

MARINE ENGINE LUBRICATION

FIELD OF THE INVENTION

This invention relates to a trunk piston marine engine lubricating composition for a medium-speed four-stroke compression-ignited (diesel) marine engine and lubrication of such an engine.

BACKGROUND OF THE INVENTION

Marine trunk piston engines generally use Heavy Fuel Oil ('HFO') for offshore running. Heavy Fuel Oil is the heaviest fraction of petroleum distillate and comprises a complex mixture of molecules including up to 15% of asphaltenes, defined as the fraction of petroleum distillate that is insoluble in an excess of aliphatic hydrocarbon (e.g. heptane) but which is soluble in aromatic solvents (e.g. toluene). Asphaltenes can enter the engine lubricant as contaminants either via the cylinder or the fuel pumps and injectors, and asphaltene precipitation can then occur, manifested in 'black paint' or 'black sludge' in the engine. The presence of such carbonaceous deposits on a piston surface can act as an insulating layer which can result in the formation of cracks that then propagate through the piston. If a crack travels through the piston, hot combustion gases can enter the crankcase, possibly resulting in a crankcase explosion.

It is therefore highly desirable that trunk piston engine oils ('TPEO's) prevent or inhibit asphaltene precipitation. The prior art describes ways of doing this.

WO 96/26995 ('995) discloses the use of a hydrocarbyl-substituted phenol to reduce 'black paint' in a diesel engine. Specifically, it mentions a lubricating oil for lubricating a medium-speed 4-stroke diesel engine, such oils also being known in the art as TPEO's. It mentions use of alkyl phenols to reduce black paint formation in use of such oils with fuel oils with a residual oil content, also known in the art as HFO's. '995 further mentions that the lubricating oil may contain detergents such as hydrocarbyl-substituted alkaline earth metal phenates, salicylates, naphthenates, sulphonates or carboxylates, which may be normal or overbased.

'995 also mentions that the lubricating oil has a TBN of 8-50, provided by adjusting the amount of detergent, for use in a 4-stroke engine, and 0.5 to 10% by weight of the phenol. Its examples describe sediments tests on TPEO's of 30 TBN containing a calcium phenate detergent and either no or varying amounts of a branched chain alkyl phenol.

'995 is not, however, concerned with the economics of treating TPEO's to inhibit 'black paint' formation. A considerable cost arises from the amount of detergent soap that is used, i.e. the detergent other than the basic material. It is now found that, when the detergent is a salicylate, there is a relationship between 'black paint' reducing performance and the respective concentrations of salicylate soap and of alkyl phenol. This relationship is such that the level of soap may be reduced, and cost reduced, without any deleterious effect on 'black paint' reducing performance.

WO 2010/124859 describes trunk piston marine engine lubrication where, to prevent or inhibit asphaltene precipitation, the lubricant comprises a Group II basestock and respective minor amounts of an overbased metal salicylate detergent and an alkyl-substituted phenol, other than a hindered phenol.

SUMMARY OF THE INVENTION

The following are now found when a salicylate detergent/alkyl phenol system is used in TPEO's in attempting to reduce or eliminate 'black paint'. When the salicylate soap concentration is high, addition of alkyl phenol does not substantially affect performance. However, when the salicylate soap level is lower, additions of low levels of alkyl phenol, for example below those stated in '995 to be preferred (i.e. 2.0% by weight) and even below those stated generally in '995 (i.e. 0.5% by weight), are found to improve performance.

A first aspect of the invention is a trunk piston marine engine lubricating oil composition of TBN in the range of 20 to 60, such as, 30 to 55, for improving asphaltene handling in use thereof, in operation of the engine when fuelled by a heavy fuel oil, which composition comprises or is made by admixing an oil of lubricating viscosity, in a major amount, containing 50 mass % or more of a Group 1 basestock, and, in respective minor amounts:

- (A) an overbased calcium alkyl salicylate detergent providing 40 to 90, such as, 50 to 85, mmol of calcium alkyl salicylate per kg of the composition, as determined by titration; and
- (B) 0.1 to 10, such as 0.1 to less than 2.0, for example to 1.5, mass % active ingredient, based on the mass of the composition, of an oil-soluble linear (straight chain) alkyl-substituted phenol.

