event may result in a knocking sound or other abnormal characteristics from the uncontrolled pressure rise in the cylinder. LSPI events are undesired and recent API specifications set LSPI performance standards for passenger car motor oils.

[0004] Lubricants designed for compression ignition heavy duty engine applications such as heavy duty diesel engines, on the other hand, tend to be more focused on suitability for truck engines, fleet operators, mining houses, and construction equipment engines to suggest but a few applications. Fluids for such applications, thus, often focus on different performance characteristics than typical passenger cars. Lubricants for heavy duty use, for instance, are often used in diesel engines and configured to maintain friction and viscosity performance with soot and/or sludge control that may be inherent to more heavy duty applications.

[0005] However, due to the unique performance requirements for spark ignition passenger car motor oils as compared to compression ignition heavy duty application, fluids designed for one application do not necessarily meet the performance standards for the other. For instance, lubricants designed for spark ignition passenger car standards would not necessary meet the friction requirements for compression ignition heavy duty applications and fluids for compression ignition heavy duty applications would not necessarily meet the LSPI performance standards for spark ignition passenger car applications.

SUMMARY

[0006] In one approach or example, a lubricating composition suitable for compression-ignition heavy duty applications and spark-ignition engines. In one example, the lubricating composition includes a detergent system providing both calcium and magnesium from one or more of a sulfonate, a phenate, a salicylate, or mixtures thereof; an antiwear and friction system including one or more metal dialkyl dithiophosphates derived from primary and secondary alcohols, and wherein a weight ratio of primary to secondary alcohols in the antiwear and friction system is at least about 3:1; wherein the amount of magnesium from the detergent system is at least 500 ppm magnesium based on the lubricating composition; and wherein the amount of phosphorus from the antiwear and friction system is less than 1200 ppm phosphorus based on the lubricating composition (in other approaches or examples, less than 1000 ppm phosphorus or less than 800 ppm phosphorus) and the amount of zinc from the antiwear and friction system is less than 1000 ppm zinc based on the lubricating composition.

[0006a] In one aspect, the present disclosure refers to a lubricating composition suitable for diesel and gasoline engines, the lubricating composition comprising: a detergent system providing both calcium and magnesium from one or more of a sulfonate, a phenate, a salicylate, or mixtures thereof and wherein a weight ratio of the calcium-to-magnesium provided by the detergent system is 1.5:1 to 2:1; and an antiwear and friction system including two or more metal dialkyl dithiophosphates derived from primary and secondary alcohols, wherein a first metal dialkyl dithiophosphate is derived from primary alcohols and a second metal dialkyl dithiophosphate is derived from a mixture of primary and secondary alcohols, and wherein a weight ratio of primary to secondary alcohols from the two or more metal dialkyl dithiophosphates combined in the antiwear and friction system is at least 3:1 to 5.5:1; wherein the amount of magnesium from the detergent system is at least 500 ppm magnesium based on the lubricating composition; and wherein the amount of phosphorus from the antiwear and friction system is less than 1200 ppm phosphorus based on the lubricating composition and the amount of zinc from the antiwear and friction system is less than 1000 ppm zinc based on the lubricating composition.

