

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11)

EP 0 978 554 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
17.12.2003 Bulletin 2003/51

(51) Int Cl.7: **C10M 101/02**, C10M 169/04

(21) Application number: **99305884.1**

(22) Date of filing: **26.07.1999**

(54) **Turbine and R&O oils containing neutral rust inhibitors**

Neutrale Rostinhibitore enthaltende Turbin- und R&O-Öle

Huiles de turbine ou R&O comprenant des inhibiteurs de rouille neutre

(84) Designated Contracting States:
BE DE FR GB

(30) Priority: **04.08.1998 GB 9816951**

(43) Date of publication of application:
09.02.2000 Bulletin 2000/06

(73) Proprietor: **ETHYL PETROLEUM ADDITIVES
LIMITED**
Bracknell, Berkshire RG12 2UW (GB)

(72) Inventors:
• **Walters, David Kenvyn**
Camberley, Surrey GU46 7TR (GB)

• **Ryan, Helen Theresa**
London W6 8NL (GB)

(74) Representative: **Cresswell, Thomas Anthony**
J.A. KEMP & CO.
14 South Square
Gray's Inn
London WC1R 5JJ (GB)

(56) References cited:
EP-A- 0 259 809 **EP-A- 0 393 732**
EP-A- 0 776 964 **EP-A- 0 799 883**
US-A- 2 971 912 **US-A- 4 101 429**
US-A- 5 089 157

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 0 978 554 B1

Description

[0001] The present invention relates to turbine and rust and oxidation (R&O) oils (hereinafter "turbine oils") having improved wet filterability without detriment to hydrolytic stability.

[0002] Steam and gas turbine oils are top-quality rust- and oxidation-inhibited oils. Steam turbines employ steam that enters the turbine at high temperature and pressure and expands across both rotating and fixed blades. Only the highest-quality lubricants are able to withstand the wet conditions, high temperatures and long periods of service associated with steam turbine operation. In gas turbines, they must withstand contact with very hot surfaces, often with intermittent operation and periods of nonuse. Therefore, to be effective, both types of oil must have, in addition to good corrosion protection and demulsibility, outstanding resistance to oxidation, which includes a minimum tendency to form deposits in critical areas of the system.

[0003] To achieve these desired properties, it is necessary to formulate these oils from specially refined base stocks of the highest quality plus a carefully balanced additive package. The nature of these fluids makes them very susceptible to contamination, particularly from other lubricants and additives. A relatively small degree of contamination can markedly affect the properties and expected service life of these lubricants. Further, to maintain effective operating conditions and to avoid damaging the equipment in which they are used, turbine oils should be kept meticulously clean and free of contaminants. Contamination is minimized by filtration of the turbine oils. To ensure that the turbine oils are substantially free of contaminants very fine filters are used.

[0004] Due to the requirements of turbine oils, only a few classes of additives, relative to other types of lubricating compositions, are combined with the base oils. Generally, a finished turbine oil will contain only the base oil, antioxidants, rust inhibitors, demulsifiers, corrosion inhibitors and diluents, if necessary.

[0005] Prior art turbine oils contain acidic rust inhibitors. For example, acidic rust inhibitors, of the type taught in U. S. Patent No. 4,101,429, have been used in turbine oils. Although, turbine oils containing acidic rust inhibitors exhibit satisfactory rust performance, they tend to interact with, for example, water and metal detergents present as contaminants producing particulates, precipitates and/or sludge. Acidic rust inhibitors thus create problems with deposit formation and filterability upon exposure to contaminants such as water and/or metal detergents. The resulting filterability problems and deposit formation are expensive and highly undesirable.

[0006] US-A-2971912 discloses antioxidants for use in synthetic-ester lubricants suitable for use in gas turbines. EP-A-776964 discloses ZDDP-containing hydraulic fluids, which exhibit improved wet-filterability.

