

(19)



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(11)

EP 1 164 181 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

19.12.2001 Bulletin 2001/51

(51) Int Cl.7: **C10G 67/04**

(21) Application number: **00112679.6**

(22) Date of filing: **15.06.2000**

(84) Designated Contracting States:

**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**

Designated Extension States:

AL LT LV MK RO SI

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(54) **Process oil production**

(57) A method for producing a process oil is provided in which an aromatic extract oil is added to a paraffinic rich feed to provide a blended feed. The blended feed

is then extracted with an aromatic extraction solvent to yield a raffinate which subsequently is hydrotreated to provide a process oil.

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DescriptionFIELD OF THE INVENTION

[0001] The present invention is concerned generally with the production of process oils from paraffinic rich feeds.

BACKGROUND OF THE INVENTION

[0002] The properties of paraffinic rich feeds make them particularly useful in a broad range of oils used in a wide variety of industrial applications. For example, the paraffinic oils may be used in rubber processing for reasons such as reducing the mixing temperature during the processing of the rubber, and preventing scorching or burning of the rubber polymer when it is being ground down to a powder, or modifying the physical properties of the finished rubber. These oils are finished by a refining procedure which imparts to the oils their excellent stability, low staining characteristics and consistent quality.

[0003] End-users of such process oils desire oils with increased solvency as indicated by a lower aniline point. Accordingly, one object of the present invention is to provide a process oil that has a lower aniline point and consequently increased solvency above what could be obtained from paraffinic distillates alone, by using paraffinic distillates in admixture with their co-produced extracts.

[0004] Due to the decline in the availability of conventional naphthenic feeds, paraffinic distillates are being substituted for portions or all of some naphthenic distillates since the demand for higher solvency process oils is still increasing. Accordingly, it is another object of the present invention to provide process oils with increased solvency using lesser amounts of paraffinic rich feeds.

SUMMARY OF THE INVENTION

[0005] A method for producing a process oil is provided which comprises:

adding an aromatic containing extract oil to a paraffinic rich feed to provide a blended feed for processing;

extracting the blended feed with an aromatic extraction solvent at temperatures in the range of about 50°C to about 150°C and at solvent to feed ratios in the range of about 0.5:1 to about 3:1 by volume to obtain a raffinate for hydrofinishing;

and then hydrotreating the raffinate in a hydrotreating stage maintained at a temperature of about 275°C to about 375°C, a hydrogen partial pressure of about 300 to about 2500 psia, and at a space velocity of about 0.1 to about 2.0 v/v/hr to provide a process oil.

[0006] These and other embodiments of the present invention will become apparent after a reading of detailed description which follows.

DETAILED DESCRIPTION OF THE INVENTION

[0007] Typically the paraffinic rich feed used to produce process oils in accordance with the method of the present invention will comprise virgin and/or synthetic hydrocarbons, although other paraffinic rich materials obtained by extraction or alkane or ketone dewaxing, catalytic dewaxing and the like may be utilized.

[0008] In accordance with the present invention, an aromatic extract oil is added to the paraffinic rich feed to provide a blended feed for hydrotreating. Preferably the aromatic extract oil used in the present invention will have an aniline point less than about 60°C for high viscosity oils (e.g., greater than about 35 cSt @ 100°C) and less than about 70°C for low viscosity oils (e.g., about 2 cSt to about 35 cSt @ 100°C).

[0009] Such an aromatic oil suitable in the process of the present invention is readily obtained by extracting a naphthenic or paraffinic rich feed such as a distillate with aromatic extraction solvents at temperatures in the range of about 50°C to about 150°C in extraction units known in the art. Typical aromatic extraction solvents include N-methylpyrrolidone, phenol, N-N-dimethylformamide, dimethylsulfoxide, methylcarbonate, morpholine, furfural, and the like and preferably N-methylpyrrolidone or phenol. Solvent to oil treat ratios are generally about 0.5:1 to about 3:1. The extraction solvent preferably contains water in the range of about 1 vol.% to about 20 vol. %. Basically the extraction can be conducted in a counter-current type extraction unit. The resultant aromatic rich solvent extract stream is then solvent stripped to provide an aromatic extract oil having an aromatic content of about 50% to 90% by weight.

[0010] The aromatic extract oil is mixed with the same or different viscosity paraffinic rich feed in an extract to feed

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volume ratio in the range of about 10:90 to about 90:10, preferably 25:75 to 50:50. Typical but not limiting examples of paraffinic feed and extract oils are provided in Tables 1 and 2 for low and high viscosity oils, respectively.

TABLE 1

LOW VISCOSITY PARAFFINIC FEED AND EXTRACT OIL - 75N		
Physical Properties (Waxy)	Paraffinic Feed	Extract Oil
Density, 15°C	0.8866	0.9332
Calc Viscosity cSt @ 100°C	3.2	3.6
Refractive Index @ 75°C	1.4713	1.5021
Aniline Point, °C	81.3	53.0
Pour Point, °C	21.0	12.0
Sulfur, wt. %	1.2	2.0
Dewaxed Viscosity Index @ -9°C Pour	71	N/A*
Compositional Properties (Waxy)		
Saturates, wt. %	62	44
Polars & Aromatics, wt. %	38	56