[0007] In other examples or approaches, the composition may include optional examples or features in any composition. Such optional features or examples include one or more of the following: wherein the calcium provided by the detergent system is provided by one or more of a calcium phenate, a calcium sulfonate, or mixtures thereof and in amounts to provide about 900 to about 1500 ppm of calcium; and/or wherein a weight ratio of the calcium to magnesium provided by the detergent system is about 1.5:1 to about 2:1; and/or wherein the detergent system includes about 50 to about 70 weight percent of calcium phenate, about 30 to about 40 weight percent of magnesium sulfonate, and 0 to about 10 weight percent of calcium sulfonate; and/or wherein the detergent system includes about 60 to about 70 weight percent of the calcium phenate, about 32 to about 38 weight percent of the magnesium sulfonate, and about 1 to about 4 weight percent of the calcium sulfonate; and/or wherein the calcium sulfonate has a total base number of less than 50; and/or wherein the antiwear and friction system includes two zinc dialkyl dithiophosphates; and/or wherein the antiwear and friction system includes a first zinc dialkyl dithiophosphate derived from primary alcohols and a second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols; and/or wherein the antiwear and friction system includes one or more zinc dialkyl dithiophosphate additives derived from a majority of primary alcohols; and/or wherein the antiwear and friction system includes up to about 60 weight percent of the first zinc dialkyl dithiophosphate derived from primary alcohols and about 40 to about 50 weight percent of the second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols; and/or wherein the second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols is derived from about 50 to about 70 weight percent primary alcohols and about 30 to about 50 weight percent secondary alcohols; and/or wherein the detergent system includes a calcium sulfonate with a neat total base number of 20 to 80; and/or wherein the detergent system includes a calcium phenate with a neat total base number of 300 to 450 and a magnesium sulfonate with a neat total base number of about 500 to about 700; and/or wherein the total base number of the lubricating composition is less than about 15 (in other approaches, less than about 12, or even less than about 10); and/or further comprising a viscosity modifier additive selected from polyolefins, olefin copolymers, ethylene/propylene copolymers, polyisobutenes, hydrogenated styrene-isoprene polymers, styrene/maleic ester copolymers, hydrogenated styrene/butadiene copolymers, hydrogenated isoprene polymers, alpha-olefin maleic anhydride copolymers,

polymethacrylates, polyacrylates, polyalkyl styrenes, hydrogenated alkenyl aryl conjugated diene copolymers, or mixtures thereof; and/or wherein the lubricating composition includes no more than about 9 weight percent of the viscosity modifier additive; and/or wherein the lubricating composition exhibits no more than 5 average events pursuant to a Sequence IX low speed pre-ignition test pursuant to ASTM D8291-21a using two iterations; and/or wherein the lubricating composition has an absolute value percent change from initial slip time of about 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010) and an absolute value percent change from initial friction coefficient (midpoint) of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010).

[0007a] In one aspect, the present disclosure refers to a lubricating composition suitable for diesel and gasoline engines, the lubricating composition comprising: a detergent system providing both calcium and magnesium from one or more of a sulfonate, a phenate, a salicylate, or mixtures thereof and wherein a weight ratio of the calcium-to-magnesium provided by the detergent system is 1.5:1 to 2:1; and an antiwear and friction system including one or more metal dialkyl dithiophosphates derived from primary and secondary alcohols, and wherein a weight ratio of primary to secondary alcohols in the antiwear and friction system is at least 3:1 to 5.5:1; wherein the amount of magnesium from the detergent system is at least 500 ppm magnesium based on the lubricating composition; and wherein the amount of phosphorus from the antiwear and friction system is less than 1200 ppm phosphorus based on the lubricating composition and the amount of zinc from the antiwear and friction system is less than 1000 ppm zinc based on the lubricating composition; wherein the lubricating composition exhibits no more than 5 average events pursuant to a Sequence IX low speed pre-ignition test pursuant to ASTM D8291-21a using two iterations; and wherein the lubricating composition has an absolute value percent change from initial slip time of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010) and an absolute value percent change from initial friction coefficient (midpoint) of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010).

[0008] In another example, a method of lubricating an engine with a lubricating composition that conforms with API SP, API CK-4, and API FA-4 certifications. In some examples, the method includes lubricating the engine with a lubricating composition wherein the lubricating composition includes a detergent system providing both calcium and magnesium from one or more of a sulfonate, a phenate, a salicylate, or mixtures thereof; and an antiwear and friction system including one or more zinc dialkyl dithiophosphates derived from primary and secondary alcohols, and wherein a weight ratio of primary to secondary alcohols in the antiwear and friction system is at least about 3:1; wherein the amount of magnesium from the detergent system is greater than 500 ppm magnesium based on the lubricating composition; and wherein the amount of phosphorus from the antiwear and friction system is less than 1200 ppm phosphorus based on the lubricating composition (in other examples, less than 1000 ppm phosphorus or less than 800 ppm phosphorus) and the amount of zinc from the antiwear system is less than 1000 ppm zinc based on the lubricating composition; and wherein the

lubricating composition exhibits no more than 5 average events pursuant to a Sequence IX low speed pre-ignition test pursuant to ASTM D8291-21a when using two iterations and wherein the lubricating composition has an absolute value percent change from initial slip time of about 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010) and an absolute value percent change from initial friction coefficient (midpoint) of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010).

