CLAIMS

1. A method for improving low temperature performance of a lubricant in a compression-ignited internal combustion engine, the method comprising operating the engine with a lubricating oil composition comprising (a) greater than 50 wt. % of a base oil of lubricating viscosity; and (b) 0.1 to 40 wt. % of an overbased alkaline earth metal salt of an alkyl-substituted hydroxyaromatic compound, wherein the alkyl substituent is a residue derived from an isomerized alpha-olefin having from 12 to 40 carbon atoms per molecule; wherein the isomerized alpha-olefin has an isomerization level of 0.1 to 0.4, wherein the isomerization level, *I*, is a relative amount of methyl groups attached to methylene backbone groups as determined by ^{1}H NMR spectroscopy, defined by the formula $I = m/(m+n)$ where m is the ^{1}H NMR integral for methyl groups with chemical shifts between 0.30 ± 0.03 to 1.01 ± 0.03 ppm, and n is the ^{1}H NMR integral for methylene groups with chemical shifts between 1.01 ± 0.03 to 1.38 ± 0.10 ppm, wherein the lubricating oil composition is a monograde lubricating oil composition meeting specifications for SAE J300 revised January 2015 requirements for a SAE 20, 30, 40, 50, or 60 monograde engine oil, and has a TBN of 5 to 200 mg KOH/g, as determined by ASTM D2896.

2. The method of claim 1, wherein the alkyl-substituted hydroxyaromatic compound is an alkyl-substituted phenol, an alkyl-substituted hydroxyaromatic carboxylic acid, or a combination thereof.

3. The method of claim 1, wherein the isomerized alpha-olefin is an isomerized normal alpha-olefin.

4. The method of claim 1, wherein the alkyl substituent of the alkyl-substituted hydroxyaromatic compound is a residue derived from an alpha-olefin having from 14 to 28 carbon atoms per molecule.

5. The method of claim 1, wherein the alkyl substituent of the alkyl-substituted hydroxyaromatic compound is a residue derived from an alpha-olefin having from 20 to 28 carbon atoms per molecule.

6. The method of claim 1, wherein the alkyl substituent of the alkyl-substituted hydroxyaromatic compound is a residue derived from an alpha-olefin having from 20 to 24 carbon atoms per molecule.

7. The method of claim 1, wherein the overbased alkaline earth metal salt of an alkyl-substituted hydroxyaromatic compound has a TBN, on an actives basis, of 100 to 500 mg KOH/g.

8. The method of claim 1, wherein the lubricating oil composition has a TBN in one of the following ranges: 5 to 10 mg KOH/ g, 15 to 150 mg KOH/g, 20 to 80 mg KOH/g, 30 to 100 mg KOH/g, 30 to 80 mg KOH/g, 60 to 100 mg KOH/g, 60 to 150 mg KOH/g.

9. The method of claim 1, wherein the lubricating oil composition further comprises one or more of other detergents, a dispersant, an antiwear agent, an antioxidant, a friction modifier, a corrosion inhibitor, a rust inhibitor, a demulsifier, a foam inhibitor, a viscosity modifier, a pour point depressant, a non-ionic surfactant, and a thickener.

10. The method of claim 1, wherein the compression-ignited internal combustion engine is a 4-stroke engine operated at 250 to 1100 rpm.

11. The method of claim 1, wherein the compression-ignited internal combustion engine is a 2-stroke engine operated at 200 rpm or less.

12. The method of claim 1, wherein the compression-ignited internal combustion engine is fueled with a residual fuel, a marine residual fuel, a low sulfur marine residual fuel, a marine distillate fuel, a low sulfur marine distillate fuel, a high sulfur fuel, or a gaseous fuel.

13. The method of claim 1, wherein low temperature performance is measured according to ASTM D6749.