A second aspect of the invention is the use of a detergent (A) in combination with a component (B) as defined in, and in the amounts stated in, the first aspect of the invention in a trunk piston marine lubricating oil composition of TBN in the range of 20 to 60, such as, 30 to 55, for a medium-speed compression-ignited marine engine, which composition comprises an oil of lubricating viscosity in a major amount and contains 50 mass % or more of a Group 1 basestock, to improve asphaltene handling during operation of the engine, fueled by a heavy fuel oil and its lubrication by the composition.

A third aspect of the invention is a method of operating a trunk piston medium-speed compression-ignited marine engine comprising

- (i) fueling the engine with a heavy fuel oil; and
- (ii) lubricating the crankcase of the engine with a composition as defined in the first aspect of the invention.

A fourth aspect of the invention is a method of dispersing asphaltenes in a trunk piston marine lubricating oil composition during its lubrication of surfaces of the combustion chamber of a medium-speed compression-ignited marine engine and operation of the engine, which method comprises

- (i) providing a composition as defined in the first aspect of the invention;
- (ii) providing the composition in the combustion chamber;
- (iii) providing heavy fuel oil in the combustion chamber; and

(iv) combusting the heavy fuel oil in the combustion chamber.

In this specification, the following words and expressions, if and when used, have the meanings ascribed below:

“active ingredients” or “(a.i.)” refers to additive material that is not diluent or solvent;

“comprising” or any cognate word specifies the presence of stated features, steps, or integers or components, but does not preclude the presence or addition of one or more other features, steps, integers, components or groups thereof; the expressions “consists of” or “consists essentially of” or cognates may be embraced within “comprises” or cognates, wherein “consists essentially of” permits inclusion of substances not materially affecting the characteristics of the composition to which it applies;

“major amount” means 50 mass % or more of a composition; -

“minor amount” means less than 50 mass % of a composition;

“TBN” means total base number as measured by ASTM D2896.

Furthermore in this specification, if and when used:

“calcium content” is as measured by ASTM 4951;

“phosphorus content” is as measured by ASTM D5185;

“sulphated ash content” is as measured by ASTM D874;

“sulphur content” is as measured by ASTM D2622;

“KV100” means kinematic viscosity at 100°C as measured by ASTM D445.

Also, it will be understood that various components used, essential as well as optimal and customary, may react under conditions of formulation, storage or use and that the invention also provides the product obtainable or obtained as a result of any such reaction.

Further, it is understood that any upper and lower quantity, range and ratio limits set forth herein may be independently combined.

DETAILED DESCRIPTION OF THE INVENTION

The features of the invention will now be discussed in more detail below.

OIL OF LUBRICATING VISCOSITY

The lubricating oils may range in viscosity from light distillate mineral oils to heavy lubricating oils. Generally, the viscosity of the oil ranges from 2 to 40 mm²/sec, as measured at 100°C.

Natural oils include animal oils and vegetable oils (e.g., castor oil, lard oil); liquid petroleum oils and hydrorefined, solvent-treated or acid-treated mineral oils of the paraffinic, naphthenic and mixed paraffinic-naphthenic types. Oils of lubricating viscosity derived from coal or shale also serve as useful base oils.

Synthetic lubricating oils include hydrocarbon oils and halo-substituted hydrocarbon oils such as polymerized and interpolymerized olefins (e.g., polybutylenes, polypropylenes, propylene-isobutylene copolymers, chlorinated polybutylenes, poly(1-hexenes), poly(1-octenes), poly(1-decenes)); alkybenzenes (e.g., dodecylbenzenes, tetradecylbenzenes, dinonylbenzenes, di(2-ethylhexyl)benzenes); polyphenyls (e.g., biphenyls, terphenyls, alkylated polyphenols); and alkylated diphenyl ethers and alkylated diphenyl sulphides and derivative, analogues and homologues thereof.

