(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 471 461 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification: **24.08.94**

(51) Int. Cl.[5]: **C10M 101/02**, C10G 73/06

(21) Application number: **91306827.6**

(22) Date of filing: **29.07.91**

(54) **Method of producing low-pour high-VI lubes by co-processing solvent dewaxing.**

(30) Priority: **30.07.90 US 559779**

(43) Date of publication of application:
19.02.92 Bulletin 92/08

(45) Publication of the grant of the patent:
24.08.94 Bulletin 94/34

(84) Designated Contracting States:
DE FR GB IT

(56) References cited:
DE-A- 2 625 635
US-A- 3 365 390

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Description

Solvent dewaxing of waxy lube oils has long been known. It has also been known that lighter oils, oils of lower boiling point and VI of about 90-105/110 are more miscible in dewaxing solvents of a given composition than are higher boiling-higher VI oils. It is also widely accepted that good yields of dewaxed oils are obtained when the dewaxing procedure is practiced under oil/solvent miscible conditions. To this end, conditions of solvent to oil ratios, dewaxing temperatures and solvent/cosolvent ratios have been adjusted to achieve oil-solvent miscibility at the dewaxing temperature (filter temperature). All too often, however, a compromise must be struck between yield of dewaxed oil and pour point, that is low pour points are achieved at the expense of product yield or conversely high yields are achieved at the price of higher pour point.

U.S. Patent 3,365,390 describes a lube oil production process involving hydrocracking a heavy oil feed, separating hydrocracked wax from a hydrocracked lubricating oil portion of the products and hydroisomerizing the hydrocracked wax using an active reforming catalyst. An isomerized lubricating oil fraction so produced can be dewaxed separately, to recover ultra high VI isomerized lube oil, or the isomerized lube oil fraction is dewaxed in admixture with a hydrocracked lubricating oil fraction. When the isomerate is dewaxed in combination with a hydrocracked lube oil fraction the wax recovered is a mixture of hydrocracked wax and isomerized wax and the properties of the recovered lube oil are upgraded due to the presence of the isomerate lube oil portion.

High boiling-high VI wax isomerate and natural waxy oil distillates are difficult to dewax to achieve pour point in the region of about -20 °C and lower. Such oils when solvent dewaxed to low temperature typically encounter oil/solvent miscibility problems resulting in poor dewaxed oil yields.

It has been discovered that high boiling high VI oils can be solvent dewaxed to low pour point under miscible conditions when using low miscibility dewaxing solvents, e.g. C_3-C_6 ketone based dewaxing solvents such as methyl ethyl ketone, methyl isobutyl ketone, acetone, etc. and mixtures thereof such as MEK/MIBK by combining a quantity of low boiling conventional VI waxy oil with the high boiling high VI oil and co-processing the mixture under conventional solvent dewaxing conditions. The addition of the low boiling conventional VI waxy oil to the high boiling high VI oil permits dewaxing to be conducted under miscible conditions resulting in the production of acceptable yields of low pour point dewaxed oil. It has further been discovered that the low pour point dewaxed oil mixture may be subsequently fractioned into fractions whose specifications are very close to the parent materials in terms of boiling point and VI and that both such fractions possess the low pour point of the mixture. Upon normalization of yields it has been discovered that the yield of the low pour-high boiling-high VI oil fraction achieved by the co-processing procedure is higher than that achieved when the high boiling high VI oil is dewaxed by itself.

Figure 1 compares the miscibility of heavy, high boiling high VI wax isomerate oil to that of a mixture of said heavy oil with a light oil at a 2/1 ratio in ketone dewaxing solvents of varying proportions at different temperatures.

Figure 2 shows the yield of -21 °C pour dewaxed oil derived from Fischer-Tropsch isomerate, the yield being normalized to 100 barrels of Fischer-Tropsch isomerate feed to the dewaxer on the basis of both neat Fischer-Tropsch isomerate and a Fischer-Tropsch isomerate/150N blend.

Heavy, high boiling, high VI waxy oils, be they waxy oils obtained by wax isomerization or conventional oils, such as deasphalted 600N hydrocracked oil, or Bright Stocks which are immiscible in typical low miscibility dewaxing solvents such as C_3-C_6 ketones at the low dewaxing temperature used when low pour points of about -21 °C are sought can be solvent dewaxed to a target pour point of about -21 °C and lower, preferably about -24 °C, most preferably about -27 °C using conventional solvents under miscible conditions (e.g. a filter temperature of no less than about -35 °C so as to have a pour/filter ΔT of about 3-4 °C or less) by adding to the heavy, high boiling, high VI waxy oil a quantity of lower boiling conventional VI waxy oil distillate and processing this mixture through the solvent dewaxing process under miscible conditions.

