Claims

1. The use of at least one nitrogen-containing detergent to reduce the filter blocking tendency of a fuel composition having a tendency to block filters, wherein the fuel composition comprises a renewable diesel component and a biodiesel component;
wherein the at least one nitrogen-containing detergent is selected from one or more of:

(a) a quaternary ammonium salt, wherein the quaternary ammonium salt is the reaction product of a compound including a tertiary amine group and a quaternising agent selected from esters of a carboxylic acid, dialkyl sulfates, benzyl halides, hydrocarbyl substituted carbonates, hydrocarbyl substituted epoxides optionally in combination with an acid, alkyl halides, alkyl sulfonates, sultones, hydrocarbyl substituted phosphates, hydrocarbyl substituted borates, alkyl nitrites, alkyl nitrates, hydroxides, N-oxides, chloroacetic acid or salts thereof, or mixtures thereof;

(b) the reaction product of a polyisobutene-substituted succinic acid or succinic anhydride and a polyethylene polyamine selected from ethylenediamine, diethylenetriamine, triethylenetetramine, tetraethylenepentamine, pentaethylenehexamine, hexaethylene-heptamine and mixtures and isomers thereof; wherein polyisobutene substituent has a number average molecular weight of between 500 and 2000;

(c) the product of a Mannich reaction between an aldehyde, an amine and a phenol which is mono-substituted with a hydrocarbyl substituent having 4 to 28 carbon atoms, or a polyisobutenyl substituent having a number average molecular weight of from 400 to 2500;

(d) the reaction product of a carboxylic acid-derived acylating agent and hydrazine;

(e) a salt formed by the reaction of a carboxylic acid with di-n-butylamine or tri-n-butylamine; and

(f) the reaction product of a hydrocarbyl-substituted dicarboxylic acid or anhydride and an amine compound or salt which product comprises at least one amino triazole group;

wherein the fuel composition comprises at least 1 vol% of a biodiesel component and at least 10 vol% of a renewable diesel component.

2. A method of reducing the filter blocking tendency of a fuel composition having a tendency to block filters and which comprises a biodiesel component and a renewable diesel component, the method comprising dosing into the fuel at least one nitrogen-containing detergent;

wherein the at least one nitrogen-containing detergent is selected from one or more of:

(a) a quaternary ammonium salt, wherein the quaternary ammonium salt is the reaction product of a compound including a tertiary amine group and a quaternising agent selected from esters of a carboxylic acid, dialkyl sulfates, benzyl halides, hydrocarbyl substituted carbonates, hydrocarbyl substituted epoxides optionally in combination with an acid, alkyl halides, alkyl sulfonates, sultones, hydrocarbyl substituted phosphates, hydrocarbyl substituted borates, alkyl nitrites, alkyl nitrates, hydroxides, N-oxides, chloroacetic acid or salts thereof, or mixtures thereof;

(b) the reaction product of a polyisobutene-substituted succinic acid or succinic anhydride and a polyethylene polyamine selected from ethylenediamine, diethylenetriamine, triethylenetetramine, tetraethylenepentamine, pentaethylenehexamine, hexaethylene-heptamine and mixtures and isomers thereof; wherein polyisobutene substituent has a number average molecular weight of between 500 and 2000;

(c) the product of a Mannich reaction between an aldehyde, an amine and a phenol which is mono-substituted with a hydrocarbyl substituent having 4 to 28 carbon atoms, or a polyisobutenyl substituent having a number average molecular weight of from 400 to 2500;

(d) the reaction product of a carboxylic acid-derived acylating agent and hydrazine;

(e) a salt formed by the reaction of a carboxylic acid with di-n-butylamine or tri-n-butylamine; and

(f) the reaction product of a hydrocarbyl-substituted dicarboxylic acid or anhydride and an amine compound or salt which product comprises at least one amino triazole group;

wherein the fuel composition comprises at least 1 vol% of a biodiesel component and at least 10 vol% of a renewable diesel component.