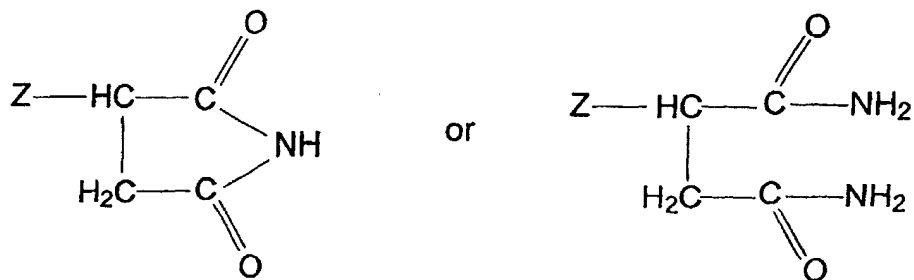
[0007] It is an object of this invention to provide turbine oils that exhibit good rust performance as well as good wet filterability and good thermal stability upon exposure to contaminants such as water and/or detergents. This objective is attained, in one embodiment of the present invention, by the use of specific neutral rust inhibitors, in place of acidic rust inhibitors, in preparing the finished turbine oils. The term "neutral rust inhibitors", in the present specification, means rust inhibitors that are essentially free of a -COOH functional group.

[0008] Accordingly, the present invention provides a composition which is suitable for use as a turbine or rust and oxidation (R&O) oil and which is substantially free of acidic rust inhibitor, which composition comprises:

(a) a major portion of a hydro-processed mineral oil which has a viscosity index of greater than 80, a saturates content of greater than 90 wt% and a sulfur content of 0.5 wt% or less;

(b) at least 0.10 wt% of at least one neutral rust inhibitor, which is a hydrocarbyl ester of formula $R(\text{COOR}')_n$, in which R and R' are each independently hydrocarbyl groups or hydroxyhydrocarbyl groups containing up to 40 carbon atoms, and n is from 1 to 4; and

(c) a compound (B) of formula:



in which Z is a group $\text{R}_1\text{R}_2\text{CH}-$, in which R_1 and R_2 are each independently hydrocarbyl groups containing up to 34 carbon atoms, the total number of carbon atoms in the groups R_1 and R_2 being from 11 to 35.

[0009] Those skilled in the art will appreciate that the mineral oils used in the present invention are commonly referred to as Group II, Group III oils. The viscosity index is assessed in accordance with IP 226. The saturates and sulfur content are assessed by mass spectroanalysis.

[0010] The term "major portion" means that the composition contains at least 50% by weight base oil.

[0011] The turbine oils of the present invention have good rust performance, good wet filterability and good performance in thermal stability tests where water and/or metal detergents are present, e.g. the ASTM D 2619 and ASTM D 4310 tests.

[0012] Unless otherwise stated all hydrocarbyl groups and moieties may be straight- or branched-chain.

[0013] In another embodiment of the present invention, turbine oils are produced which are substantially free of metal detergents. For purposes of the present invention, the term "substantially free" means that no acidic rust inhibitors or metal detergents are purposefully added to the finished oil although there may be some present due to contamination or as an impurity.

[0014] Preferably, R and R' in the at least one neutral rust inhibitor of formula $R(\text{COOR}')_n$ are each independently hydrocarbyl groups or hydroxyhydrocarbyl groups containing 8 to 20 carbon atoms.

[0015] It will be appreciated that the maximum number of groups COOR' which are present on the hydrocarbyl or hydroxyhydrocarbyl group R will vary depending on the number of carbon atoms in R. For example, if R is a hydrocarbyl group containing only one carbon atom, the maximum possible value of n will be 4. When R is a hydroxyhydrocarbyl group containing one carbon atom the maximum value of n will be 3.

[0016] The hydrocarbyl esters can be prepared by conventional esterification procedures from a suitable alcohol and an acid, acid halide, acid anhydride or mixtures thereof. Also, the esters of the invention can be prepared by conventional methods of transesterification. By "essentially free", it is meant that the starting acids, acid halides, acid anhydrides or mixtures thereof used in preparing the neutral rust inhibitors are reacted with an amount of alcohol sufficient to theoretically convert all of the -COOH groups to esters. Typically, the neutral rust inhibitor will have a TAN of less than 10mgKOH/g. Preferred esters include, but are not limited to, octyloleoyl malate, dioleoylmalate, pentaerythritol monooleate and glycerol monooleate.