Alkylene oxide polymers and interpolymers and derivatives thereof where the terminal hydroxyl groups have been modified by esterification, etherification, etc., constitute another class of known synthetic lubricating oils. These are exemplified by polyoxyalkylene polymers prepared by polymerization of ethylene oxide or propylene oxide, and the alkyl and

aryl ethers of polyoxyalkylene polymers (e.g., methyl-polyiso-propylene glycol ether having a molecular weight of 1000 or diphenyl ether of poly-ethylene glycol having a molecular weight of 1000 to 1500); and mono- and polycarboxylic esters thereof, for example, the acetic acid esters, mixed C₃-C₈ fatty acid esters and C₁₃ oxo acid diester of tetraethylene glycol.

Another suitable class of synthetic lubricating oils comprises the esters of dicarboxylic acids (e.g., phthalic acid, succinic acid, alkyl succinic acids and alkenyl succinic acids, maleic acid, azelaic acid, suberic acid, sebacic acid, fumaric acid, adipic acid, linoleic acid dimer, malonic acid, alkylmalonic acids, alkenyl malonic acids) with a variety of alcohols (e.g., butyl alcohol, hexyl alcohol, dodecyl alcohol, 2-ethylhexyl alcohol, ethylene glycol, diethylene glycol monoether, propylene glycol). Specific examples of such esters includes dibutyl adipate, di(2-ethylhexyl) sebacate, di-n-hexyl fumarate, dioctyl sebacate, diisooctyl azelate, diisodecyl azelate, dioctyl phthalate, didecyl phthalate, dieicosyl sebacate, the 2-ethylhexyl diester of linoleic acid dimer, and the complex ester formed by reacting one mole of sebacic acid with two moles of tetraethylene glycol and two moles of 2-ethylhexanoic acid.

Esters useful as synthetic oils also include those made from C₅ to C₁₂ monocarboxylic acids and polyols and polyol esters such as neopentyl glycol, trimethylolpropane, pentaerythritol, dipentaerythritol and tripentaerythritol.

Silicon-based oils such as the polyalkyl-, polyaryl-, polyalkoxy- or polyaryloxysilicone oils and silicate oils comprise another useful class of synthetic lubricants; such oils include tetraethyl silicate, tetraisopropyl silicate, tetra-(2-ethylhexyl)silicate, tetra-(4-methyl-2-ethylhexyl)silicate, tetra-(p-tert-butyl-phenyl) silicate, hexa-(4-methyl-2-ethylhexyl)disiloxane, poly(methyl)siloxanes and poly(methylphenyl)siloxanes. Other synthetic lubricating oils include liquid esters of phosphorus-containing acids (e.g., tricresyl phosphate, trioctyl phosphate, diethyl ester of decylphosphonic acid) and polymeric tetrahydrofurans.

Unrefined, refined and re-refined oils can be used in lubricants of the present invention. Unrefined oils are those obtained directly from a natural or synthetic source without further purification treatment. For example, a shale oil obtained directly from retorting operations; petroleum oil obtained directly from distillation; or ester oil obtained directly from esterification and used without further treatment, are unrefined oils. Refined

oils are similar to unrefined oils except that the oil is further treated in one or more purification steps to improve one or more properties. Many such purification techniques, such as distillation, solvent extraction, acid or base extraction, filtration and percolation, are known to those skilled in the art. Re-refined oils are obtained by processes similar to those used to provide refined oils but begin with oil that has already been used in service. Such re-refined oils are also known as reclaimed or reprocessed oils and are often subjected to additional processing using techniques for removing spent additives and oil breakdown products.

The American Petroleum Institute (API) publication "Engine Oil Licensing and Certification System", Industry Services Department, Fourteenth Edition, December 1996, Addendum 1, December 1998 categorizes Group 1 base stocks as follows:

Group I base stocks contain less than 90 percent saturates and/or greater than 0.03 percent sulphur and have a viscosity index greater than or equal to 80 and less than 120 using the test methods specified in Table E-1.