3. A fuel composition comprising a renewable diesel component, a biodiesel component and least one nitrogen-containing detergent; wherein the fuel composition has a reduced filter blocking tendency compared with an otherwise identical fuel composition which does not comprise the nitrogen-containing detergent and has a tendency to block filters;

wherein the at least one nitrogen-containing detergent is selected from one or more of:

(a) a quaternary ammonium salt, wherein the quaternary ammonium salt is the reaction product of a compound including a tertiary amine group and a quaternising agent selected from esters of a carboxylic acid, dialkyl sulfates, benzyl halides, hydrocarbyl substituted carbonates, hydrocarbyl substituted epoxides optionally in combination with an acid, alkyl halides, alkyl sulfonates, sultones, hydrocarbyl substituted phosphates, hydrocarbyl substituted borates, alkyl nitrites, alkyl nitrates, hydroxides, N-oxides, chloroacetic acid or salts thereof, or mixtures thereof;

(b) the reaction product of a polyisobutene-substituted succinic acid or succinic anhydride and a polyethylene polyamine selected from ethylenediamine, diethylenetriamine, triethylenetetramine, tetraethylenepentamine, pentaethylenehexamine, hexaethylene-heptamine and mixtures and isomers thereof; wherein polyisobutene substituent has a number average molecular weight of between 500 and 2000;

(c) the product of a Mannich reaction between an aldehyde, an amine and a phenol which is mono-substituted with a hydrocarbyl substituent having 4 to 28 carbon atoms, or a polyisobutenyl substituent having a number average molecular weight of from 400 to 2500;

(d) the reaction product of a carboxylic acid-derived acylating agent and hydrazine;

(e) a salt formed by the reaction of a carboxylic acid with di-n-butylamine or tri-n-butylamine; and

(f) the reaction product of a hydrocarbyl-substituted dicarboxylic acid or anhydride and an amine compound or salt which product comprises at least one amino triazole group;

wherein the fuel composition comprises at least 1 vol% of a biodiesel component and at least 10 vol% of a renewable diesel component.

4. A use, method or composition according to any preceding claim wherein the fuel composition comprises from 1 to 40 vol% (preferably from 5 to 35 vol%) of a biodiesel component and from 60 to 99 vol% (preferably from 65 to 95 vol%) of a renewable diesel component.

5. A use, method or composition according to any preceding claim wherein the at least one nitrogen-containing detergent comprises a quaternary ammonium salt.

6. A use, method or composition according to claim 5 wherein the compound including at least one tertiary amine group is selected from:

(i) the reaction product of a hydrocarbyl-substituted acylating agent and a compound comprising at least one tertiary amine group and a primary amine, secondary amine or alcohol group;

(ii) a Mannich reaction product comprising a tertiary amine group;

(iii) a polyalkylene substituted amine having at least one tertiary amine group; and

(iv) an alkylamine (such as a tertiary alkylamine), an alkyl alkanolamine (such as dimethylethanolamine) and an alkanolamine.

7. A use, method or composition according to any of claim 5 or claim 6 wherein the quaternary ammonium salt is the quaternised reaction product of a hydrocarbyl substituted succinic acid derived acylating agent and a compound able to react with said acylating agent and which includes a tertiary amine group.

8. A use, method or composition according to any of claims 5 to 7 wherein the quaternary ammonium salt is formed by reacting methyl salicylate, dimethyl oxalate or propylene oxide optionally in combination with an acid with the reaction product of a polyisobutylene-substituted succinic anhydride having a PIB molecular weight of 700 to 1300 and dimethylaminopropylamine.

9. A use, method or composition according to claim 6 or claim 7 wherein the quaternary ammonium salt is formed by reacting chloroacetic acid or a salt thereof with the reaction product of oleic acid or a reactive derivative thereof and dimethylaminopropylamine.

10. A use, method or composition according to any of claims 1 to 4 wherein the at least one nitrogen-containing detergent comprises the product of a Mannich reaction between an aldehyde, an amine and a substituted phenol.

11. A use, method or composition according to claim 10 wherein the Mannich reaction product is the reaction product of formaldehyde, a polyethylene polyamine and a para-substituted monoalkyl phenol.

12. A use, method or composition according to any preceding claim which provides an improved filter blocking tendency as measured by the Canadian Cold Soak Filter Blocking Tendency test CAN/CGSB-3.0 No. 142.0-2019.