[0008a] In one aspect, the present disclosure refers to a method of lubricating an engine with a lubricating composition that conforms with API SP, API CK-4, and API FA-4 certifications, the method comprising lubricating the engine with a lubricating composition, the lubricating composition including a detergent system providing both calcium and magnesium from one or more of a sulfonate, a phenate, a salicylate, or mixtures thereof and wherein a weight ratio of the calcium to magnesium provided by the detergent system is 1.5:1 to 2:1; and an antiwear and friction system including two or more zinc dialkyl dithiophosphates derived from primary and secondary alcohols, wherein a first metal dialkyl dithiophosphate is derived from primary alcohols and a second metal dialkyl dithiophosphate is derived from a mixture of primary and secondary alcohols, and wherein a weight ratio of primary to secondary alcohols from the two or more metal dialkyl dithiophosphates combined in the antiwear and friction system is at least 3:1 to 5.5:1; wherein the amount of magnesium from the detergent system is greater than 500 ppm magnesium based on the lubricating composition; and wherein the amount of phosphorus from the antiwear and friction system is less than 1200 ppm phosphorus based on the lubricating composition and the amount of zinc from the antiwear system is less than 1000 ppm zinc based on the lubricating composition; and wherein the wherein the lubricating composition exhibits no more than 5 average events pursuant to a Sequence IX low speed pre-ignition test pursuant to ASTM D8291-21a when using two iterations and wherein the lubricating composition has an absolute value percent change from initial slip time of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010) and an absolute value percent change from initial friction coefficient (midpoint) of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010).

[0009] In other examples or approaches, the methods may include optional examples, steps, or features in any composition. Such optional features, steps, or examples include one or more of the following: wherein the calcium provided by the

detergent system is provided by one or more of a calcium phenate, a calcium sulfonate, or mixtures thereof and in amounts to provide about 900 to about 1500 ppm of calcium; and/or wherein a weight ratio of the calcium to magnesium provided by the detergent system is about 1.5:1 to about 2:1; and/or wherein the detergent system includes about 50 to about 70 weight percent of a calcium phenate, about 30 to about 40 weight percent of a magnesium sulfonate, and about 0 to about 10 weight percent of a calcium sulfonate; and/or wherein the detergent system includes about 60 to about 70 weight percent of the calcium phenate, about 32 to about 38 weight percent of the magnesium sulfonate, and about 1 to about 4 weight percent of the calcium sulfonate; and/or wherein the calcium sulfonate has a total base number of less than 50; and/or wherein the antiwear and friction system includes a first zinc dialkyl dithiophosphate derived from primary alcohols and a second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols; and/or wherein the antiwear and friction system includes one or more zinc dialkyl dithiophosphate additives derived from a majority of primary alcohols; and/or wherein the antiwear and friction system includes up to about 60 weight percent of a first zinc dialkyl dithiophosphate derived from primary alcohols and about 40 to about 50 weight percent of a second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols; and/or wherein the second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols is derived from about 50 to about 70 weight percent primary alcohols and about 30 to about 50 weight percent secondary alcohols; and/or wherein the detergent system includes a calcium sulfonate with a neat total base number of 20 to 80; and/or wherein the detergent system includes a calcium phenate with a neat total base number of 300 to 450 and a magnesium sulfonate with a neat total base number of about 500 to about 700.

[00010] In yet other examples, the present disclosure provides for the use of any example of the lubricating compositions of this Summary for API SP, API CK-4, and API FA-4 certifications and, in particular, for achieving more than 5 average events pursuant to a Sequence IX low speed pre-ignition test pursuant to ASTM D8291-21a when using two iterations and achieving an absolute value percent change from initial slip time of about 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010) and an absolute value percent change from initial friction coefficient (midpoint) of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010).

[00011] Other examples of the present disclosure will be apparent to those skilled in the

art from consideration of the specification and practice of the disclosure disclosed herein. The following definitions of terms are provided in order to clarify the meanings of certain terms as used herein.

