**[0004a]** In one aspect of the present disclosure, there is provided an engine lubricant composition comprising a base oil and a dispersant comprising a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxylic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

**[0004b]** In another aspect of the present disclosure, there is provided a method for maintaining the soot or sludge handling capability of an engine lubricant while not adversely affecting elastomeric seal material in the engine, comprising lubricating the engine with a lubricant composition comprising a base oil and an additive that comprises a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxylic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

**[0004c]** In yet another aspect of the present disclosure, there is provided a method for maintaining the soot or sludge handling capability of an engine lubricant, comprising lubricating the engine with a lubricant composition comprising a base oil and an additive that comprises a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxlic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

**[0004d]** In a further aspect of the present disclosure, there is provided a method for protecting elastomeric seal material in the engine, comprising lubricating the engine with a lubricant composition comprising a base oil and an additive that comprises a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxlic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

**[0004e]** In another aspect of the present disclosure, there is provided a method for operating an engine comprising lubricating the engine with an engine lubricant comprising a base oil and a lubricant additive package comprising a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxylic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

**[00011]** As used herein, the terms "additive package," "additive concentrate," and "additive composition" are considered synonymous, fully interchangeable terminology referring the portion of the lubricating composition excluding the major amount of base oil stock mixture.

**[00012]** 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 predominantly hydrocarbon character. Examples of hydrocarbyl groups include:

(1) hydrocarbon substituents, that is, aliphatic (e.g., alkyl or alkenyl), alicyclic (e.g., cycloalkyl, cycloalkenyl) substituents, and aromatic-, aliphatic-, and alicyclic-substituted aromatic substituents, as well as cyclic substituents wherein the ring is completed through another portion of the molecule (e.g., two substituents together form an alicyclic radical);

(2) substituted hydrocarbon substituents, that is, substituents containing non-hydrocarbon groups which, in the context of this present disclosure, do not alter the predominantly hydrocarbon substituent (e.g., halo (especially chloro and fluoro), hydroxy, alkoxy, mercapto, alkylmercapto, nitro, nitroso, and sulfoxy);

(3) hetero substituents, that is, substituents which, while having a predominantly hydrocarbon character, in the context of this present disclosure, contain other than carbon in a ring or chain otherwise composed of carbon atoms. Heteroatoms include sulfur, oxygen, nitrogen, and encompass substituents such as pyridyl, furyl, thienyl, and imidazolyl. In general, no more than two, for example, no more than one, non-hydrocarbon substituent will be present for every ten carbon atoms in the hydrocarbyl group; typically, there will be no non-hydrocarbon substituents in the hydrocarbyl group.

**[00013]** As used herein, the term "percent by weight", unless expressly stated otherwise, means the percentage the recited component represents to the weight of the entire composition.

**[00014]** The terms "oil-soluble" or "dispersible" used herein may but do 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 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.

What is claimed is:

1. An engine lubricant composition comprising a base oil and a dispersant comprising a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxylic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

2. The engine lubricant composition of claim 1, wherein component C comprises 1,8-naphthalic anhydride.

3. The engine lubricant composition of claim 1, wherein the lubricant composition comprises from about 0.5 to about 5 percent by weight of the dispersant.

4. The engine lubricant composition of claim 1, wherein component C comprises 1,8-naphthalic anhydride, and component D comprises maleic anhydride.

5. The engine lubricant composition of claim 1, wherein from 0.25 to 1.5 moles of component D is reacted per mole of component B.

6. The engine lubricant composition of claim 1, further comprising one or more of the members of the group selected from detergents, dispersants, friction modifiers, antioxidants, rust inhibitors, viscosity index improvers, emulsifiers, demulsifiers, corrosion inhibitors, antiwear agents, metal dihydrocarbyl dithiophosphates, ash-free amine phosphate salts, antifoam agents, and pour point depressants.

7. The engine lubricant composition of claim 1, further comprising an oil-soluble titanium-containing additive.

8. A method for maintaining the soot or sludge handling capability of an engine lubricant while not adversely affecting elastomeric seal material in the engine, comprising lubricating the engine with a lubricant composition comprising a base oil and an additive that comprises a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic

anhydride, and pyrene dicarboxylic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

9. The method of claim 8, wherein component C comprises 1,8-naphthalic anhydride.

10. The method of claim 8, wherein component D comprises maleic anhydride.

11. The method of claim 8, wherein the lubricant composition comprises from about 0.5 to about 5 percent by weight of the reaction product.

12. The method of claim 8, wherein a mole ratio of component D reacted with component B ranges from 0.25:1 to 1.5:1.

13. The method of claim 8, wherein the lubricant composition further comprises one or more of the members of the group selected from detergents, dispersants, friction modifiers, antioxidants, rust inhibitors, viscosity index improvers, emulsifiers, demulsifiers, corrosion inhibitors, antiwear agents, metal dihydrocarbyl dithiophosphates, ash-free amine phosphate salts, antifoam agents, and pour point depressants.

14. The method of claim 8, wherein the lubricant composition further comprises an oil-soluble titanium-containing additive.

15. A method for maintaining the soot or sludge handling capability of an engine lubricant, comprising lubricating the engine with a lubricant composition comprising a base oil and an additive that comprises a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxlic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

16. A method for protecting elastomeric seal material in the engine, comprising lubricating the engine with a lubricant composition comprising a base oil and an additive that comprises a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-

benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxlic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

17. A method for operating an engine comprising lubricating the engine with an engine lubricant comprising a base oil and a lubricant additive package comprising a reaction product of:

A) a polyisobutenyl succinic acid or anhydride having a number average molecular weight of from 500 to 5000;

B) an amine selected from the group consisting of diethylene triamine, triethylene tetramine, tetraethylene pentamine, pentaethylene hexamine, heavy polyamines, and mixtures thereof;

C) a compound selected from the group consisting of 1,8-naphthalic acid or anhydride, 1,2-naphthalenedicarboxylic acid or anhydride, naphthalene-1,4-dicarboxylic acid, naphthalene-2,6-dicarboxylic acid, phthalic anhydride, pyromellitic anhydride, 1,2,4-benzene tricarboxylic acid anhydride, diphenic acid or anhydride, 2,3-pyridine dicarboxylic acid or anhydride, 3,4-pyridine dicarboxylic acid or anhydride, 1,4,5,8-naphthalenetetracarboxylic acid or anhydride, perylene-3,4,9,10-tetracarboxylic anhydride, and pyrene dicarboxylic acid or anhydride, wherein from 0.25 to 1.5 moles of the component C are reacted per mole of component B; and

D) a compound selected from the group consisting of acetic acid or anhydride, oxalic acid or anhydride, malonic acid or anhydride, succinic acid or anhydride, alkenyl succinic acid or anhydride, glutaric acid or anhydride, adipic acid or anhydride, pimelic acid or anhydride, suberic acid or anhydride, azelaic acid or anhydride, sebacic acid or

anhydride, maleic acid or anhydride, fumaric acid or anhydride, tartaric acid or anhydride, glycolic acid or anhydride, and 1,2,3,6-tetrahydrophthalic acid or anhydride.

18. The method of claim 17, wherein the reaction product exhibits improved fluoroelastomeric seal compatibility compared to reaction product made in the absence of component D.

19. The method of claim 17, wherein the lubricant composition comprises from 0.5 to 5 percent by weight of the reaction product.

20. The method of claim 17, wherein the polyisobutenyl group of the polyisobutenyl succinic acid acid or anhydride has greater than 60 mole percent terminal vinylidene content.