The light lower boiling conventional VI waxy oil added to the heavy, high boiling high VI waxy oil will be such that it can be easily separated from the heavy oil by distillation, therefore it will be characterized by possessing a 90% off point about 50-300 °F, preferably 50-100 °F, lower than the 10% off point of the heavy oil. The bulk of the light oil is substantially lighter and lower boiling than the bulk of the heavy oil.

The light oil is added to the heavy oil in an amount sufficient to render the mixture miscible in the low miscibility dewaxing solvent used at a filter temperature which permits the waxy oil to possess a pour point of at least -21 °C, preferably about -24 °C, most preferably about -27 °C. The amount of added light oil can range between about 5 to 50% by vol. of the oil mixture, preferably about 20 to 40 vol.%.

The solvent dewaxing process which is benefited by operating on the dual component waxy feed stock is any typical solvent dewaxing process including those identified as dilution indirect chilling processes, pre-

dilution direct chilling processes or just direct chilling processes.

Indirect chilling processes include, for example, scraped surface chilling processes wherein the waxy oil charge is diluted with solvent to produce a solution which is passed through the scraped surface chiller wherein a refrigerant is passed through the outer jacket of the heat exchanger while a rotating scraper blade prevents wax build up in the inner surface of the chiller.

Direct chilling processes can employ either no dilution or predilution of the waxy charge. The waxy charge with or without dilution is then chilled by the injection of cold solvent directly into the waxy charge.

A preferred embodiment of dilution chilling is the DILCHILL process wherein the waxy charge is passed through a chilling tower divided into stages and cold solvent is injected into a number of said stages. In those stages into which cold solvent is injected, a high level of agitation is maintained so that substantially instantaneous mixing of the chilling solvent and waxy oil is achieved thereby avoiding detrimental shock chilling. This procedure is described in greater detail in U.S. Patent 3,773,650. In an alternate embodiment the waxy oil is chilled to a temperature about 35 °F above the filter temperature in the apparatus described above, with chilling down to the filter temperature being performed in a subsequent scraped surface chiller. This embodiment is described in U.S. Patent 3,775,288.

The low miscibility dewaxing solvents which are typically used in solvent dewaxing processes and which are the same solvents which are used in the process of the present invention include C_3-C_6 ketones such acetone, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK) and mixtures thereof, such as MEK/MIBK.

The heavy high boiling high VI waxy oil can be that material obtained by isomerizing wax either synthetic wax as is obtained from Fischer-Tropsch synthesis or natural wax as is obtained by dewaxing hydrocarbon oils, commonly called slack wax or a natural petroleum material such as hydrocracked oil, deasphalted 600N or, Bright Stock oil. When the waxy oil to be dewaxed is a heavy high boiling high VI wax isomerate, it is preferred that the total fraction of oil boiling in the lube oil boiling range (i.e. about 330 °C and above preferably about 370 °C and above) be the feed to the dewaxing process of the present invention, i.e. utilizes the addition of a light oil fraction to facilitate dewaxing under miscible conditions. In general heavy-high boiling-high VI materials be they isomerates natural oils, or hydrocracked oils are those materials having a viscosity in the range 6 to 12 cSt (12 mm^2/s) @ 100 °C, preferably 8 to 10 cSt (8-10 mm^2/s) @ 100 °C, a mid LV% boiling point of 450 to 550 °C, preferably 475 to 525 °C and a VI of at least 120, preferably at least 140.

The light, lower boiling lower VI oil is one having a viscosity of about 3 to 7 cSt (3-7 mm^2/s) @ 100 °C, preferably about 4 to 6 cSt (4-6 mm^2/s) @ 100 °C, a 90% off point about 0 to 300 °F (0 to 166,7 °C), preferably about 50 to 100 °F (27,8 to 55,6 °C), lower than the 10% off point of the heavy oil and a VI of less than about 110, preferably less than about 100.

In the process of the present invention the heavy oil is mixed with a volume of light oil to permit operation of the solvent dewaxing process under miscible conditions at a filter temperature low enough to produce an oil having a pour point of at least -21 °C.

After processing the mixed oil feed through the solvent dewaxing process the resulting dewaxed oil product is fractionated into fractions corresponding very closely to the original parent materials (i.e. a light oil fraction of conventional VI and a heavy oil fraction of high VI). Each of these fractions possesses a pour point of at least about -21 °C, the pour point of the mixture. The yield of heavy oil of -21 °C pour obtained by this co-processing technique is higher than that achievable by processing the heavy oil by itself.