* Viscosity Index of coproduced raffinate at -9°C pour is 95

TABLE 2

HIGH VISCOSITY PARAFFINIC FEED AND EXTRACT OIL - 600N		
Physical Properties (Waxy)	Paraffinic Feed	Extract Oil
Density 15°C	0.9327	0.9670
Viscosity, cSt @ 100°C	17.7	42.2
Refractive Index @ 75°C	1.5036	1.5511
Aniline Point, °C	90.3	44.0
Pour Point, °C	48.0	6.0
Sulfur, wt. %	1.7	3.0
Dewaxed Viscosity Index @ -9° Pour	39	N/A*
Compositional Properties (Waxy)		
Saturates, wt. %	42	17
Polars & Aromatics, wt. %	58	83

*Viscosity Index of coproduced raffinate at -9°C pour is 100

[0011] The resultant mixture is then subjected to a solvent extraction using aromatic extraction solvents such as those previously described in connection with obtaining the aromatic extract oil for blending, but under generally milder conditions. Thus, for example, in extracting the blended feed the ratio of solvent to blended feed is generally in the range of about 0.5:1 to about 3:1 and the extraction is conducted at a temperature in the range of about 50°C to about 150°C and the extraction solvent contains water in the range of about 1 vol% to about 20 vol%; and preferably greater than about 5 vol% to produce a raffinate.

[0012] The resultant raffinate is then subjected to a hydrotreating step in a single hydrotreating stage which is maintained at a temperature in the range of about 275°C to about 375°C and preferably within the range of 340°C to 365°C at a hydrogen partial pressure in the range of about 300 to about 2500 psia and preferably from 500 to 1200 psia. Hydrotreating is conducted at a liquid hourly space velocity in the range from about 0.1 to about 2.0 v/v/hour and

preferably from 0.5 to 1.0 v/v/hour.

[0013] The hydrotreating is effected conventionally under hydrogen pressure and with a conventional catalyst. Catalytic metals such as nickel, cobalt, tungsten, iron, molybdenum, manganese, platinum, palladium, and combinations of these supported on conventional supports such as alumina, silica, magnesia, and combinations of these with or without acid-acting substances such as halogens and phosphorous may be employed. A particularly preferred catalyst is a nickel molybdenum phosphorus catalyst supported on alumina, for example KF-840.

[0014] An optional dewaxing step could be conducted on the paraffinic rich feed or the hydrofinished product using catalytic dewaxing or alkane or ketone or catalytic dewaxing.

Claims

1. A method for producing a process oil comprising:

blending an aromatic extract oil and a paraffinic rich feed to provide a blended feed;

extracting the blended feed with an aromatic extraction solvent at a temperature of from 50°C to 150°C and a solvent to feed ratio of from 0.5:1 to 3:1 to obtain a raffinate for hydrotreating;

hydrotreating the raffinate in a single hydrotreating stage at a temperature of from 275°C to 375°C and a hydrogen partial pressure of from 2.07 to 17.2 MPaa (300 to 2500 psia) at a space velocity of from 0.1 to 2.0 v/v/hr whereby a process oil is produced.

2. The method of claim 1 wherein the aromatic extraction solvent contains greater than 5 vol% water.

3. The method of claim 1 wherein the aromatic extraction solvent contains from 1 vol% to 20 vol% water.

4. The method of any preceding claim wherein the paraffinic rich feed is a paraffinic distillate.

5. The method of any preceding claim wherein the aromatic extract oil and the paraffinic feed are blended in the volume ratio of from 10:90 to 90:10.

6. The method of claim 5 wherein the volume ratio of aromatic extract oil to paraffinic feed is the range of from 25:75 to 50:50.

7. The method of any preceding claim wherein the aromatic extract oil has an aromatic content of from 50% to 90% by weight.

8. The method of any preceding claim including dewaxing of the paraffinic rich feed or the hydrofinished oil using catalytic dewaxing or alkane or ketone dewaxing.

9. A method for producing a process oil comprising:

(a) solvent extracting a naphthenic rich feed with an aromatic extraction solvent to obtain an aromatic rich solvent stream;

(b) removing the solvent from the aromatic rich solvent stream to obtain an aromatic extract oil;

(c) blending the aromatic rich extract oil and a paraffinic rich feed to obtain a blended feed;

(d) extracting the blended feed under milder conditions than the extraction of step (a) with an aromatic extraction solvent at a temperature of from 50°C to 150°C, and a solvent to feed ratio of from 0.5:1 to 3:1 to obtain a raffinate;

(e) hydrotreating the raffinate at a temperature in the range of from 275°C to 375°C, at a hydrogen partial pressure of from 2.07 to 17.2 MPaa (300 to 2500 psia) at a space velocity of from 0.1 to 2.0 v/v/hr.

10. The method of claim 9 wherein the aromatic extraction solvent of step (d) contains from 1 vol% to 20 vol% water.

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11. The method of claim 9 or 10 wherein the aromatic extraction solvent of step (d) contains greater than 5 vol% water.

12. The method of claim 9, 10 or 11 wherein in step (c) the volume ratio of aromatic extract oil to paraffinic feed in the blended feed is in the range of from 10:90 to 90:10.

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13. The method of claim 12 wherein the volume ratio of aromatic extract oil to paraffinic feed is in the range of from 25:75 to 50:50.

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14. The method of any of claims 9 to 13 wherein the feed or hydrotreated raffinate oil is dewaxed using catalytic or alkane or ketone dewaxing.

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EUROPEAN SEARCH REPORT

Application Number
EP 00 11 2679

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.7)
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			C10G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 31 October 2000	Examiner Michiels, P
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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31-10-2000

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