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(54) Process for preparing a very high quality lube base stock oil.

(57) A process for obtaining a very high quality lube base stock is disclosed which comprises:

(a) introducing an aromatic and nitrogen-and sulfur-containing feedstock selected from a dewaxed oil obtained from refining distillate fraction and having a 60 to 700 SUS at 38°C (100°F) and a dewaxed oil obtained from refining vacuum resid and having a 2300 to 2700 SUS at 38°C (100°F), and hydrogen, into a single stage hydrotreating reactor; and,

(b) subjecting the feedstock to hydrotreating in the reactor in the presence of a sulfided cobalt/molybdenum hydrotreating catalyst at an average reactor temperature of from 288° to 371°C - (550 to 700°F) at a hydrogen partial pressure of 10340 to 20680 kPa.a (1500 to 3000 psia) at the reactor outlet, an LHSV of 0.1 to 1.0 and a hydrogen circulation rate of 53.4 to 445 vol/vol (300 to 2500 SCF per barrel).

PROCESS FOR PREPARING A VERY HIGH QUALITY LUBE BASE STOCK OIL

This invention relates to the manufacture of high grade viscous oil products from crude petroleum fractions. It is particularly directed to the manufacture of very high quality lube base stock oils from crude stocks of high wax content, commonly classified as "wax base" in contrast to "naphthenic base" crudes. The latter crudes are relatively lean in straight chain paraffins and yield viscous fractions which inherently possess low pour points.

Lube base stock oils are conventionally prepared by refining distillate fractions or the residuum prepared by vacuum distilling a suitable crude oil from which the lighter portion has been removed by distillation in an atmospheric tower. Thus, the charge to the vacuum tower is commonly referred to as an atmospheric resid or reduced crude, and the residuum from the vacuum tower is distinguished from the starting material by referring to it as the vacuum resid.

The vacuum distillate fractions are upgraded by a sequence of unit operations, the first of which is solvent extraction with a solvent selective for aromatic hydrocarbons. This step serves to remove aromatic hydrocarbons of low viscosity index and provides a raffinate of improved viscosity index and quality. Various processes have been used in this extraction stage employing solvents such as turfural, phenol, sulfur dioxide, and others. The vacuum resid, because it contains most of the asphaltenes of the crude oil, is conventionally treated to remove these asphalt-like constituents prior to solvent extraction to increase the viscosity index.

The raffinate from the solvent extraction step contains paraffins which adversely affect the pour point. Thus, the waxy raffinate, regardless of whether prepared from a distillate fraction or from a vacuum resid, must be dewaxed. Various dewaxing procedures have been used and the art has gone in the direction of treatment with a solvent such as methyl ethyl ketone (MEK)/toluene mixtures and/or catalytic dewaxing to remove the wax and provide a dewaxed oil. The dewaxed raffinate may then be finished by any of a number of sorption or catalytic processes to improve color and oxidation stability, e.g., clay percolation or hydrofinishing.

The quality of the lube base stock oil prepared by the sequence of operations outlined above depends on the particular crude chosen as well as the severity of treatment for each of the treatment stages. Additionally, the yield of a high quality lube base stock oil also depends on these factors and, as a rule, the higher the quality sought, the less the yield. In general, naphthenic crudes are favored because less loss is encountered, particularly in the dewaxing step. In many cases, however, waxy crudes are more readily available, and it would be desirable to provide a process for preparing very high quality lube base stock oils in good yields from such waxy crude oils.

In recent years techniques have become available for the catalytic dewaxing of petroleum stocks. U.S. Patent Re. No. 28, 398 describes a process for catalytic dwaxing employing a catalyst comprising zeolite ZSM-5. Such a process combined with catalytic hydrofinishing is described in U.S. Patent No. 3,894, 938.