The wax which is isomerized may come from any of a number of sources. Synthetic waxes from Fischer-Tropsch processes may be used, as may be waxes recovered from the solvent or autorefrigerative dewaxing of conventional hydrocarbon oils as well as mixtures of these waxes. Waxes from dewaxing conventional hydrocarbon oils are commonly called slack waxes and usually contain an appreciable amount of oil. The oil content of these slack waxes can range anywhere from 0 to 45% or more, usually 5 to 30% oil. For the purposes of this application, the heavy waxes recovered from the dewaxing of Bright Stock and the heavy Fischer-Tropsch waxes are the feeds of choice.

Hydroisomerization may be performed over any of the standard hydroisomerization catalysts which contain a hydrogenation metal selected from Group VIB and Group VIII and mixtures thereof, preferably the Group VIII metals, more preferably the noble Group VIII metals, most preferably platinum. Metal loading ranges between 0.1 to 5.0 wt% metal, preferably 0.1 to 1.0 wt% metal, most preferably 0.2 to 0.6 wt% metal.

The hydrogenation metal component is supported on a refractory inorganic metal oxide support, preferably alumina or silica-alumina, most preferably the transition aluminas, e.g., gamma alumina. Preferably the support is halogenated. The halogen is usually chlorine or fluorine or mixture thereof, preferably fluorine, with net halogen content in the range 1 to 10 wt%, preferably 2 to 8 wt%.

Isomerization is conducted under conditions of temperature between about 250 to 400 °C, preferably 270-360 °C, pressures of 500 to 3000 psi H_2, preferably 1000-1500 psi H_2, hydrogen gas rates of 1000 to 10,000 SCF/bbl, and a space velocity in the range 0.1-10 v/v/hr, preferably 1-2 v/v/hr.

Preferred catalysts are the subject of U.S. Patent 4,959,337, U.S. Patent 4,906,601 and U.S. Patent 4,900,707.

The use of these catalysts for the production of a lube oil base stock or blending stock by the isomerization of wax is the subject of U.S. Patent 4,929,795, U.S. Patent 4,923,588, and U.S. Patent 4,937,399 respectively.

A most preferred catalyst is the subject of U.S. Patent 4,906,601. The use of that catalyst for wax isomerization is the subject of U.S. Patent 4,923,588.

That catalyst comprises a noble Group VIII metal on low fluoride content small particle size refractory metal oxide base. The catalyst is characterized by having a fluoride content in the range of 0.1 to up to but less than 2 wt%, preferably 0.1 to 1.5 wt%, more preferably 0.2 to 1.0 wt%, a particle diameter of less than 1/16 inch and a preferred noble Group VIII metal loading in the range of 0.1 to 2.0 wt%. The preferred small particle support is 1/20 inch trilobe alumina.

As one would expect, noble metal isomerization catalysts are extremely susceptible to deactivation by the presence of heteroatom compounds (i.e. N, O or S compounds) in the wax feed so care must be exercised to remove such heteroatom materials from the wax feed charges. When dealing with high purity waxes such as synthetic Fischer-Tropsch waxes, such precautions may not be necessary. In such cases, subjecting such waxes to very mild hydrotreating may be sufficient to insure protection for the isomerization catalyst. On the other hand, waxes obtained from natural petroleum sources contain quantities of heteroatom compounds as well as appreciable quantities of oil which contain heteroatom compounds. In such instances the slack waxes should be hydrotreated to reduce the level of heteroatom compounds to levels commonly accepted in the industry as tolerable for feeds to be exposed to isomerization catalysts. Such levels will typically be a N content of about 1 to 5 ppm and a S content of about 1 to 20 ppm, preferably 2 ppm or less nitrogen and 5 ppm or less sulfur. Similarly, such slack waxes prior to hydrotreating should be deoiled to an oil content in the range of 0 to 35% oil, preferably 5 to 25% oil. The hydrotreating step will employ a typical hydrotreating catalyst such as Co/Mo or Ni/Mo on alumina under standard, commercially acceptable conditions, e.g., temperature of 280 to 400 °C, space velocity of 0.1 to 2.0 V/V/hr, pressure of from 500 to 3000 psig H_2 and hydrogen gas rates of from 500 to 5000 SCF/bbl.

The present invention will be better understood by reference to the following non-limiting examples.

Figure 1 shows how the miscibility of a Fischer-Tropsch 8.7 cSt (8,7 mm^2/s) @100 °C isomerate fraction boiling in the 550 to 575 °C range (about equivalent to a 250N viscosity grade) can be improved about 10 °C with the addition of 33% of a conventional 150N basestock. Filtration studies were performed with this combined feedstock and compared with base case evaluation of the neat Fischer-Tropsch 8.7 cSt (8,7 mm^2/s) @100 °C wax isomerate. The isomerate was made by isomerizing a Fischer-Tropsch 150 wax as feed over an isomerization catalyst comprising 0.6 Pt/5.6% F/Al_2O_3 at a temperature between 365 to 375 °C, a pressure of 1000 psig, a H_2 flow rate of 7500 SCF H_2/bbl and a LHSV of 1. The dewaxing data are given in Table 1.