[00012] The terms “lubricating oil,” “lubricant composition,” “lubricating composition,” “lubricant” and “lubricating fluid” refer to a finished lubrication product comprising a major amount of a base oil plus a minor amount of an additive composition.

[00013] As used herein, the terms “additive package,” “additive concentrate,” or “additive composition” refer the portion of the lubricating oil composition excluding the major amount of base oil.

[00014] 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, imidazolyl groups, oxygen and nitrogen, and wherein no more than two non-hydrocarbon substituents are present for every ten carbon atoms in the hydrocarbyl group.

[00015] As used herein, the term "percent by weight" or “wt%”, unless expressly stated otherwise, means the percentage the recited component represents to the weight of the entire composition. All percent numbers herein, unless specified otherwise, is weight percent.

[00016] The terms "soluble," "oil-soluble," or "dispersible" used herein may, but does not necessarily, indicate that the compounds or additives are soluble, dissolvable, miscible, or capable of being suspended in the oil in all proportions. The foregoing terms do mean, however, that they are, for instance, soluble, suspendable, dissolvable, or stably dispersible in oil to an extent sufficient to exert their intended effect in the environment in which the oil is employed. Moreover, the additional incorporation of other additives may also permit incorporation of higher levels of a particular additive, if desired.

[00017] The term "alkyl" as employed herein refers to straight, branched, cyclic, and/or substituted saturated chain moieties from about 1 to about 200 carbon atoms. The term "alkenyl" as employed herein refers to straight, branched, cyclic, and/or substituted unsaturated chain

moieties from about 3 to about 30 carbon atoms. The term “aryl” as employed herein refers to single and multi-ring aromatic compounds that may include alkyl, alkenyl, alkylaryl, amino, hydroxyl, alkoxy, halo substituents, and/or heteroatoms including, but not limited to, nitrogen, and oxygen.

[00018] As used herein, the molecular weight is determined by gel permeation chromatography (GPC) using commercially available polystyrene standards (with a Mn of about 180 to about 18,000 as the calibration reference). The number average molecular weight (Mn) for any example herein may be determined with a gel permeation chromatography (GPC) instrument obtained from Waters or the like instrument and the data processed with Waters Empower Software or the like software. The GPC instrument may be equipped with a Waters Separations Module and Waters Refractive Index detector (or the like optional equipment). The GPC operating conditions may include a guard column, 4 Agilent PLgel columns (length of 300×7.5 mm; particle size of 5 μ, and pore size ranging from 100-10000 Å) with the column temperature at about 40 °C. Un-stabilized HPLC grade tetrahydrofuran (THF) may be used as solvent, at a flow rate of 1.0 mL/min. The GPC instrument may be calibrated with commercially available polystyrene (PS) standards having a narrow molecular weight distribution ranging from 500 – 380,000 g/mol. The calibration curve can be extrapolated for samples having a mass less than 500 g/mol. Samples and PS standards can be in dissolved in THF and prepared at concentration of 0.1-0.5 weight percent and used without filtration. GPC measurements are also described in US 5,266,223, which is incorporated herein by reference. The GPC method additionally provides molecular weight distribution information; *see, for example*, W. W. Yau, J. J. Kirkland and D. D. Bly, “Modern Size Exclusion Liquid Chromatography”, John Wiley and Sons, New York, 1979, also incorporated herein by reference.

[00019] It is to be understood that throughout the present disclosure, the terms "comprises," "includes," “contains,” etc. are considered open-ended and include any element, step, or ingredient not explicitly listed. The phrase "consists essentially of" is meant to include any expressly listed element, step, or ingredient and any additional elements, steps, or ingredients that do not materially affect the basic and novel examples of the disclosure. The present disclosure also contemplates that any composition described using the terms, "comprises," "includes," “contains,” is also to be interpreted as including a disclosure of the same composition "consisting essentially of" or “consisting of” the specifically listed components thereof.

