols.

[0034] As used herein, the term "hydrocarbyl substituent" or "hydrocarbyl group" is used in its ordinary sense, which is well-known to those skilled in the art. Specifically, it refers to a group having a carbon atom directly attached to the remainder of the molecule and having a predominantly hydrocarbon character. Each hydrocarbyl group is independently selected from hydrocarbon substituents, and substituted hydrocarbon substituents containing one or more of halo groups, hydroxyl groups, alkoxy groups, mercapto groups, nitro groups, nitroso groups, amino groups, pyridyl groups, furyl groups,

[0042] The internal combustion engine may contain components of one or more of an aluminum-alloy, lead, tin, copper, cast iron, magnesium, ceramics, stainless steel, composites, and/or mixtures thereof. The components may be coated, for example, with a diamond-like carbon coating, a lubrited coating, a phosphorus-containing coating, molybdenum-containing coating, a graphite coating, a nano-particle-containing coating, and/or mixtures thereof. The aluminum-alloy may include aluminum silicates, aluminum oxides, or other ceramic materials. In one example the aluminum-alloy is an aluminum-silicate surface. As used herein, the term "aluminum alloy" is intended to be synonymous with "aluminum composite" and to describe a component or surface comprising aluminum and another component intermixed or reacted on a microscopic or nearly microscopic level, regardless of the detailed structure thereof. This would include any conventional alloys with metals other than aluminum as well as composite or alloy-like structures with non-metallic elements or compounds such with ceramic-like materials.

[0043] The lubricating oil composition for an internal combustion engine may be suitable for any engine lubricant irrespective of the sulfur, phosphorus, or sulfated ash (ASTM D874) content. The sulfur content of the engine oil lubricant may be about 1 wt.% or less, or about 0.8 wt.% or less, or about 0.5 wt.% or less, or about 0.3 wt.% or less, or about 0.2 wt.% or less. In one example the sulfur content may be in the range of about 0.001 wt.% to about 0.5 wt.%, or about 0.01 wt.% to about 0.3 wt.%. The phosphorus content may be about 0.2 wt.% or less, or about 0.1 wt.% or less, or about 0.085 wt.% or less, or about 0.08 wt.% or less, or even about 0.06 wt.% or less, or about 0.055 wt.% or less, or about 0.05 wt.% or less. In one example the phosphorus content may be about 50 ppm to about 1000 ppm, or about 325 ppm to about 850 ppm. The total sulfated ash content may be about 2 wt.% or less, or about 1.5 wt.% or less, or about 1.1 wt.% or less, or about 1 wt.% or less, or about 0.8 wt.% or less, or about 0.5 wt.% or less. In one example the sulfated ash content may be about 0.05 wt.% to about 0.9 wt.%, or about 0.1 wt.% or about 0.2 wt.% to about 0.45 wt.%. In another example, the sulfur content may be about 0.4 wt.% or less, the phosphorus content may be about 0.08 wt.% or less, and the sulfated ash is about 1 wt.% or less. In yet another example the sulfur content may be about 0.3 wt.% or less, the phosphorus content is about 0.05 wt.% or less, and the sulfated ash may be about 0.8 wt.% or less.

[0044] In one example the lubricating oil composition is an engine oil, wherein the lubricating oil composition may have (i) a sulfur content of about 0.5 wt.% or less, (ii) a phosphorus content of about 0.1 wt.% or less, and (iii) a sulfated ash content of about 1.5 wt.% or less.

[0045] In one example the lubricating oil composition is suitable for a 2-stroke or a 4-stroke marine diesel internal combustion engine. In one example the marine diesel combustion engine is a 2-stroke engine. In some examples, the lubricating oil composition is not suitable for a 2-stroke or a 4-stroke marine diesel internal combustion engine for one or more reasons, including but not limited to, the high

sulfur content of fuel used in powering a marine engine and the high TBN required for a marine-suitable engine oil (e.g., above about 40 TBN in a marine-suitable engine oil).

[0046] In some examples, the lubricating oil composition is suitable for use with engines powered by low sulfur fuels, such as fuels containing about 1 to about 5% sulfur. Highway vehicle fuels contain about 15 ppm sulfur (or about 0.0015% sulfur).

[0047] Low speed diesel typically refers to marine engines, medium speed diesel typically refers to locomotives, and high speed diesel typically refers to highway vehicles. The lubricating oil composition may be suitable for only one of these types or all.