In an effort to reach the -21 °C pour target, solvent composition of the MEK/MIBK system was lowered to 10% MEK and the dewaxing of 100% Fischer-Tropsch 8.7 cSt (8,7 mm^2/s) @100 °C wax isomerate was performed at a filter temperature just below miscibility (degrees from miscibility -3). Typical of immiscible dewaxing, the process gave a low pour filter temperature spread and high filter rates. However, as is normally experienced with immiscible dewaxing, the wash efficiency with two liquid phases is very poor and the resulting low yield of 15.7 wt% is unacceptable. Although not measured directly it is calculated, based on typical immiscible isomerate dewaxing data that the product had a VI of about 158, a viscosity at 100 °C of about 8.0 cSt (8,0 mm^2/s). It has been observed that on going from miscible dewaxing to immiscible dewaxing a viscosity decrease is common while VI shows very little change.

Going to miscible dewaxing, as was done in the second case by raising the filtration temperature, raised the yields to acceptable levels but the attainable pour point was raised to only -10 °C.

Using a blend of conventional 150N oil and Fischer-Tropsch 8.7 cSt (8,7 mm^2/s) @100 °C wax isomerate the filter temperature can be lowered below the target pour without immiscibility occurring. Low pours (-21 °C) were achieved at good yields. The lower filtration rate of 5.2 m^3/M^2d is not necessarily cause for concern as plants running 600N stocks are typically designed for filter rates of 4 to 6 m^3/m^2d and techniques to handle these rates are known.

As one might expect, the product from the dewaxer is a mixture of conventional and non-conventional lube. Crucial to the process is the successful separation of the light dewaxed oil from the heavy dewaxed oil e.g. the light conventional oil from the heavier isomerate oil. While any separation process (distillation,

extraction, membranes, etc.) could be considered, the simplest and most straight forward process is distillation. For that reason low boiling conventional lubes are co-processed with the relatively high boiling isomerate oils. It is interesting to note that this does not imply a wide difference in viscosity grades. Due to the highly paraffinic nature of the isomerate oil it has a much higher boiling point than equivalent viscosity conventional stocks. This difference in the viscosity/boiling point relationship makes the separation of a 5.0 cSt 150N oil and a 8.7 cSt Fischer Tropsch wax isomerate quite feasible as demonstrated in Table 2.

The dewaxed oil product from the co-processing was cut into fractions which were then reblended to roughly the same specifications as would be possessed by individually processed dewaxed oil fractions (See Table 2).

Using the 40% to Final Boiling Point blend, a 9.2 cSt (9,2 mm^2/s), 148 VI, -22 °C pour product was made, leaving a 102 VI, 4.7 cSt (4,7 mm^2/s), -22 °C pour conventional stock. These specifications are very close to the parent materials. Surprisingly it has been found that not only is the dewaxing of the heavy oil fraction made easier by the procedure of dewaxing a heavy oil/light oil blend, but also the yield of dewaxed heavy oil is higher. Thus, while 100 barrels of Fischer-Tropsch isomerate can be dewaxed to give 15.7 barrels of -21 °C pour oil (15.7 LV%, see Table 1), when these same 100 barrels of Fischer-Tropsch isomerates are mixed with 50 barrels of 150N oil (to give a total of 150 barrels of oil to be dewaxed) a total dewaxed oil yield of 49.3% is obtained (74 barrels DWO based on 150 barrels mixture) and upon fractionation 60% or 44.4 barrels (60% of 74 barrels) is found to constitute the amount of oil having a VI, viscosity and pour corresponding to the 15.7 barrels obtained when the Fischer-Tropsch isomerate was dewaxed by itself. Thus, yield of the premium quality high VI oil is increased at the same time the dewaxing is made easier (See Figure 2).

This yield increase is much greater than what one would obtain from simply mixing fractions of separately dewaxed FT isomerate and 150N oil. Linear blending of such fractions to give a final product with a 148 VI would require a mixture of 84 LV% FT isomerate/16 LV% 150N. This blend would produce a yield of only 18.7% compared to the about 44% of 148 VI product obtained by co-processing. The oil product obtained by linear blending would also be of different quality. Whereas coprocessing gives a yield of 44.4% of a 148 VI, 55.21 cSt (55,21 mm^2/s) @ 40 °C, 9.19 cSt (9,19 mm^2/s) @ 100 °C material, linear blending would produce an 18.7% yield of a 148 VI, 44.78 cSt (44,78 mm^2/s) @ 40 °C, 7.9 cSt (7,9 mm^2/s) @ 100 °C product. Furthermore, coprocessing followed by fractionation produces a light oil of 102 VI and 5 Vis which is obviously superior to the base 150N oil fraction which, when separately dewaxed produced a DWO of 90 VI and 5 Vis.