U.S. Patent No. 4,437,975 describes a process for preparing a lube base stock oil from a vacuum resid by catalytically dewaxing the vacuum resid over a zeolite catalyst such as ZSM-5 and cascading the entire effluent, including hydrogen, into a hydrotreating reactor operated under relatively mild conditions, i.e., at a temperature from 260° to 357°C (500° to 675°F) and at a hydrogen partial pressure at the reactor inlet of 1034 to 10340 kPa.a (150 to 1500 psia). Under these conditions, the olefins present in the dewaxed feedstock are substantially hydorgenated thereby eliminating a principal source of oxidative and thermal instability. These hydrotreating conditions are not severe enough, however, to effect any appreciable reduction in the content of aromatic compounds and nitrogen-and sulfur-containing compounds the pressence of which limits the use of the resulting oils to relatively undemanding service applications.

U.S. Patent No. 3,959,122 describes a process for producing a technical white oil having an ultraviolet absorptivity in the 280 to 289 millimicron region of less than 2.0 and having a viscosity in the range of 300 to 600 SUS (Saybolt Universal Seconds) at 38°C (100°F) in which a paraffinic distillate having a viscosity in the range of 400 to 600 SUS is hydrorefined at a temperature of 288° to 316°C (550° to 600°F), at a hydrogen partial pressure in the range of 5520 to 20685 kPa (800 to 3000 psi) and a total pressure in the range of 5520 to 41400 kPa g (800 to 6000 psig) in the presence of a sulfided nickel/molybdenum hydrogenation catalyst and at a liquid hourly space velocity - (LHSV) of 0.l to 1.0. Under these hydro-refining conditions, a significant reduction in aromatic, nitrogen and sulfur content occurs providing a very high quality oil which is suitable for demanding lubrication applications, e. g., as turbine oils.

This invention provides a process for preparing a very high quality lube base stock oil having excellent thermal and oxidation stability from a waxy crude oil. The process comprises:

(a) introducing an aromatic and nitrogen-and sulfur-containing feedstock selected from a dewaxed oil obtained from refining distillate fraction and having a 60 to 700 SUS at 38°C (100°F) and a dewaxed oil obtained from refining vacuum resid and having a 2300 to 2700 SUS at 38°C (100°F), and hydrogen, into a single stage hydrotreating reactor; and,

(b) subjecting the feedstock to hydrotreating in the reactor in the presence of a sulfided cobalt/molybdenum hydrotreating catalyst at an average reactor temperature of from 288° to 370°C (550° to 700°F) at a hydrogen partial pressure of from 10340 to 20685 kPa (1500 to 3000 psia) at the reactor outlet, an LHSV of from 0.1 to 1.0 and a hydrogen circulation rate of from 53.4 to 445 vol/vol (300 SCF (standard cubic feet) to 2500 SCF per barrel).

The use of a sulfided cobalt/molybdenum catalyst provides several advantages over a sulfided nickel/molybdenum catalyst as used in the hydrorefining process of U.S. Patent No. 3,959,122 referred to above. Thus, the greater stability of a cobalt/molybdenum catalyst compared to that of a nickel/molybdenum catalyst permits the former to be regenerated at a higher temperature and correspondingly shorter period of time than the latter thereby reducing reactor down-time and increasing productivity. In addition,the greater stability of the cobalt/molybdenum catalyst makes it more suitable for steam/air regeneration which is less expensive than the nitrogen/air regeneration methods more commonly employed with nickel/molybdenum catalysts. Moreover, cobalt/molybdenum is significantly easier to sulfide/presulfide, the form in which the catalyst must be used in the hydrotreating process herein. These advantages result in an overall superior hydrotreating operation compared to one employing a nickel/molybdenum catalyst.