[0017] In compound (B) the radical Z may be, for example, 1-methylpentadecyl, 1-propyltridecenyl, 1-pentyltridecenyl, 1-tridecenylpentadecenyl or 1-tetradecyleicosenyl. Preferably, the number of carbon atoms in the groups R_1 and R_2 is from 16 to 28 and more commonly 18 to 24. It is especially preferred that the total number of carbon atoms in R_1 and R_2 is 20 to 22. The preferred compound (B) is 3-C₁₈₋₂₄ alkenyl-2,5-pyrrolidindione, i.e. a compound in which the average number of carbon atoms in the alkenyl group is from 18 to 24.

[0018] In one aspect of the invention, the compound (B) has a titratable acid number (TAN) of 80 to 140 mgKOH/g, preferably 110mgKOH/g. The TAN is determined in accordance with ASTM D 664.

[0019] The compounds (B) are commercially available or may be made by the application or adaptation of known techniques (see for example EP-A-0389237).

[0020] Lubricating oils contemplated for use in this invention are hydro-processed mineral oils. Suitable lubricating oils include basestocks produced by hydrocracking (rather than solvent extracting) the aromatic and polar components of crude oil. In general, the lubricating oils will have a kinematic viscosity ranging from $1 \times 10^{-6} \text{ m}^2/\text{s}$ to $40 \times 10^{-6} \text{ m}^2/\text{s}$ (1 to 40 cSt) at 100°C.

[0021] The mineral oils useful in this invention include all common mineral oil base stocks. This would include oils that are naphthenic or paraffinic in chemical structure. They may be hydrotreated or hydro-refined, dewaxed by chilling or catalytic dewaxing processes, or hydrocracked. The mineral oil may be produced from natural crude sources or be composed of isomerized wax materials or residues of other refining processes.

[0022] Typically the mineral oils will have kinematic viscosities of from $2 \times 10^{-6} \text{ m}^2/\text{s}$ to $12 \times 10^{-6} \text{ m}^2/\text{s}$ (2 cSt to 12 cSt) at 100°C. The preferred mineral oils have kinematic viscosities of from $3 \times 10^{-6} \text{ m}^2/\text{s}$ to $10 \times 10^{-6} \text{ m}^2/\text{s}$ (3 to 10 cSt), and most preferred are those mineral oils with viscosities of $5 \times 10^{-6} \text{ m}^2/\text{s}$ to $9 \times 10^{-6} \text{ m}^2/\text{s}$ (5 to 9 cSt) at 100°C.

[0023] The base oils have a viscosity index (VI) of greater than 80, a saturates content of greater than 90 wt% and sulfur content of 0.5 wt% or less. In a preferred embodiment the oils have a sulfur content of 0.3 wt% or less, more preferably 0.1 wt% or less.

[0024] The turbine and R&O oils of the present invention may be prepared by simple blending of the various components with a suitable base oil.

[0025] For the sake of convenience, and in a preferred embodiment of the present invention, the additive component (s) used in practice of this invention may be provided as a concentrate for formulation into a turbine or R&O oil ready for use. Concentrates of the present invention containing both neutral rust inhibitor(s) and compound (B) tend to impart greater rust protection in the presence of sea water (ASTM D665B) than concentrates lacking the compound (B), and are typically added to the base oil at a treat rate of from 0.2 to 2%, for example, 0.3 to 2%, by weight based on the weight of the finished oil.

[0026] In the present invention, the neutral rust inhibitor(s) are generally present in the additive concentrate in an amount of from 10 to 60 percent by weight, based on the total weight of the concentrate, while compound (B) is generally

present in the additive concentrate in an amount of from 1 to 15 percent by weight. The concentrate may comprise, in addition to the additive components, a solvent or diluent for the additive components. The solvent or diluent should be miscible with and/or capable of dissolving in the turbine base oil to which the concentrate is to be added. Suitable solvents and diluents are well known. The solvent or diluent may be the turbine base oil itself. The concentrate may suitably include any of the conventional additives used in turbine oils. The proportions of each component of the concentrate are controlled by the intended degree of dilution.

[0027] Whether added directly to the base oil, or in the form of a concentrate, the neutral rust inhibitor(s) should be present in the finished oil in an amount of at least about 0.10, and preferably from 0.10 to 0.45 percent by weight. Whether added directly to the base oil, or in the form of a concentrate, compound (B) should be present in the finished oil in an amount of 0.008 to 0.25 percent by weight.