Table 1

EVALUATION OF NCL/CONVENTIONAL CO-PROCESSED DEWAXING

Feed Composition, %	100/Fischer Tropsch 8.7 cSt isomerate	100/Fischer Tropsch 8.7 cSt isomerate	67/Fischer Tropsch 8.7 cSt isomerate 33/150N	150N
Solvent Composition, %	10/MEK 90/MIBK	20/MEK 80/MIBK	20/MEK 80/MIBK	20MEK 80MIBK
Filter Temperature, °C	-25	-15	-23	-25
Degrees from Miscibility, °C	-3	+3	+4	+20
Feed Filter Rate, m^3/m^2d	19.1	6.2	5.2	11.0
Wax Cake Liquids/Solids, V/V	3.6	3.5	5.6	5.0
Dewaxed Oil Yield, wt% (wash - filter time)	15.7	56.5	49.3	68.0
Dewaxed Oil Pour, °C	-23	-10	-21	-21

1 cSt = $1mm^2/s$

Table 2

DEWAXED OIL INSPECTIONS

FISCHER-TROPSCH WAX ISOMERATE/150N 2/1 DEWAXED AT -25°C

	A	B	C	D	E	Total Reblend Calc by Wt
Inspections of Distillate Cuts	325	376	327	328	329	
Dist Cut LV%	100	I-35	35-45	45-55	55-64	65-100
Temp °C		I-458	458-487	487-509	507-519	5194
Wt% Act.	100	36.3	10.1	9.6	9.7	33.5
Autopour, °C	-21	-23	-24	-22	-21	-21
Microtube Cloud, °C	-24	-24	-25	-22	-20	-21
API Gravity at 60°F	34.6				.8405	.8405
Density at 15°C	0.8515	.8724	.8682	.8501		
Vis at 40°C cSt	40.65	22.97	46.19	46.17	48.28	62.54 42.72
Vis at 100°C cSt	7.03	4.38	7.23	7.78	8.36	10.24 7.31
VI	134	97	117	137.5	149	151.5 135
RI at 75°C	1.4502	1.4572	1.4561	1.4485	1.4444	1.4441
Inspections of Blends						
DWO Sample	Fischer Tropsch Wax	Hi VI 9 Vis fraction from combined feed dewaxing	150N 011	Low VI 5 Vis fraction from combined feed dewaxing		
Dist Cut. LV%	100	~40 to FBP	100	~1 to 40%		
Vis at 40°C cSt	48.26	55.21	30.23	25.03		
at 100°C cSt	8.65	9.19	5.02	4.66		
VI	159.0	148.0	90	102.0		
Density at 15°C	0.831	0.841	0.874	0.868		
RI at 75°C	1.4422	1.4461	1.4609	1.4572		
DWO Pour °C (Autopour)	-10	-22	-21	-22		
DWO Cloud °C (Microtube)	-10	-21		-24		

1 cSt = $1 mm^2/s$

Claims

1. A method for producing high boiling, high viscosity index (VI) dewaxed oils having a pour point of -21 °C or lower by solvent dewaxing under miscible conditions using low miscibility dewaxing solvents, said process involving the step of combining a low boiling conventional VI waxy oil with the high boiling

high VI oil and co-processing the mixture under conventional miscible solvent dewaxing conditions using low miscibility dewaxing solvent, selected from a C_3 - C_6 ketone or a mixture of two or more C_3 - C_6 ketones, wherein the high boiling, high VI oil is any natural petroleum oil, hydrocracked oil, or oil obtained by the isomerization of wax, said oil having a viscosity in the range of from 6 to 10 cS (6 to 10 $\mu m^2/s$) at 100 °C , a mid LV% boiling point of from 450 to 550 °C and a VI of at least about 120, and the low boiling, conventional VI waxy oil has a viscosity of from 3 to 7 cS (3 to 7 $\mu m^2/s$) at 100 °C, a 90% off-point from 0 to 300 °F, (0 to 166.7 °C) lower than the 10% off-point of the high boiling, high VI oil and a VI of less than about 110, wherein the amount of low boiling, conventional VI oil added to the high boiling, high VI oil is in the range of from 5 to 50% by volume.

2. The method of claim 1 wherein the high boiling, high VI oil has a viscosity in the range of from 8 to 10cS (8 to 10 $\mu m^2/s$) at 100 °C, a mid LV% boiling point of from 475 to 525 °C and a VI of at least 140.