[0048] Further, lubricants of the present description may be suitable to meet one or more industry specification requirements such as ILSAC GF-3, GF-4, GF-5, GF-6, PC-11, CF, CF-4, CH-4, CI-4, CJ-4, API SG, SJ, SL, SM, SN, ACEA A1/B1, A2/B2, A3/B3, A3/B4, A5/B5, C1, C2, C3, C4, C5, E4/E6/E7/E9, Euro 5/6, Jaso DL-1, Low SAPS, Mid SAPS, or original equipment manufacturer specifications such as Dexos™ 1, Dexos™ 2, MB-Approval 229.1, 229.3, 229.5, 229.31, 229.51, 229.52, 229.6, 229.71, 226.5, 226.51, 228.0/.1, 228.2/.3, 228.31, 228.5, 228.51, 228.61, VW 501.01, 502.00, 503.00/503.01, 504.00, 505.00, 505.01, 506.00/506.01, 507.00, 508.00, 509.00, 508.88, 509.99, BMW Longlife-01, Longlife-01 FE, Longlife-04, Longlife-12 FE, Longlife-14 FE+, Longlife-17 FE+, Porsche A40, C30, Peugeot Citroën Automobiles B71 2290, B71 2294, B71 2295, B71 2296, B71 2297, B71 2300, B71 2302, B71 2312, B71 2007, B71 2008, Renault RN0700, RN0710, RN0720, Ford WSS-M2C153-H, WSS-M2C930-A, WSS-M2C945-A, WSS-M2C913A, WSS-M2C913-B, WSS-M2C913-C, WSS-M2C913-D, WSS-M2C948-B, WSS-M2C948-A, GM 6094-M, Chrysler MS-6395, Fiat 9.55535 G1, G2, M2, N1, N2, Z2, S1, S2, S3, S4, T2, DS1, DSX, GH2, GS1, GSX, CR1, Jaguar Land Rover STJLR.03.5003, STJLR.03.5004, STJLR.03.5005, STJLR.03.5006, STJLR.03.5007, STJLR.51.5122 or any past or future PCMO or HDD specifications not mentioned herein. In some examples for passenger car motor oil (PCMO) applications, the amount of phosphorus in the finished fluid is 1000 ppm or less or 900 ppm or less or 800 ppm or less.

[0049] Other hardware may not be suitable for use with the disclosed lubricant. A "functional fluid" is a term which encompasses a variety of fluids including but not limited to tractor hydraulic fluids, power transmission fluids including automatic transmission fluids, continuously variable transmission fluids and manual transmission fluids, hydraulic fluids, including tractor hydraulic fluids, some gear oils, power steering fluids, fluids used in wind turbines, compressors, some industrial fluids, and fluids related to power train components. It should be noted that within each of these fluids such as, for example, automatic transmission fluids, there are a variety of different types of fluids due to the various transmissions having different designs which have led to the need for fluids of markedly different functional characteristics. This is contrasted by the term "lubricating fluid" which is not used to generate or transfer power.

[0050] With respect to tractor hydraulic fluids, for example, these fluids are all-purpose products used for all lubricant applications in a tractor except for lubricating the engine. These lubricating applications may include lubrication of gearboxes, power take-off and clutch(es), rear axles, reduction gears, wet brakes, and hydraulic accessories.

[0051] When the functional fluid is an automatic transmission fluid, the automatic transmission fluids must have enough friction for the clutch plates to transfer power. However, the friction coefficient of fluids has a tendency to decline due to the temperature effects as the fluid heats up during operation. It is important that the tractor hydraulic fluid or automatic transmission fluid maintain its high friction coefficient at elevated temperatures, otherwise brake systems or automatic transmissions may fail. This is not a function of an engine oil.

[0052] Tractor fluids, and for example Super Tractor Universal Oils (STUOs) or Universal Tractor Transmission Oils (UTTOs), may combine the performance of engine oils with transmissions, differentials, final-drive planetary gears, wet-brakes, and hydraulic performance. While many of the additives used to formulate a UTTO or a STUO fluid are similar in functionality, they may have deleterious effect if not incorporated properly. For example, some anti-wear and extreme pressure additives used in engine oils can be extremely corrosive to the copper components in hydraulic pumps. Detergents and dispersants used for gasoline or diesel engine performance may be detrimental to wet brake performance. Friction modifiers specific to quiet wet brake noise, may lack the thermal stability required for engine oil performance. Each of these fluids, whether functional, tractor, or lubricating, are designed to meet specific and stringent manufacturer requirements.

[0053] The present disclosure provides novel lubricating oil blends formulated for use as automotive crankcase lubricants. The present disclosure provides novel lubricating oil blends formulated for use as 2T and/or 4T motorcycle crankcase lubricants. Examples of the present disclosure may provide lubricating oils suitable for crankcase applications and having improvements in the following characteristics: air entrainment, alcohol fuel compatibility, antioxidancy, antiwear performance, biofuel compatibility, foam reducing properties, friction reduction, fuel economy, preignition prevention, rust inhibition, sludge and/or soot dispersability, piston cleanliness, deposit formation, and water tolerance.

[0054] Engine oils of the present disclosure may be formulated by the addition of one or more additives, as described in detail below, to an appropriate base oil formulation. The additives may be combined with a base oil in the form of an additive package (or concentrate) or, alternatively, may be combined individually with a base oil (or a mixture of both). The fully formulated engine oil may exhibit improved performance properties, based on the additives added and their respective proportions.

[0055] Unless stated otherwise, all percentages are in weight percent and all molecular weights are number average molecular weights.