Analytical Methods for Base Stock are tabulated below:

PROPERTY	TEST METHOD
Saturates	ASTM D 2007
Viscosity Index	ASTM D 2270
Sulphur	ASTM D 2622
	ASTM D 4294
	ASTM D 4927
	ASTM D 3120

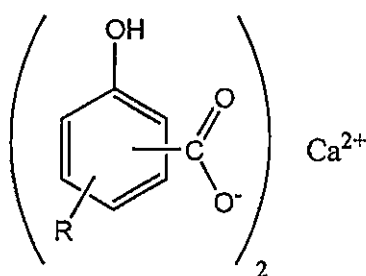
As stated, the oil of lubricating viscosity in this invention contains 50 mass % or more of the defined basestock or a mixture thereof. Preferably, it contains 60, such as 70, 80 or 90, mass % or more of the defined basestock or a mixture thereof. The oil of lubricating viscosity may be substantially all the defined basestock or a mixture thereof.

OVERBASED CALCIUM ALKYL SALICYLATE DETERGENT (A)

A metal detergent is an additive based on so-called metal "soaps", that is metal salts of acidic organic compounds, sometimes referred to as surfactants. They generally comprise a polar head with a long hydrophobic tail. Overbased metal detergents, which comprise neutralized metal detergents as the outer layer of a metal base (e.g. carbonate) micelle, may be provided by including large amounts of metal base by reacting an excess of a metal base, such as an oxide or hydroxide, with an acidic gas such as carbon dioxide.

In the present invention, (A) are overbased calcium alkyl-substituted salicylates.

The overbased detergent typically has the structure shown:



wherein R is a linear alkyl group. There may be more than one R group attached to the benzene ring. The COO⁻ group can be in the ortho, meta or para position with respect to the hydroxyl group; the ortho position is preferred. The R group can be in the ortho, meta or para position with respect to the hydroxyl group.

Salicylic acids are typically prepared by the carboxylation, by the Kolbe-Schmitt process, of phenoxides, and in that case, will generally be obtained (normally in a diluent) in admixture with uncarboxylated phenol. Salicylic acids may be non-sulphurized or sulphurized, and may be chemically modified and/or contain additional substituents. Processes for sulphurizing an alkyl salicylic acid are well known to those skilled in the art, and are described, for example, in US 2007/0027057.

The alkyl groups advantageously contain 5 to 100, preferably 9 to 30, especially 14 to 24, carbon atoms.

The term "overbased" is generally used to describe metal detergents in which the ratio of the number of equivalents of the metal moiety to the number of equivalents of the acid

moiety is greater than one. The term 'low-based' is used to describe metal detergents in which the equivalent ratio of metal moiety to acid moiety is greater than 1, and up to about 2.

By an "overbased calcium salt of surfactants" is meant an overbased detergent in which the metal cations of the oil-insoluble metal salt are essentially calcium cations. Small amounts of other cations may be present in the oil-insoluble metal salt, but typically at least 80, more typically at least 90, for example at least 95, mole %, of the cations in the oil-insoluble metal salt, are calcium ions. Cations other than calcium may be derived, for example, from the use in the manufacture of the overbased detergent of a surfactant salt in which the cation is a metal other than calcium. Preferably, the metal salt of the surfactant is also calcium.

Carbonated overbased metal detergents typically comprise amorphous nanoparticles. Additionally, there are disclosures of nanoparticulate materials comprising carbonate in the crystalline calcite and vaterite forms.

The basicity of the detergents may be expressed as a total base number (TBN). A total base number is the amount of acid needed to neutralize all of the basicity of the overbased material. The TBN may be measured using ASTM standard D2896 or an equivalent procedure. The detergent may have a low TBN (i.e. a TBN of less than 50), a medium TBN (i.e. a TBN of 50 to 150) or a high TBN (i.e. a TBN of greater than 150, such as 150-500).

As stated, 40-90, such as, 50-85, mmol of calcium alkyl salicylate per kg of the composition is provided, the values being determined by titration. Preferably, the values are in the range of 50-80, more preferably 50-70, mmol/kg.