[0028] The additive concentrates and finished oils of the present invention may further contain additional additives such as phosphorus-containing additives and sulfurized esters. Preferred phosphorus containing additives include amine salts of acid phosphates and phosphorus and sulfur containing compounds.

[0029] Other additives commonly used in turbine and R&O oils may be included in the turbine and R&O oils of the present invention. These include antioxidants, demulsifiers and corrosion inhibitors. These additives, when present, are used in amounts conventionally used in turbine oil packages.

[0030] The invention will now be illustrated by the following Examples.

EXAMPLES

[0031] In Table 1, the formulations for various turbine oil concentrates are set forth. Turbine Oil Concentrate 1 represents a formulation within the scope of the present invention, i.e., it contains a neutral rust inhibitor and compound (B) and is substantially free of acidic rust inhibitor. Turbine Oil Concentrate 2 represents an additive concentrate outside of the scope of the present invention in that it contains an acidic rust inhibitor. All of the samples used similar conventional additives (e.g., antioxidants, demulsifiers and corrosion inhibitors) in similar amounts.

Table 1:

Turbine Oil Concentrates		
	Turbine Oil 1 (TO1)	Turbine Oil 2 (TO2) (Comparative)
Rust Inhibitor X	22.50	
Rust Inhibitor Z		12.00
Compound B	5.00	

RI X: Pentaerythritol monooleate neutral rust inhibitor.

RI Z: An acidic rust inhibitor comprising the reaction product of oleic acid, triethylene tetramine and maleic anhydride substituted by a C12 alkenyl group of the kind described in U.S. Patent No. 4,101,429.

Comp. B: 3-C₁₈₋₂₄ alkenyl-2,5-pyrrolidindione.

[0032] Turbine oils are prepared by adding additive concentrates as described above to base oils of various viscosities at a treat rate of 0.8 percent by weight. The base oil used was a hydro-processed (HP) mineral oils having a VI of at least 98, a saturates level of at least 98% and a sulfur content of less than 0.01 wt%. A solvent refined (SR) base oil was also used. The finished oils were tested for wet filterability using the Shell Filtration Test and for rust performance using the ASTM D 665B rust test.

[0033] The Shell Filtration Test is intended to evaluate the filterability characteristics of oil based hydraulic fluids with and without calcium and/or water contamination. The fluids as blended and the contaminated fluids are each tested in duplicate as follows. After pre-treatment at 70 °C, 300 ml of test oil are filtered through a 1.2 micron Millipore membrane using a 650 mm Hg vacuum. The fluid temperature is not controlled but should be in the range of 19 to 26 °C. The times for each successive 100 ml of fluid to filter, or for the filter membrane to block, are noted. In the following Tables the results of the Shell Filtration Test are indicated as either PASS, meaning that all 300 ml of oil passed through the filter, or FAIL, meaning that the filter became blocked.

[0034] The results of the Shell Filtration Test and the ASTM D 665B rust test are set forth below in Table 2.

Table 2:

Shell Filtration and ASTM D 665B Rust Test results			
Additive Concentrate	Base Oil - ISO #	Shell Filtration Test	D665B rust test
TO1	HP - 32	PASS	PASS
TO2	SR - 32	FAIL	PASS
TO2	SR- 46	FAIL	PASS
TO1	HP - 68	PASS	PASS
TO2	SR - 68	FAIL	PASS
TO1	HP -100	PASS	PASS

[0035] It is clear from the above Table that compositions of the present invention exhibit both passing Shell Filtration results and ASTM D 665B results. Further, it is clear from the above Table 2 that turbine oils (TO2) containing sufficient amounts of acidic rust inhibitor to pass the ASTM D 665B rust test fail the Shell Filtration Test.

[0036] In handling, i.e., storing and transporting, of turbine oils, the turbine oil often comes into contact with residual lubricating fluids containing acidic rust inhibitors and/or metal detergents or turbine oils containing acidic rust inhibitors. The turbine oils of the present invention enable passing Shell Filtration Test results upon contamination with these sources of acidic rust inhibitors and/or metal detergents.