CLAIMS

1. A lubricating composition suitable for diesel and gasoline engines, the lubricating composition comprising:

a detergent system providing both calcium and magnesium from one or more of a sulfonate, a phenate, a salicylate, or mixtures thereof and wherein a weight ratio of the calcium-to-magnesium provided by the detergent system is 1.5:1 to 2:1; and

an antiwear and friction system including two or more metal dialkyl dithiophosphates derived from primary and secondary alcohols, wherein a first metal dialkyl dithiophosphate is derived from primary alcohols and a second metal dialkyl dithiophosphate is derived from a mixture of primary and secondary alcohols, and wherein a weight ratio of primary to secondary alcohols from the two or more metal dialkyl dithiophosphates combined in the antiwear and friction system is at least 3:1 to 5.5:1;

wherein the amount of magnesium from the detergent system is at least 500 ppm magnesium based on the lubricating composition; and

wherein the amount of phosphorus from the antiwear and friction system is less than 1200 ppm phosphorus based on the lubricating composition and the amount of zinc from the antiwear and friction system is less than 1000 ppm zinc based on the lubricating composition.

2. The lubricating composition of claim 1, wherein the calcium provided by the detergent system is provided by one or more of a calcium phenate, a calcium sulfonate, or mixtures thereof and in amounts to provide 900 to 1500 ppm of calcium.

3. The lubricating composition of claim 1, wherein the detergent system includes 50 to 70 weight percent of calcium phenate, 30 to 40 weight percent of magnesium sulfonate, and 0 to 10 weight percent of calcium sulfonate.

4. The lubricating composition of claim 3, wherein the detergent system includes 60 to 70 weight percent of the calcium phenate, 32 to 38 weight percent of the magnesium sulfonate, and 1 to 4 weight percent of the calcium sulfonate.

5. The lubricating composition of claim 4, wherein the calcium sulfonate has a total base number of less than 50.

6. The lubricating composition of claim 1, wherein the antiwear and friction system includes two zinc dialkyl dithiophosphates.

7. The lubricating composition of claim 4, wherein the antiwear and friction system includes a first zinc dialkyl dithiophosphate derived from primary alcohols and a second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols.

8. The lubricating composition of claim 1, wherein the antiwear and friction system includes one or more zinc dialkyl dithiophosphate additives derived from a majority of primary alcohols.

9. The lubricating composition of claim 7, wherein the antiwear and friction system includes up to 60 weight percent of the first zinc dialkyl dithiophosphate derived from primary alcohols and 40 to 50 weight percent of the second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols.

10. The lubricating composition of claim 9, wherein the second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols is derived from 50 to 70 weight percent primary alcohols and 30 to 50 weight percent secondary alcohols.

11. The lubricating composition of claim 1, wherein the detergent system includes a calcium sulfonate with a neat total base number of 20 to 80.

12. The lubricating composition of claim 1, wherein the detergent system includes a calcium phenate with a neat total base number of 300 to 450 and a magnesium sulfonate with a neat total base number of 500 to 700.

13. The lubricating composition of claim 1, further comprising a viscosity modifier additive selected from polyolefins, olefin copolymers, ethylene/propylene copolymers, polyisobutenes, hydrogenated styrene-isoprene polymers, styrene/maleic ester copolymers, hydrogenated styrene/butadiene copolymers, hydrogenated isoprene polymers, alpha-olefin maleic anhydride copolymers, polymethacrylates, polyacrylates, polyalkyl styrenes, hydrogenated alkenyl aryl conjugated diene copolymers, or mixtures thereof.

14. The lubricating composition of claim 13, wherein the lubricating composition includes no more than 9 weight percent of the viscosity modifier additive.

15. The lubricating composition of claim 1, wherein the lubricating composition exhibits no more than 5 average events pursuant to a Sequence IX low speed pre-ignition test pursuant to ASTM D8291-21a using two iterations.