LINEAR ALKYL-SUBSTITUTED PHENOL (B)

As stated, the phenol constitutes 0.1 to 10, preferably 0.1 to less than 2.0, such as 0.1 to 1.5, mass % of the mass of the composition. Also, it may constitute from 0.1 or from 0.25 to less than 0.5, mass % of the mass of the composition. It may be present in the range of 0.2 or 0.25 to 5 or 10 mass %.

The alkyl substitution in (B) may be mono, for example by way of a straight chain alkyl group having from 9 to 30, preferably 14 to 24, carbon atoms.

As an example of alkylphenol (B) there may be mentioned an alkyl benzenol where the alkyl substitution is, for example, in the 2-position or in the 4-position.

(A) and (B) may be provided for the purpose of the invention by blending them together, or, they may be provided individually.

CO-ADDITIVES

The lubricating oil composition of the invention may comprise further additives, different from and additional to (A) and (B). Such additional additives may, for example include ashless dispersants, other metal detergents, anti-wear agents such as zinc dihydrocarbyl dithiophosphates, anti-oxidants and demulsifiers. In some cases, an ashless dispersant need not be provided.

It may be desirable, although not essential, to prepare one or more additive packages or concentrates comprising the additives, whereby additives (A) and (B) can be added simultaneously to the base oil to form the lubricating oil composition. Dissolution of the additive package(s) into the lubricating oil may be facilitated by solvents and by mixing accompanied with mild heating, but this is not essential. The additive package(s) will typically be formulated to contain the additive(s) in proper amounts to provide the desired concentration, and/or to carry out the intended function in the final formulation when the additive package(s) is/are combined with a predetermined amount of base lubricant. Thus, additives (A) and (B), in accordance with the present invention, may be admixed with small amounts of base oil or other compatible solvents together with other desirable additives to form additive packages containing active ingredients in an amount, based on the additive package, of, for example, from 2.5 to 90, preferably from 5 to 75, most preferably from 8 to 60, mass % of additives in the appropriate proportions, the remainder being base oil.

The final formulations as a trunk piston engine oil may typically contain 30, preferably 10 to 28, more preferably 12 to 24, mass % of the additive package(s), the remainder being base oil. The trunk piston engine oil has a compositional TBN (using ASTM

D2896) of 20 to 60, such as, 30 to 55. For example, it may be 40 to 55 or 35 to 50. When the TBN is high, for example 45-55, the concentration of (A) may be high such as up to 80 mmol/kg. When the TBN is lower, for example 30 to below 45, the concentration of (A) may be low such as up to 70 mmol/kg.

EXAMPLES

The present invention is illustrated by but in no way limited to the following examples.

COMPONENTS

The following components were used:

Component (A): one or more calcium alkyl salicylate detergents having basicity indices of 3-6

Component (B): a mixed 2- and 4- (linear C16 alkyl) benzenol (2:1)

Base oil I: solvent-extracted API Group I base oil

HFO: a heavy fuel oil (ISO-F-RMK 380)

LUBRICANTS

Selections of the above components were blended to give a range of trunk piston marine engine lubricants. Some of the lubricants are examples of the invention; others are reference examples for comparison purposes. The compositions of the lubricants tested when each contained HFO are shown in the tables below under the "Results" heading.

TESTING

Light Scattering

Test lubricants were evaluated for asphaltene dispersancy using light scattering according to the Focused Beam Reflectance Method ("FBRM"), which predicts asphaltene agglomeration and hence 'black sludge' formation.

The FBRM test method was disclosed at the 7th International Symposium on Marine Engineering, Tokyo, 24th - 28th October 2005, and was published in 'The Benefits of Salicylate Detergents in TPEO Applications with a Variety of Base Stocks', in the Conference Proceedings. Further details were disclosed at the CIMAC Congress, Vienna, 21st -24th May 2007 and published in "Meeting the Challenge of New Base Fluids for the Lubrication of Medium Speed Marine Engines – An Additive Approach" in the Congress Proceedings. In the latter paper it is disclosed that by using the FBRM method it is possible to obtain quantitative results for asphaltene dispersancy that predict performance for lubricant systems based on base stocks containing greater than or less than 90% saturates, and greater than or less than 0.03% sulphur. The predictions of relative performance obtained from FBRM were confirmed by engine tests in marine diesel engines.