[0037] For some applications, oxidation performance in the presence of water is desired along with acceptable rust test performance. Turbine oils containing components (A) and (B) of the present invention have been found to exhibit excellent thermal stability in tests with water present and passing rust test performance. ASTM D 4310 is used to determine the tendency of inhibited mineral oils, especially turbine oils, to form sludge during oxidation in the presence of oxygen, water, and copper and iron metals at an elevated temperature. In this test, an oil sample is reacted with oxygen in the presence of water and an iron-copper catalyst coil for 1000 hours. The oil is then analysed to determine the total acid number (TAN), the weight of sludge and loss of copper and iron from the catalyst. Table 3 shows the hydrolytic stability in the presence of water of turbine oils containing the combination of additives (A) and (B) of the present invention.

[0038] The formulated oil included pentaerythritol monooleate at a concentration of 0.18 wt % and 3-C₁₈₋₂₄ alkenyl-2,5-pyrrolidindione at a concentration of 0.04 wt%. The base oil was a hydro-processed basestock having a viscosity index of 99, a saturates content of 99.5 wt % and a sulfur content of 0.02 wt %.

Table 3

Sludge (mg)	Copper wt. Change (mg)	Iron wt. change (mg)	TAN (mg/KOH g)
12.5	0.5	0.75	0.425

The results represent the average of 2 runs.

[0039] The additive combinations used in the present invention are especially effective in hydro-processed mineral oils. Table 4 demonstrates the exceptional properties of the additive systems used in the present invention in these hydro-processed mineral oils. The following formulated oils contained identical additive concentrates (TO1). The solvent refined mineral oils (SR-32 and SR-68) contained 0.82 wt% of TO1, while the hydro-processed mineral oils (HP-32, HP-68 and HP-100) contained 0.80 wt% of TO1. The formulated oils were tested in the Rotating Bomb Oxidation Test (RBOT) defined in ASTM D-2272. The RBOT is a test for estimating the oxidation stability of turbine oils. The test oil, water and copper catalyst coil, contained in a covered glass container, are placed in a bomb equipped with a recording pressure gauge. The bomb is charged with oxygen to a pressure of 620 kPa, placed in a constant-temperature oil bath set at 150 °C, and rotated axially at 100 rpm at an angle of 30° from the horizontal. The number of minutes required to reach a specific drop in gauge pressure is the oxidation stability of the test sample.

[0040] The formulated oils containing solvent refined basestocks were also tested in the Lifetime Turbine Oil Oxidation Test (Life TOST) as defined in ASTM D-943. The Life TOST is used to evaluate the oxidation stability of inhibited steam turbine oils. In the Life TOST, the oil sample is reacted with oxygen in the presence of water and an iron-copper

catalyst at 95 °C. The test continues until the measured total acid number of the oil is 2.0 mg KOH/g. The number of test hours required for the oil to reach 2.0 mg KOH/g is the "oxidation lifetime". The RBOT for base oil alone would be in the region of 15-30 minutes.

Table 4

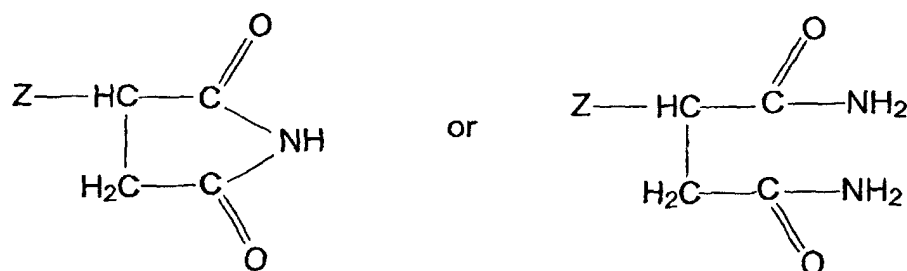
Base oil	RBOT (minutes)	Life TOST (hours)
SR-32	602.5 (avg. of 2 runs)	6188
HP-32	1199 (avg. of 3 runs)	
SR-68	707.5 (avg. of 2 runs)	6032
HP-68	1292 (avg. of 3 runs)	
HP-100	1253 (avg. of 3 runs)	