3. The method of claim 1 or claim 2 werein the low boiling conventional VI oil has viscosity of about 4 to 6 cS (4 to 6 $\mu m^2/s$) at 100 °C, a 90% off-point 50 to 100 °F (27.8 to 55.6 °C) lower than the 10% off-point of the high boiling, high VI oil and a VI of less than about 100.

4. The method of any one of claims 1 to 3 wherein the amount of low boiling, conventional VI oil added to the high boiling, high VI oil is in the range of 20 to 40 vol.%.

Patentansprüche

1. Verfahren zur Herstellung hochsiedender entparaffinierter Öle mit hohem Viskositätsindex (VI) und einem Stockpunkt von -21 °C oder darunter durch Lösungsmittelentparaffinierung unter mischbaren Bedingungen unter Verwendung von Entparaffinierungslösungsmitteln mit niedriger Mischbarkeit, bei dem ein niedrigsiedendes paraffinhaltiges Öl mit konventionellem VI mit dem hochsiedenden Öl mit hohem VI kombiniert und die Mischung unter konventionellen mischbaren Lösungsmittelentparaffinierungsbedingungenunter Verwendung von Entparaffinierungslösungsmitteln mit niedriger Mischbarkeit ausgewählt aus einem C_3- bis C_6-Keton oder einer Mischung aus zwei oder mehr C_3- bis C_6-Ketonen zusammen verarbeitet wird, wobei das hochsiedende Öl mit hohem VI ein beliebiges natürliches Petroleumöl, hydrogecracktes Öl oder durch die Isomerisierung von Paraffin erhaltenes Öl ist, das Öl eine Viskosität im Bereich von 6 bis 10 cS (6 bis 10 $\mu m^2/s$) bei 100 °C, einen mittleren Flüssigvolumen (LV) % Siedepunkt von 450 bis 550 °C und einen VI von mindestens etwa 120 aufweist und das niedrigsiedende paraffinhaltige Öl mit konventionellem VI eine Viskosität von 3 bis 7 cS (3 bis 7 $\mu m^2/s$) bei 100 °C, einen 90 % Siedepunkt, der 0 bis 300 °F (0 bis 166,7 °C) niedriger als der 10 % Siedepunkt des hochsiedenden Öls mit hohen VI ist, und einen VI von weniger als etwa 110 aufweist, wobei die Menge des dem hochsiedenden Öl mit hohem VI zugesetzten niedrigsiedenden Öls mit konventionellem VI im Bereich von 5 bis 50 Vol.% liegt.

2. Verfahren nach Anspruch 1, bei dem das hochsiedende Öl mit hohem VI eine Viskosität im Bereich von 8 bis 10 cS (8 bis 10 $\mu m^2/s$) bei 100 °C, einen mittleren LV%-Siedepunkt von 475 bis 525 °C und einen VI von mindestens 140 aufweist.

3. Verfahren nach Anspruch 1 oder Anspruch 2, bei dem das niedrigsiedende Öl mit konventionellem VI eine Viskosität von 4 bis 6 cS (4 bis 6 $\mu m^2/s$) bei 100 °C, einen 90 % Siedepunkt, der 50 bis 100 °F (27,8 bis 55,6 °C) niedriger als der 10 % Siedepunkt des hochsiedenden Öls mit hohem VI ist, und einen VI von weniger als etwa 100 aufweist.

4. Verfahren nach einem der Ansprüche 1 bis 3, bei dem die Menge des dem hochsiedenden Öl mit hohem VI zugesetzten niedrigsiedenden Öls mit konventionellem VI im Bereich von 20 bis 40 Vol.% liegt.

Revendications

1. Procédé de production d'huiles déparaffinées de haut indice de viscosité (IV) et de haut point d'ébullition ayant un point d'écoulement de -21 °C ou moins par déparaffinage par solvants dans des conditions de miscibilité en utilisant des solvants de déparaffinage de faible miscibilité, ledit procédé comprenant les stades suivants : on combine une huile paraffinée d'IV classique et de bas point

d'ébullition avec l'huile de haut IV et de haut point d'ébullition et on traite conjointement le mélange dans des conditions de déparaffinage par solvants miscibles classiques en utilisant un solvant de déparaffinage de faible miscibilité, choisi parmi une cétone en C_3-C_6 ou un mélange de deux ou plusieurs cétones en C_3-C_6, procédé dans lequel l'huile de haut IV et de haut point d'ébullition est une huile de pétrole naturelle quelconque, une huile hydrocraquée, ou une huile obtenue par isomérisation de cire, ladite huile ayant une viscosité dans la plage de 6 à 10 cS (6 à 10 mm^2/s) à 100 °C, un point d'ébullition à 50 % en volume de liquide de 450 à 550 °C et un IV d'au moins environ 120, et l'huile paraffinée d'IV classique et de bas point d'ébullition a une viscosité de 3 à 7 cS (3 à 7 mm^2/s) à 100 °C, un point de coupure, correspondant à un volume distillé de 90%, inférieur de 0 à 300 °F (0 à 166,7 °C) au point de coupure, correspondant à un volume distillé de 10 %, de l'huile de haut IV et de haut point d'ébullition et un IV inférieur à environ 110, la quantité d'huile d'IV classique et de bas point d'ébullition ajoutée à l'huile de haut IV et de haut point d'ébullition se situant dans la plage de 5 à 50 % en volume.