Known unit processes are applied to distillate or vacuum resid fractions of waxy crude in particular sequence and within limits to prepare lube base stock oils used, for example, in hydraulic fluids, motor oils, turbine oils, marine oils and gear lubricants. The first step after preparation of a distillate fraction of suitable boiling range is extraction with a solvent which is selective for aromatic hydrocarbons, e.g., furfural, phenol, n-methylpyrrolidone, or others, to remove undesirable components of the fraction. With a vacuum resid fraction, it is required to propane deasphalt the resid prior to solvent extraction. In some instances, such as with a cylinder stock, solvent extraction of the deasphalted vacuum resid can be omitted. The raffinate from solvent extraction or propane deasphalting of vacuum resid is then dewaxed in a conventional manner, e.g., by treatment with a solvent such as MEK/toluene, propane or catalytically in the presence of hydrogen over a catalyst of an aluminosilicate zeolite having a silica to alumina ratio greater than 12 and a constraint index of 1 to 12 or by a combination of solvent and catalytic dewaxing as in U.S. Patent No. 3,755,138. The dewaxed oil is then hydrotreated in a single stage hydrotreating unit in the presence of sulfided cobalt/molybdenum catalyst operated under the foregoing specified conditions to provide a white oil possessing substantially improved color, demulsibility and oxidation stability and ideally suited for severe service applications such as turbine oils. The hydrotreated product is thereafter distilled, i.e., topped by distillation, to separate low boiling products of dewaxing in order to meet physical property specifications such as flash point and others. Conducting the unit processes at the conditions more fully specified hereinafter imparts high quality characteristics to the lube base stock oils and at the same time produces high yields of finished oils.

The wax base crudes (sometimes called "paraffin base") from which the charge stock is derived by distillation constitute a well recognized class of crude petroleums. Many scales have been devised for classification of crude, some of which are described in Chapter VII Evaluation of Oil Stocks of "Petroleum Refinery Engineering", W.L. Nelson, McGraw-Hill, 1941. A convenient scale identified by Nelson at page 69 involves determination of the cloud point of the Bureau of Mines "Key Fraction No. 2" which boils between 275° and 300°C (527° and 572°F) at 5330 kPa (40 mm) pressure. If the cloud point of this fraction is above -15°C (5°F), the crude is considered to be a wax base.

Known and conventional solvent extraction by counter cuirrent extraction with at least an equal volume (100 vol. %) of a selective solvent such a furfural is contemplated. It is preferred to use from 1.5 to 4.0 volumes of solvent per volume of oil. The furfural raffinate product is thereafter subjected to any one of several known and conventional solvent and/or catalytic dewaxing procedures.

Solvent dewaxing is a well known technique and needs no detailed description here. In general, the raffinate from the solvent refining unit is combined with a selective solvent and chilled to the appropriate temperature to crystallize the wax which is then separated therefrom. Representative examples of suitable solvents are (a) the aliphatic ketones having from 3 to 6 carbon atoms such as acetone, methyl ethyl ketone (MEK) and methyl isobutyl ketone (MIBK) and (b) propane, butane, and propylene as well as mixtures of the foregoing ketones and mixtures of the aforesaid ketones with aromatic compounds such as benzene and toluene. In addition, halogenated low molecular weight hydrocarbons such as the C_2-C_4 chlorinated hydrocarbons, e.g., dichloromethane and dichloroethane and mixtures thereof, can be used as solvents. Specific examples of suitable solvent mixtures are methyl ethyl ketone and methyl isobutyl ketone, methyl ethyl ketone and toluene, dichloromethane and dichloroethane and propylene and acetone. The raffinate is dewaxed by the selected solvent or solvent mixture which is adjusted to the composition of the charge stock to meet specifications for the particular lube base stock and the contemplated end-use, such being determined in accordance with well established practices.

In a preferred catalytic dewaxing procedure, the waxy raffinate from the solvent extraction operation is mixed with hydrogen and contacted at 260° to 375°C (500° to 675°F) with a catalyst containing a zeolite ZSM-5 or other aluminosilicate zeolite having a silicate/alumina ratio above 12 and a constraint index of 1 to 12, with or without a hydrogenation component, and at an LHSV of 0.1 to 2.0 volumes of charge oil volume of catalyst per hour. The preferred space velocity is 0.5 to 1.0 LHSV. The catalytic dewaxing reaction produces olefins which would impair properties of the dewaxed oil product if retained. These are saturated by hydrogenation in the hydrotreating reactor. The saturation reaction is evidenced by the temperature rise in the first portion of the reactor, and confirmed by chemical analysis of the feed and hydrotreated product. By this means it is possible to prepare stable very high quality lube base stock oils having pour points even below -54°C (-65°F).