[0041] It is clear from Table 4 that the turbine oils prepared from hydro-processed mineral oils exhibit superior oxidation stability, compared to solvent refined mineral oils, as evidenced by the increased (nearly doubled) length of the RBOT for the turbine oils prepared from hydro-processed mineral oils. As is readily apparent from Table 4, the Life TOST for the turbine oils prepared from solvent refined mineral oils was over 250 days. Due to the extremely long test time for these oils the RBOT may be used as a tool to predict Life TOST results. In the paper Mookken, RT. et al., *Dependence of Oxidation Stability of Steam Turbine Oil on base Oil Composition*, Lubrication Engineering, October 1997, pages 19-24, it was shown that the RBOT can be used as a screening test to get an indication of the TOST life of the blended turbine oil. The study shows that the RBOT and Life TOST are directly proportional. Thus, it is clear from Table 4 that the turbine oils prepared from hydro-processed mineral oils will exhibit superior oxidation stability as determined by Life TOST in view of their significantly longer RBOT life.

Claims

1. A composition which is suitable for use as a turbine or rust and oxidation (R&O) oil and which is substantially free of acidic rust inhibitor, which composition comprises:

- (a) a major portion of a hydro-processed mineral oil which has a viscosity index of greater than 80, a saturates content of greater than 90 wt% and a sulfur content of 0.5 wt% or less;
- (b) at least 0.10 wt% of at least one neutral rust inhibitor, which is a hydrocarbyl ester of formula $R(\text{COOR}')_n$, in which R and R' are each independently hydrocarbyl groups or hydroxyhydrocarbyl groups containing up to 40 carbon atoms, and n is from 1 to 4; and
- (c) a compound (B) of formula:

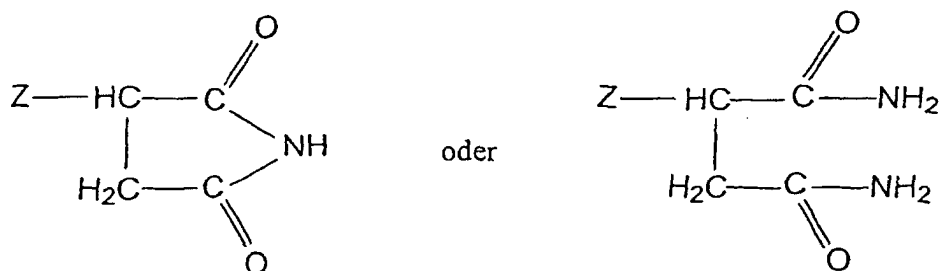


in which Z is a group R_1R_2CH- , in which R_1 and R_2 are each independently hydrocarbyl groups containing up to 34 carbon atoms, the total number of carbon atoms in the groups R_1 and R_2 being from 11 to 35.

2. A composition according to claim 1, wherein the at least one neutral rust inhibitor is present in an amount of from 0.10 to 0.45% by weight.
3. A composition according to claim 1 or 2, wherein R and R' are each independently hydrocarbyl groups or hydroxyhydrocarbyl groups containing 8 to 20 carbon atoms.
4. A composition according to any one of the preceding claims, further comprising at least one additive selected from sulfurized esters, phosphorus-containing additives, phosphorus- and sulfur-containing additives, antioxidants, demulsifiers and corrosion inhibitors.
5. A composition according to any one of the preceding claims, wherein the total number of carbon atoms in the groups R_1 and R_2 is 18 to 24.
6. A composition according to any one of the preceding claims, wherein compound (B) is a 3-C₁₈₋₂₄ alkenyl-2,5-pyrrolidindione.
7. A composition according to any one of the preceding claims, comprising from 0.10 to 0.45% by weight of said at least one neutral rust inhibitor and from 0.008 to 0.25% by weight of compound (B).
8. Use, in a turbine or rust and oxidation (R&O) base oil which is substantially free of acidic rust inhibitor and which is a hydro-processed mineral oil which has a viscosity index of greater than 80, a saturates content of greater than 90 wt% and a sulfur content of 0.5 wt% or less,
of at least 0.10 wt% of at least one neutral rust inhibitor as defined in any one of claims 1 to 3 and a compound (B) as defined in any one of claims 1, 5 or 6,
to improve the wet-filterability of the base oil, to improve the hydrolytic stability of the base oil and/or to reduce the formation in the base oil of sludge, precipitates and/or particulates by reaction with water and/or metal detergents.
9. A method of operating a steam or gas turbine, wherein the turbine is lubricated with a composition according to any of claims 1 to 7.