16. A lubricating composition suitable for diesel and gasoline engines, the lubricating composition comprising:

a detergent system providing both calcium and magnesium from one or more of a sulfonate, a phenate, a salicylate, or mixtures thereof and wherein a weight ratio of the calcium-to-magnesium provided by the detergent system is 1.5:1 to 2:1; and

an antiwear and friction system including one or more metal dialkyl dithiophosphates derived from primary and secondary alcohols, and wherein a weight ratio of primary to secondary alcohols in the antiwear and friction system is at least 3:1 to 5.5:1;

wherein the amount of magnesium from the detergent system is at least 500 ppm magnesium based on the lubricating composition; and

wherein the amount of phosphorus from the antiwear and friction system is less than 1200 ppm phosphorus based on the lubricating composition and the amount of zinc from the antiwear and friction system is less than 1000 ppm zinc based on the lubricating composition;

wherein the lubricating composition exhibits no more than 5 average events pursuant to a Sequence IX low speed pre-ignition test pursuant to ASTM D8291-21a using two iterations; and

wherein the lubricating composition has an absolute value percent change from initial slip time of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010) and an absolute value percent change from initial friction coefficient (midpoint) of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010).

17. A method of lubricating an engine with a lubricating composition that conforms with API SP, API CK-4, and API FA-4 certifications, the method comprising

lubricating the engine with a lubricating composition, the lubricating composition including a detergent system providing both calcium and magnesium from one or more of a sulfonate, a phenate, a salicylate, or mixtures thereof and wherein a weight ratio of the calcium

to magnesium provided by the detergent system is 1.5:1 to 2:1; and an antiwear and friction system including two or more zinc dialkyl dithiophosphates derived from primary and secondary alcohols, wherein a first metal dialkyl dithiophosphate is derived from primary alcohols and a second metal dialkyl dithiophosphate is derived from a mixture of primary and secondary alcohols, and wherein a weight ratio of primary to secondary alcohols from the two or more metal dialkyl dithiophosphates combined in the antiwear and friction system is at least 3:1 to 5.5:1; wherein the amount of magnesium from the detergent system is greater than 500 ppm magnesium based on the lubricating composition; and wherein the amount of phosphorus from the antiwear and friction system is less than 1200 ppm phosphorus based on the lubricating composition and the amount of zinc from the antiwear system is less than 1000 ppm zinc based on the lubricating composition; and

wherein the wherein the lubricating composition exhibits no more than 5 average events pursuant to a Sequence IX low speed pre-ignition test pursuant to ASTM D8291-21a when using two iterations and wherein the lubricating composition has an absolute value percent change from initial slip time of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010) and an absolute value percent change from initial friction coefficient (midpoint) of 10 percent or less pursuant to Allison Transmission friction test TES-439 (November 2010).

18. The method of claim 17, wherein the calcium provided by the detergent system is provided by one or more of a calcium phenate, a calcium sulfonate, or mixtures thereof and in amounts to provide 900 to 1500 ppm of calcium.

19. The method of claim 17, wherein the detergent system includes 50 to 70 weight percent of a calcium phenate, 30 to 40 weight percent of a magnesium sulfonate, and 0 to 10 weight percent of a calcium sulfonate.

20. The method of claim 19, wherein the detergent system includes 60 to 70 weight percent of the calcium phenate, 32 to 38 weight percent of the magnesium sulfonate, and 1 to 4 weight percent of the calcium sulfonate.

21. The method of claim 20, wherein the calcium sulfonate has a total base number of less than 50.

22. The method of claim 17, wherein the antiwear and friction system includes a first zinc dialkyl dithiophosphate derived from primary alcohols and a second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols.

23. The method of claim 17, wherein the antiwear and friction system includes one or more zinc dialkyl dithiophosphate additives derived from a majority of primary alcohols.

24. The method of claim 23, wherein the antiwear and friction system includes up to 60 weight percent of a first zinc dialkyl dithiophosphate derived from primary alcohols and 40 to 50 weight percent of a second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols.

25. The method of claim 26, wherein the second zinc dialkyl dithiophosphate derived from a mixture of primary and secondary alcohols is derived from 50 to 70 weight percent primary alcohols and 30 to 50 weight percent secondary alcohols.

26. The method of claim 17, wherein the detergent system includes a calcium sulfonate with a neat total base number of 20 to 80.

27. The method of claim 17, wherein the detergent system includes a calcium phenate with a neat total base number of 300 to 450 and a magnesium sulfonate with a neat total base number of 500 to 700.