The FBRM probe contains fibre optic cables through which laser light travels to reach the probe tip. At the tip, an optic focuses the laser light to a small spot. The optic is rotated so that the focussed beam scans a circular path between the window of the probe and the sample. As particles flow past the window, they intersect the scanning path, giving backscattered light from the individual particles.

The scanning laser beam travels much faster than the particles; this means that the particles are effectively stationary. As the focussed beam reaches one edge of the particle the amount of backscattered light increases; the amount will decrease when the focussed beam reaches the other edge of the particle.

The instrument measures the time of the increased backscatter. The time period of backscatter from one particle is multiplied by the scan speed and the result is a distance or chord length. A chord length is a straight line between any two points on the edge of a particle. This is represented as a chord length distribution, a graph of numbers of chord lengths (particles) measured as a function of the chord length dimensions in microns. As the measurements are performed in real time, the statistics of a distribution can be calculated and tracked. FBRM typically measures tens of thousands of chords per second, resulting in a

robust number-by-chord length distribution. The method gives an absolute measure of the particle size distribution of the asphaltene particles.

The Focused beam Reflectance Probe (FBRM), model Lasentec D600L, was supplied by Mettler Toledo, Leicester, UK. The instrument was used in a configuration to give a particle size resolution of 1 μm to 1mm. Data from FBRM can be presented in several ways. Studies have suggested that the average counts per second can be used as a quantitative determination of asphaltene dispersancy. This value is a function of both the average size and level of agglomerate. In this application, the average count rate (over the entire size range) was monitored using a measurement time of 1 second per sample.

The test lubricant formulations were heated to 60°C and stirred at 400rpm; when the temperature reached 60°C the FBRM probe was inserted into the sample and measurements made for 15 minutes. An aliquot of heavy fuel oil (10% w/w) was introduced into the lubricant formulation under stirring using a four blade stirrer (at 400 rpm). A value for the average counts per second was taken when the count rate had reached an equilibrium value (typically overnight).

RESULTS

Light Scattering

The results of the FBRM tests are summarized in TABLES 1, 2 and 3 below, where lower particle count indicates better performance.

Comparative examples are designated "Ref" and examples of the invention designated by a number alone.

TABLE 1

Ex	Soap (mmol/kg)	Phenol (mass %)	Particle Counts
Ref 1	80	-	15.78
Ref 2	80	1.5	13.58
Ref 3	80	3.0	14.83
Ref 4	70	-	37.68
1	70	1.5	12.25
2	70	3.0	11.96
Ref 5	60	-	136.96
3	60	1.5	15.31
4	60	3.0	12.4

Ref 1, Ref 2 and Ref 3 show that, at high soap levels, the presence or absence of the phenol has little effect on performance. At lower soap levels (Ref 4; 1, 2; and Ref 5, 3, 4), the absence of phenol gives poor results, but performance is restored to about those at 80 mmol/kg (i.e. Ref 1, Ref 2 and Ref 3) when phenol is present.

TABLE 2

Ex	Soap (mmol/kg)	Phenol (mass %)	Particle Counts
Ref 6	80	-	18.82
Ref 7	70	-	22.23
Ref 8	60	-	77.16
5	60	0.25	47.42
6	60	0.5	43.38
7	60	1.0	34.48

Ref 6, Ref 7, Ref 8 show that, in the absence of phenol, performance deteriorates as soap level decreases. 5, 6, 7 show that, at a low soap level of 60 mmol/kg, performance is improved by progressive additions of phenol.

TABLE 3

These results are obtained using a higher asphaltene content heavy fuel oil, which is accordingly more difficult to treat.