Patentansprüche

1. Zusammensetzung, die für die Anwendung als Turbinenöl oder Rost- und Oxidationsinhibitionsöl (R&O-Öl) geeignet und im Wesentlichen frei von sauren Rostinhibitoren ist, wobei die Zusammensetzung umfasst:
 - (a) eine Hauptmenge eines hydroprozessierten Mineralöls, das einen Viskositätsindex von über 80, einen Gehalt an gesättigten Verbindungen von über 90 Gew.-% und einen Schwefelgehalt von 0,5 Gew.-% oder darunter aufweist;
 - (b) mindestens 0,10 Gew.-% mindestens eines neutralen Rostinhibitors, bei dem es sich um einen Hydrocarbylester der Formel $R(COOR')_n$ handelt, worin R und R' jeweils unabhängig Hydrocarbylgruppen oder Hydroxyhydrocarbylgruppen mit bis zu 40 Kohlenstoffatomen darstellen und n von 1 bis 4 ist; und
 - (c) eine Verbindung (B) der Formel:



15 worin Z eine Gruppe R_1R_2CH- darstellt, worin R_1 und R_2 jeweils unabhängig Hydrocarbylgruppen sind, enthaltend bis zu 34 Kohlenstoffatome, wobei die Gesamtzahl der Kohlenstoffatome in den Gruppen R_1 und R_2 von 11 bis 35 beträgt.

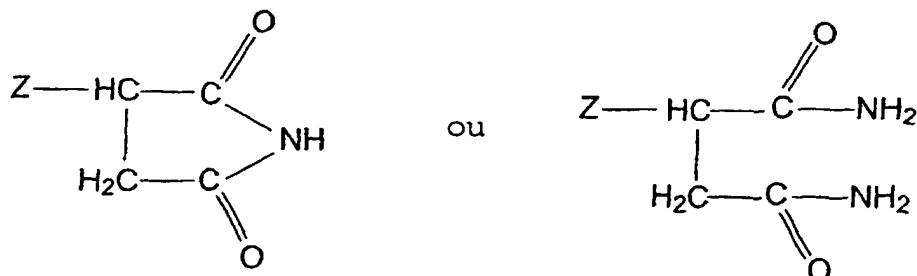
- 20
2. Zusammensetzung gemäß Anspruch 1, worin der mindestens eine neutrale Rostinhibitor in einer Menge von 0,10 bis 0,45 Gew.-% vorliegt.
- 25
3. Zusammensetzung gemäß Anspruch 1 oder 2, worin R und R' jeweils unabhängig Hydrocarbylgruppen oder Hydroxyhydrocarbylgruppen darstellen, enthaltend 8 bis 20 Kohlenstoffatome.
- 30
4. Zusammensetzung gemäß einem der vorstehenden Ansprüche, zusätzlich umfassend mindestens ein Additiv, ausgewählt unter geschwefelten Estern, Phosphor enthaltenden Additiven, Phosphor und Schwefel enthaltenden Additiven, Antioxidantien, Demulgatoren und Korrosionsinhibitoren.
- 35
5. Zusammensetzung gemäß einem der vorstehenden Ansprüche, worin die Gesamtzahl der Kohlenstoffatome in den Gruppen R_1 und R_2 18 bis 24 beträgt.
- 40
6. Zusammensetzung gemäß einem der vorstehenden Ansprüche, worin die Verbindung (B) ein 3- C_{18-24} -alkenyl-2,5-pyrrolidindion ist.
- 45
7. Zusammensetzung gemäß einem der vorstehenden Ansprüche, umfassend von 0,10 bis 0,45 Gew.-% des mindestens einen neutralen Rostinhibitors und von 0,008 bis 0,25 Gew.-% der Verbindung (B).
- 50
8. Verwendung in einem Turbinenöl oder Rost- und Oxidationsinhibitionsgrundöl (R&O-Grundöl), das im Wesentlichen frei von sauren Rostinhibitoren ist und bei dem es sich um ein hydroprozessiertes Mineralöl handelt, das einen Viskositätsindex von größer 80, einen Gehalt an gesättigten Verbindungen von größer 90 Gew.-% und einen Schwefelgehalt von 0,5 Gew.-% oder darunter aufweist, von mindestens 0,10 Gew.-% mindestens eines neutralen Rostinhibitors, wie in einem der Ansprüche 1 bis 3 definiert, und einer Verbindung (B), wie in einem der Ansprüche 1, 5 oder 6 definiert, zur Verbesserung der Nassfiltrierbarkeit des Grundöls, zur Verbesserung der hydrolytischen Stabilität des Grundöls und/oder zur Verringerung von Schlamm, Präzipitaten und/oder Teilchen im Grundöl durch Reaktion mit Wasser und/oder Metaldetergentien.
- 55
9. Verfahren des Betriebs einer Dampf- oder Gasturbine, worin die Turbine mit einer Zusammensetzung nach einem der Ansprüche 1 bis 7 geschmiert wird.