In some instances it may be desirable to partially dewax the charge stock to the catalytic dewaxing unit by conventional solvent dewaxing techniques as described above, say to a pour point of from -12°C (10°F) to about 10°C (50°F). The higher melting point waxes so removed are those of higher market value than the waxes removed in conventionally taking the product to a still lower pour point below -12°C (10°F).

The cracked (and hydrogenated) fragments from cracking wax molecules in the catalytic dewaxer will have adverse effects on the flash point of the dewaxed raffinate product and are therefore removed by distillation of the product to flash point specifications.

In the process of this invention, effluent from the solvent or catalytic dewaxing step (or sequential solvent/catalytic dewaxing operations) is introduced into a conventional fixed bed single stage hydrotreating reactor containing a sulfided cobalt/molybdenum catalyst on a support, e. g., one of alumina. Such catalysts are well known in the art and are commercially available. Shell's S 344 catalyst, a 1.6 mm (1/16 inch) pelletized extrudate of sulfided cobalt (2.4 wt. %) and molybdenum (9.8 wt. %) on alumina having a surface area of 190 m^2/gm and a pore volume of 0.56 cc/gm has been found to provide entirely acceptale results.

The hydrotreating reactor is operated at an average reactor bed temperature of from 288° to 370°C (550 to 700°F), preferably from 316° to 343°C (600 to 650°F), a hydrogen partial pressure of from 10340 to 20680 kPa.g (1500 to 3000 psia), preferably from 13800 to 17240 kPa.a (2000 to 2500 psia), at the reactor outlet, an LHSV of from 0.1 to 1.0, preferably from 0.3 to 0.6, and a hydrogen circulation rate of from 0.07 to 0.6 m^3/liter - (300 to 2500), and preferably from 89 to 356 vol/vol (500 to 2000 SCF per barrel).

The effluent from the hydrotreating reactor is steam-stripped to remove the most volatile components and thereby meet flash point and other product specifications.

The following examples are illustrative of the process of this invention.

EXAMPLE 1

An automotive grade furfural-extracted oil derived from a North Sea crude (Statfjord) which was dewaxed in a conventional manner employing a 65/35 toluene/MEK mixture was charged to a fixed bed single stage hydrotreating reactor of known construction loaded with Shell's S 344 sulfided cobalt/molybdenum on alumina hydrotreating catalyst.

The data for the conditions of the hydrotreating operation, the characteristics of the charge stock and the properties of the resulting hydrotreated oil in five separate cases are set forth in Table 1 as follows:

TABLE 1

HYDROTREATING CONDITIONS OF SOLVENT DEWAXED CHARGE STOCK AND PROPERTIES OF RESULTING HYDROTREATED OIL

Hydrotreating Conditions	Charge Stock	Case 1	Case 2
Average reactor temp., °C (°F)	-	343(650)	343(650)
LHSV, hr^{-1}	-	0.3	0.6
Hydrogen circ., vol/vol (SCF/B)	-	224(1261)	108(609)
Hydrogen partial pressure (inlet) kPa.g (psig)	-	16970(2461)	15170(2200)
Properties of Oil[1]			
Sp Gr	0.875	0.867	0.869
Viscosity			
KV Viscosity at 40°C	61.25	50.87	56.22
KV at 100°C	8.03	7.27	7.67
SUS at 38°C (100°F)	317	263	291
SUS at 99°C (210°F)	53	51	52
Viscosity Index	96.7	161.7	99.2
Pour Point, °C	-12	-11	-11
Cloud Point, °C	-6	-7	-7
Flash, °C	240	222	232
Sulfur, ppm	1900	3	10
Nitrogen, ppm	64	0.8	0.2
UV Absorbance			
400 nm (x 10^{-5})	79	0.56	1.4
325 nm (x 10^{-3})	32	0.35	1.5
275 nm (x 10^{-1})	4.5	0.26	1.7
254 nm	0.67	0.03	0.13
226 nm	3.15	0.20	1.37
Aromatics, wt %	16.5	4.5	-
OCST[2] (3 days at 150°C)	D8	3.0	-
RBOT[3], min	-	355	-

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[1] The properties of the hydrotreated products were measured following steam stripping to remove volatiles.