Ex	Soap (mmol/kg)	Phenol (mass %)	Particle Counts
Ref 9	80	-	517
Ref 10	70	-	1675
Ref 11	60	-	3916
8	60	0.25	3043
9	60	0.5	1926
10	60	1.0	1896

The same trend as in Table 2 is shown, but less exaggerated. Ref 9, Ref 10, Ref 11 show that, in the absence of phenol, performance deteriorates with decreasing soap level. 8, 9 and 10 show that, at a low soap level of 60 mmol/kg, performance is partly restored by progressive additions of phenol.

CLAIMS

1. A trunk piston marine engine lubricating oil composition of TBN in the range of 20 to 60, such as, 30 to 55, for improving asphaltene handling in use thereof, in operation of the engine when fuelled by a heavy fuel oil, which composition comprises or is made by admixing an oil of lubricating viscosity, in a major amount, containing 50 mass % or more of a Group 1 basestock, and, in respective minor amounts:
 - (A) an overbased calcium alkyl salicylate detergent providing 40 to 70 mmol of calcium alkyl salicylate per kg of the composition, as determined by titration; and
 - (B) 0.1 to 5 mass % active ingredient based on the mass of the composition, of an oil-soluble linear (straight chain) alkyl-substituted phenol.
2. The composition as claimed in claim 1 wherein (A) provides 50 to 80, such as 50 to 70, mmol of calcium alkyl salicylate per kg of the composition.
3. The composition as claimed in claim 1 or 2 wherein the alkyl substitution in (B) is monosubstitution by way of a straight chain alkyl group having 9 to 30 carbon atoms.
4. The composition as claimed in any of claims 1 to 3 wherein (B) is an alkylbenzenol.
5. The composition as claimed in claim 4 wherein alkyl-substitution in the benzenol is in the 2-position or in the 4-position.
6. The composition as claimed in any of claims 1 to 5 wherein (B) is present in the range of 0.1, or of 0.25, to less than 0.5 mass % of the mass of the composition.
7. The composition as claimed in any of claims 1 to 5 wherein (B) is present in the range of 0.2, or of 0.25, to 5, or to 10, mass % of the mass of the composition.

8. The composition as claimed in any of claims 1 to 7 wherein (A) is C₉ to C₃₀ alkyl-substituted.
9. The composition as claimed in any of claims 1 to 8 having a TBN in the range of 40 to 55, or 35 to 50.
10. The composition as claimed in any of claims 1 to 9 having a TBN of 45 to 55 when (A) provides up to 80 mmol of calcium alkyl salicylate per kg of the composition.
11. The composition as claimed in any of claims 1 to 9 having a TBN from 30 to less than 45 when (A) provides up to 70 mmol of calcium alkyl salicylate per kg of the composition.
12. The composition as claimed in any of claims 1 to 11 with a heavy fuel oil content.
13. A method of operating a trunk piston medium-speed compression-ignited marine engine comprising
 - (i) fueling the engine with a heavy fuel oil; and
 - (ii) lubricating the crankcase of the engine with a composition as defined in any of claims 1 to 12.
14. A method of dispersing asphaltenes in a trunk piston marine lubricating oil composition during its lubrication of surfaces of the combustion chamber of a medium-speed compression-ignited marine engine and operation of the engine, which method comprises
 - (i) providing a composition as defined in any of claims 1 to 12:
 - (ii) providing the composition in the combustion chamber;
 - (iii) providing heavy fuel oil in the combustion chamber; and

- (v) combusting the heavy fuel oil in the combustion chamber.
15. The use of detergent(s) (A) in combination with component (B) as defined in and in the amounts stated in any of claims 1 to 12 in a trunk piston marine lubricating oil composition of TBN in the range of 20 to 60, such as, 30 to 55, for a medium-speed compression-ignited marine engine, which composition comprises an oil of lubricating viscosity in a major amount and contains 50 mass % or more of a Group 1 basestock, to improve asphaltene handling during operation of the engine, fueled by a heavy fuel oil, and its lubrication by the composition.