Revendications

1. Composition qui est apte à l'utilisation comme huile pour turbines ou huile antirouille et anti-oxydante (R&O) et qui est pratiquement dépourvue d'agent antirouille acide, composition qui comprend :

(a) une proportion dominante d'une huile minérale hydrotraitée qui a un indice de viscosité supérieur à 80, une teneur en composés saturés supérieure à 90% en poids et une teneur en soufre égale ou inférieure à 0,5% en poids ;

- (b) au moins 0,10% en poids d'au moins un agent antirouille neutre, qui est un ester hydrocarbylique de formule $R(COOR')_n$, dans laquelle R et R' représentent chacun indépendamment des groupes hydrocarbyle ou groupes hydroxyhydrocarbyle contenant jusqu'à 40 atomes de carbone, et n a une valeur de 1 à 4 ; et
- (c) un composé (B) de formule :



dans laquelle Z représente un groupe R_1R_2CH- , dans lequel R_1 et R_2 représentent chacun indépendamment des groupes hydrocarbyle contenant jusqu'à 34 atomes de carbone, le nombre total d'atomes de carbone dans les groupes R_1 et R_2 allant de 11 à 35.

2. Composition suivant la revendication 1, dans laquelle ledit au moins un agent antirouille neutre est présent en une quantité de 0,10 à 0,45 % en poids.
3. Composition suivant la revendication 1 ou 2, dans laquelle R et R' représentent chacun indépendamment des groupes hydrocarbyle ou groupes hydroxyhydrocarbyle contenant 8 à 20 atomes de carbone.
4. Composition suivant l'une quelconque des revendications précédentes, comprenant en outre au moins un additif choisi entre des esters sulfurés, des additifs contenant du phosphore, des additifs contenant du phosphore et du soufre, des anti-oxydants, des désémulsifiants et des inhibiteurs de corrosion.
5. Composition suivant l'une quelconque des revendications précédentes, dans laquelle le nombre total d'atomes de carbone dans les groupes R_1 et R_2 va de 18 à 24.
6. Composition suivant l'une quelconque des revendications précédentes, dans laquelle le composé (B) est une 3 (alcényle en C_{18} à C_{24})2,5-pyrrolidinedione.
7. Composition suivant l'une quelconque des revendications précédentes, comprenant 0,10 à 0,45% en poids dudit au moins un agent antirouille neutre et 0,008 à 0,25% en poids de composé (B).
8. Utilisation, dans une huile de base pour turbines ou huile antirouille et anti-oxydante (R&O) qui est pratiquement dépourvue d'agents antirouille acide et qui est une huile minérale hydrotraitée ayant un indice de viscosité supérieur à 80, une teneur en composés saturés supérieure à 90% en poids et une teneur en soufre égale ou inférieure à 0,5% en poids,

d'au moins 0,10% en poids d'au moins un agent antirouille neutre répondant à la définition suivant l'une quelconque des revendications 1 à 3 et d'un composé (B) répondant à la définition suivant l'une quelconque des revendications 1, 5 ou 6,

pour améliorer la filtrabilité à l'état humide de l'huile de base, pour améliorer la stabilité à l'hydrolyse de l'huile de base et/ou pour réduire la formation dans l'huile de base de boues, de précipités et/ou de particules par réaction avec l'eau et/ou des détergents métalliques.
9. Procédé pour faire fonctionner une turbine à vapeur ou à gaz, dans lequel la turbine est lubrifiée avec une composition suivant l'une quelconque des revendications 1 à 7.