[2] OCST = Oven Color Stability Test

[3] RBOT = Rotating Bomb Oxidation Test (butylated hydroxytoluene (BHT) added as antioxidant).

TABLE 1 (continued)

HYDROTREATING CONDITIONS OF SOLVENT DEWAXED CHARGE STOCK AND PROPERTIES OF RESULTING HYDROTREATED OIL

Hydrotreating Conditions	Charge Stock	Case 3	Case 4
Average reactor temp., °C (°F)	-	357(675)	316(600)
LHSV, hr^{-1}	-	0.5	0.5
Hydrogen circ., vol/vol (SCF/B)	-	137(767)	128(717)
Hydrogen partial pressure (inlet) kPa.g (psig)	-	16250(2357)	16590(2406)
Properties of Oil[1]			
Sp Gr	0.875	0.868	0.872
Viscosity			
KV Viscosity at 40°C	61.25	49.99	59.42
KV at 100°C	8.03	7.20	7.90
SUS at 38°C (100°F)	317	258	308
SUS at 99°C (210°F)	53	50	53
Viscosity Index	96.7	102.3	97.6
Pour Point, °C	-12	-11	-12
Cloud Point, °C	-6	-4	-8
Flash, °C	240	226	236
Sulfur, ppm	1900	2	68
Nitrogen, ppm	64	0.2	0.2
UV Absorbance			
400 nm (x 10^{-5})	79	2.3	0.50
325 nm (x 10^{-3})	32	1.4	1.2
275 nm (x 10^{-1})	4.5	1.2	2.1
254 nm	0.67	0.03	0.14
226 nm	3.15	0.94	1.60
Aromatics, wt %	16.5	3.3	-
OCST[2] (3 days at 150°C)	D8	3.0	2.5
RBOT[3], min	-	350	-

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[1] The properties of the hydrotreated products were measured following steam stripping to remove volatiles.

[2] OCST = Oven Color Stability Test

[3] RBOT = Rotating Bomb Oxidation Test (butylated hydroxytoluene (BHT) added as antioxidant).

TABLE 1 (continued)

HYDROTREATING CONDITIONS OF SOLVENT DEWAXED CHARGE STOCK AND PROPERTIES OF RESULTING HYDROTREATED OIL

Hydrotreating Conditions	Charge Stock	Case 5
Average reactor temp., °C (°F)	-	316(600)
LHSV, hr^{-1}	-	0.3
Hydrogen circ., vol/vol (SCF/B)	-	211(1186)
Hydrogen partial pressure (inlet) kPa.g (psig)	-	16940(2457)
Properties of Oil[1]		
Sp Gr	0.875	0.870
Viscosity		
KV Viscosity at 40°C	61.25	58.31
KV at 100°C	8.03	7.82
SUS at 38°C (100°F)	317	302
SUS at 99°C (210°F)	53	53
Viscosity Index	96.7	98.0
Pour Point, °C	-12	-12
Cloud Point, °C	-6	-6
Flash, °C	240	238
Sulfur, ppm	1900	22
Nitrogen, ppm	64	0.2
UV Absorbance		
400 nm (x 10^{-5})	79	0.2
325 nm (x 10^{-3})	32	0.4
275 nm (x 10^{-1})	4.5	1.4
254 nm	0.67	0.09
226 nm	3.15	1.34
Aromatics, wt %	16.5	9.7
OCST[2] (3 days at 150°C)	D8	2.0
RBOT[3], min	-	-

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[1] The properties of the hydrotreated products were measured following steam stripping to remove volatiles.

[2] OCST = Oven Color Stability Test

[3] RBOT = Rotating Bomb Oxidation Test (butylated hydroxytoluene (BHT) added as antioxidant).

As these data show, in each case, the sulfur, nitrogen and aromatic content of the charge stock was substantially reduced providing very high quality lube base stock oils ("technical grade white oils") possessing much improved color and oxidation stability. The hydrotreated oils were entirely suitable for use as turbine oils.