2. Procédé selon la revendication 1, dans lequel l'huile de haut IV et de haut point d'ébullition a une viscosité dans la plage de 8 à 10 cS (8 à 10 mm^2/s) à 100 °C, un point d'ébullition à 50 % en volume de liquide de 475 à 525 °C et un IV d'au moins 140.

3. Procédé selon la revendication 1 ou 2, dans lequel l'huile d'IV classique et de bas point d'ébullition a une viscosité d'environ 4 à 6 cS (4 à 6 mm^2/s) à 100 °C, un point de coupure correspondant à un volume distillé de 90 % inférieur de 50 à 100 °F (27,8 à 55,6 °C) au point de coupure correspondant à un volume distillé de 10 % de l'huile de haut IV et de haut point d'ébullition et un IV inférieur à environ 100.

4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel la quantité d'huile d'IV classique et de bas point d'ébullition ajoutée à l'huile de haut IV et de haut point d'ébullition se situe dans la plage de 20 à 40 % en volume.

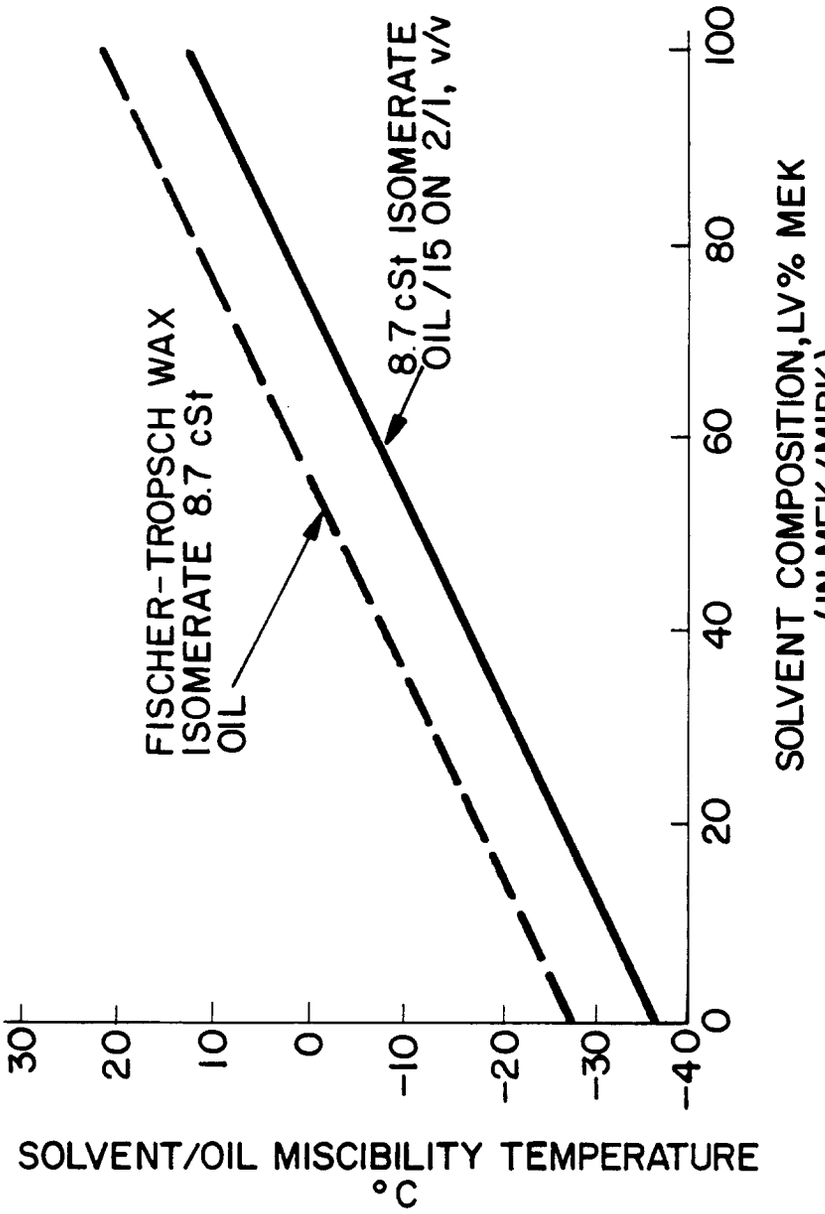
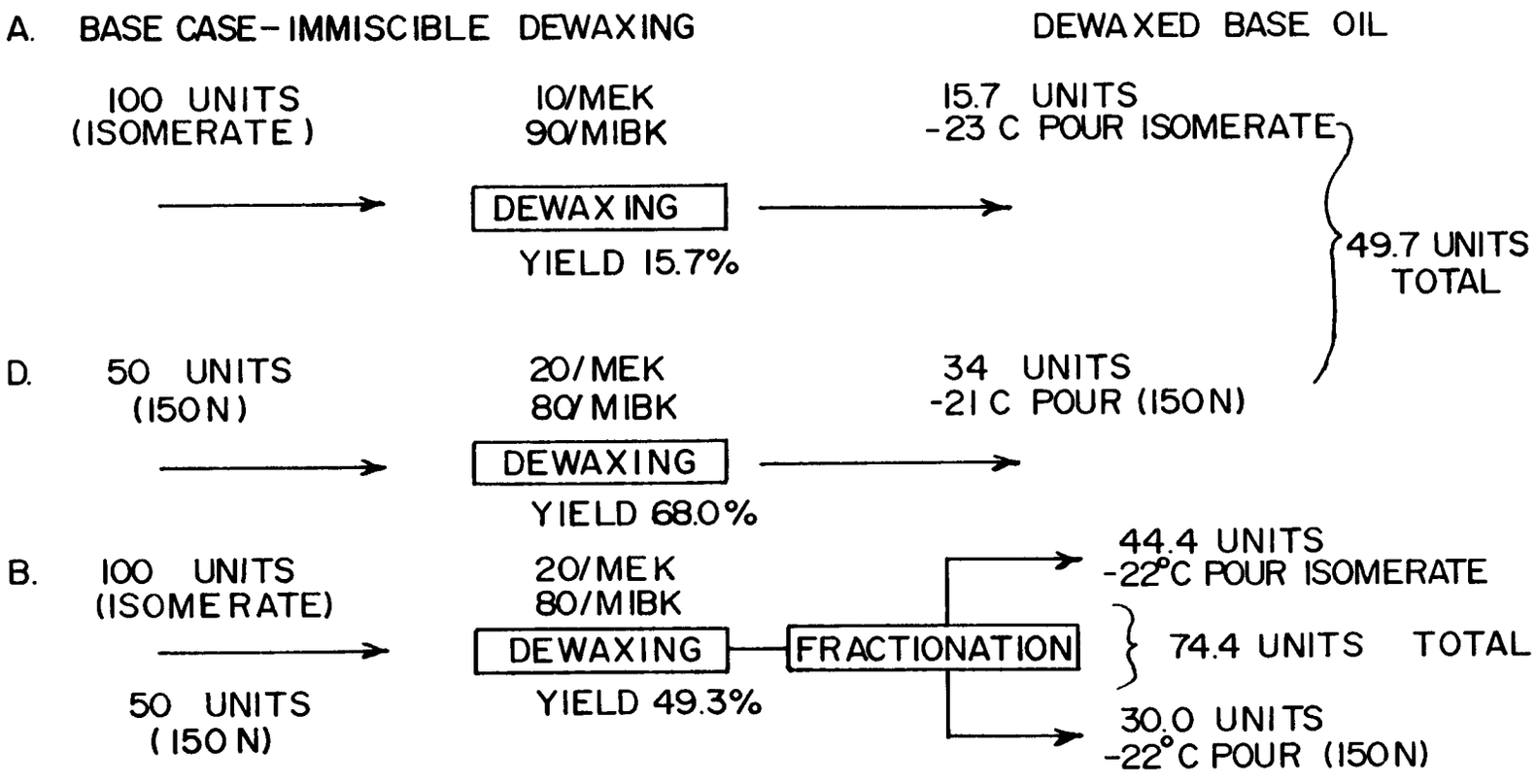

FISCHER-TROPSCH WAX
ISOMERATE 8.7 cSt
OIL
8.7 cSt ISOMERATE
OIL/15 ON 2/1, v/v
30
20
10
0
-10
-20
-30
-40
0
20
40
60
80
100
SOLVENT/OIL MISCIBILITY TEMPERATURE
°C
SOLVENT COMPOSITION, LV% MEK
(IN MEK/MIBK)

FIG. 1

YIELD ADVANTAGE OF CO-PROCESSING



RELATIVE ISOMERATE YIELD ADVANTAGE 44.4/15.7 = 2.83/1

FIG. 2