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 about 1.5:1 to about 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 about 3:1 to about 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 about 900 to about 1500 ppm of calcium.

3. The lubricating composition of claim 1, 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.

4. The lubricating composition of claim 3, 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.

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 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.

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 about 50 to about 70 weight percent primary alcohols and about 30 to about 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 about 500 to about 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 about 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 about 1.5:1 to about 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 about 3:1 to about 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 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).

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 about 1.5:1 to about 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 about 3:1 to about 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 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).

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 about 900 to about 1500 ppm of calcium.

19. The method of claim 17, 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.

20. The method of claim 19, 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.

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 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.

25. The method of claim 26, 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.

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 about 500 to about 700.