EXAMPLE 2

A high severity furfural-extracted distillate derived from a North Sea crude (Statfjord) which was subsequently dewaxed in a conventional manner with a 65/35 toluene/MEK mixture was subjected to hydrotreatment in the reactor and with the hydrotreating catalyst of Example 1 with the results (four cases) set forth in Table 2 as follows:

TABLE 2

HYDROTREATING CONDITIONS OF SOLVENT DEWAXED CHARGE STOCK AND PROPERTIES OF RESULTING HYDROTREATED OIL

Hydrotreating Conditions	Charge Stock	Case 1	Case 2
Average reactor temp., °C (°F)	-	340(652)	343(649)
LHSV, hr^{-1}	-	0.31	0.57
Hydrogen circ., vol/vol (SCF/B)	-	212(1190)	112(630)
Hydrogen partial pressure (inlet) kPa.g (psig)	-	17100(2480)	13720(1990)
Properties of Oil[1]			
Sp Gr	0.868	0.863	0.865
Viscosity			
KV Viscosity at 40°C	56.8	48.2	52.3
KV at 100°C	7.81	7.16	7.50
SUS at 38°C (100°F)	292	248	270
SUS at 99°C (210°F)	52	50	51
Viscosity Index	102.7	107.2	105.1
Pour Point, °C	-12	-10	-10
Cloud Point, °C	-8	-8	-6
Flash, °C	242	222	236
Sulfur, ppm	1150	1	4
Nitrogen, ppm	36	0.2	0.2
RI at 70°C	1.4585	1.4547	1.4561
UV Absorbance			
400 nm (x 10^{-6})	1740	6.90	17.0
325 nm (x 10^{-4})	403	313	11.8
275 nm (x 10^{-2})	38.2	2.40	6.45
254 nm (x 10^{-1})	4.21	0.11	0.36
288 nm	2.38	0.29	0.68
Aromatics, wt %	10.8	1.9	4.6
Yield, vol. %	-	95.6	97.2

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[1] The properties of the hydrotreated products were measured following steam stripping to remove volatiles.

TABLE 2 (continued)

HYDROTREATING CONDITIONS OF SOLVENT DEWAXED CHARGE STOCK AND PROPERTIES OF RESULTING HYDROTREATED OIL

Hydrotreating Conditions	Charge Stock	Case 3	Case 4
Average reactor temp., °C (°F)	-	316(600)	317(603)
LHSV, hr^{-1}	-	0.57	0.34
Hydrogen circ., vol/vol (SCF/B)	-	110(620)	183(1030)
Hydrogen partial pressure (inlet) kPa.g (psig)	-	15030(2180)	17030(2470)
Properties of Oil[1]			
Sp Gr	0.868	0.867	0.866
Viscosity			
KV Viscosity at 40°C	56.8	55.4	
54.6			
KV at 100°C	7.81	7.74	
7.68			
SUS at 38°C (100°F)	292	286	
282			
SUS at 99°C (210°F)	52	52	
52			
Viscosity Index	102.7	103.5	104.1
Pour Point, °C	-12	-10	-10
Cloud Point, °C	-8	-8	-7
Flash, °C	242	238	242
Sulfur, ppm	1150	49	14
Nitrogen, ppm	36	0.2	0.2
RI at 70°C	1.4585	1.4574	1.4568
UV Absorbance			
400 nm (x 10^{-6})	1740	6.60	3.20
325 nm (x 10^{-4})	403	9.99	3.15
275 nm (x 10^{-2})	38.2	10.9	9.12
254 nm (x 10^{-1})	4.21	0.66	0.54
288 nm	2.38	1.13	0.88
Aromatics, wt %	10.8	-	5.7
Yield, vol. %	-	97.9	96.0

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[1] The properties of the hydrotreated products were measured following steam stripping to remove volatiles.

The lube base stock oil product in each of the four cases was a technical grade white oil of very high quality which is well suited for use as a turbine oil.

EXAMPLE 3

This example illustrates the process of the present invention employing the reactor and catalyst of Example 1 but employing as the charge stock, a catalytically dewaxed solvent-extracted distillate of 200 SUS at 38°C (100°F) derived from a Mexican crude (Isthmus). The conditions of hydrotreatment, the properties of the charge stock and the properties of the hydrotreated oil (following steam stripping to remove volatiles) are set forth in Table 3 as follows:

TABLE 3: HYDROTREATING CONDITIONS OF CATALYTICALLY DEWAXED 200 SUS ISTHMUS CHARGE STOCK AND PROPERTIES OF RESULTING HYDROTREATED OIL

Hydrotreating Conditions	Charge Stock	Run
Average Reactor temp. °C (°F)	-	343 (650)
LHSV, hr^{-1}	-	0.3
Hydrogen circ., vol/vol	-	216
(SCF/B)	-	(1215)
Hydrogen partial pressure (inlet), kPa.g	-	17100
(psig)	-	(2480)
Properties of Oil		
Viscosity		
KV at 40°C	39.07	32.41
KV at 100°C	6.017	5.43
SUS at 38°C (100°F)	202	167
SUS at 99°C (210°F)	46	45
Viscosity Index	-	103.7
Pour Point, °C	-	-8
Cloud Point, °C	-	-6
Flash Point, °C	-	204
Sulfur, ppm	3100	-
Nitrogen, ppm	40	0.2
UV Absorbance		
275nm (x 10^{-2})	113	5.2
325nm (x 10^{-4})	1230	7.2
400nm (x 10^{-5})	111	1.5
Aromatics, wt % (by UV)	24	3.5

The hydrotreated oil was of technical white oil grade and is well suited for use as a turbine oil.

Claims

1. A process for obtaining a very high quality lube base stock which comprises:

(a) introducing an aromatic and nitrogen-and sulfur-containing feedstock selected from dewaxed oil obtained from refining distillate fractions and having a 60 to 700 SUS at 38°C and a dewaxed oil obtained from refining vacuum resid and having a 2300 to 2700 SUS at 38°C and hydrogen, into a single stage hydrotreating reactor; and,

(b) subjecting the feedstock to hydrotreating in said reactor in the presence of a sulfided cobalt/molybdenum hydrotreating catalyst at an average reactor temperature of from 316° to 357°C at a hydrogen partial pressure of from 13800 to 17240 kPa.a at the reactor outlet, an LHSV of from 0.3 to 0.6 and a hydrogen circulation rate of from 53.4 to 445 vol/vol to provide a very high quality lube base stock in which the aromatic, nitrogen and sulfur content is substantially reduced.

2. The process of claim 1 wherein the feedstock is a solvent dewaxed oil.

3. The process of claim 1 wherein the feedstock is a catalytically dewaxed oil.

4. The process of claim 1 wherein the feedstock is an oil which has been dewaxed by a combination of solvent dewaxing and catalytic dewaxing operations.

5. The process of claim 12 wherein the feedstock possesses an SUS at 38°C in the range of 100 to 600.

6. The process of claim 1 in which volatiles are removed from the hydrotreated product of step (b).

7. The process of claim 1 wherein following hydrotreating, the resulting lube base stock contains essentially no aromatics.

8. The process of claim 1 wherein following hydrotreating, the resulting lube base stock contains essentially no sulfur.

9. The process of claim 1 wherein following hydrotreating, the resulting lube base stock contains essentially no nitrogen.

10. The process of claim 1 wherein following hydrotreating, the resulting lube base stock contains essentially no aromatics, sulfur and nitrogen.

European Patent
Office

EUROPEAN SEARCH REPORT

Application number
EP 86305095.1

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	GB - A - 2 059 433 (THE BRITISH PETROLEUM COMPANY LIMITED) * Claims; page 1, line 55 - page 2, line 45 * --	1	C 10 G 65/02 C 10 G 49/04
A	GB - A - 1 566 233 (SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ B.V.) * Claims; page 2, line 57 - page 4, line 29 * ----	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			C 10 G 65/00 C 10 G 49/00 C 10 G 45/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	02-12-1986	STÖCKLMAYER

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
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