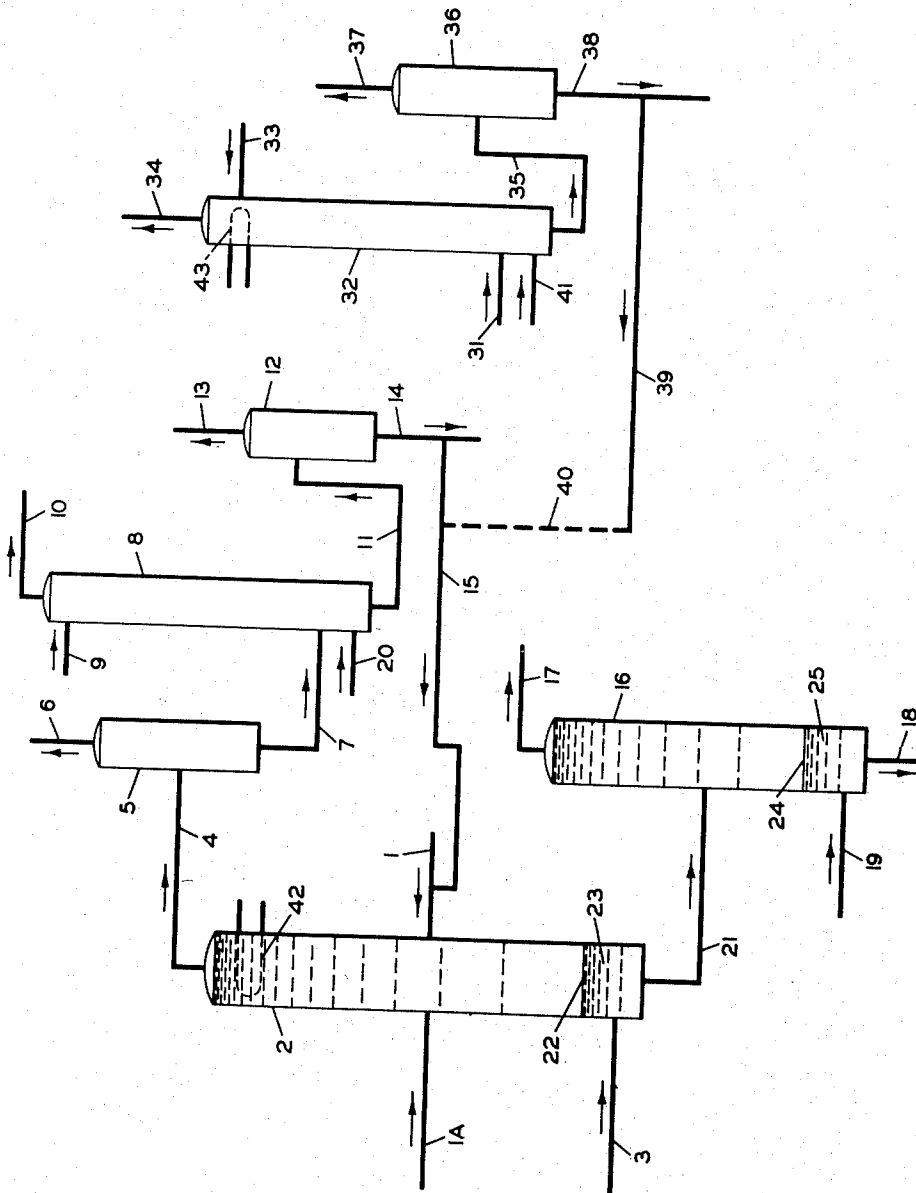


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PROPANE FRACTIONATION OF REDUCED CRUDE OIL WITH RECYCLE OF A SOL- VENT EXTRACT

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1

This invention relates to propane-fractionation of lubricating oil stocks. In one of its more specific aspects it relates to a method for the treatment of low asphalt-containing lubricating oil stocks for the separation and recovery of lubricating oil fractions. In a still more specific aspect it relates to a process for the separation and recovery of lubricating oil fractions from crude lubricating oil stocks containing asphaltic constituents by treatment with liquid propane wherein the asphaltic constituents are not precipitated and caked in oil fractionating apparatus.

Deasphalting petroleum oils and more particularly reduced crude oils from which distillate lubricating oil fractions have been removed is old in the art. Such operations are usually carried out at temperatures between about 70° and 140° F. to take advantage of the precipitating action of propane on the heavy asphaltic constituents of the oil. It has also been recognized for many years that a fractionating effect can be obtained with propane-oil mixtures at temperatures ranging from about 140° F. up to the critical of propane. Utilizing the unique properties of liquid propane whereby increasing temperatures result in progressive rejection of hydrocarbons in such a manner that the higher molecular weight components and the more aromatic and naphthenic components are separated first and the lighter components and more paraffinic hydrocarbons last, a combination of low temperature distillation and solvent extraction is achieved. However, due to the difficulties involved in working at high pressures and in close proximity to the critical temperature of propane, commercial exploitation was unknown until quite recently.

It has been found, however, that some low-asphalt content reduced crude lubricating oil stocks may be fractionated continuously for long periods of time by liquid propane at high temperatures and under correspondingly high pressures, while other low-asphalt crude lubricating oil stocks can be fractionated for only short periods of time. In these latter cases it has been found that the contacting equipment became plugged with hard deposits of asphaltic material. These asphaltic materials had apparently been precipitated from the oil upon contact with the high temperature liquid propane. It should be mentioned that all the oils in question were low-asphalt content oils and did not differ significantly from each other in total content, as conventionally determined. Why certain of these oils caused plugging and others did not is not clearly understood.

An object of our invention is to devise a process in which a low-asphalt-containing reduced crude lubricating oil stock is fractionated for the separation and recovery of lubricating oil constituents. Another object of our invention is to

2

devise a method for the separation and recovery of lubricating oil fractions from such crude oil stocks by fractionation with liquid propane without the formation of hard asphaltic deposits in the oil fractionation apparatus. Still another object of our invention is to devise a continuous process for the separation and removal of lubricating oil fractions from low asphalt-containing reduced crude oil stocks suitable for the manufacture of lubricating oils by fractionation with propane wherein the asphaltic, naphthenic and aromatic oil constituents are stripped of some of their higher viscosity index oily constituents in such a manner that a hard mass does not deposit in the extraction equipment. Still other objects and advantages of our invention will be obvious to those skilled in the art upon reading the following disclosure, which, taken with the attached drawing, forms a part of this specification.

In preparing to apply the above mentioned unique properties of liquid propane to actual commercial separation of certain grades of lubricating oil from residual stocks, a hitherto unrecognized problem was encountered. Upon treating some Mid-Continent reduced crude oil stocks with liquid propane in a countercurrent contacting tower at a propane-to-oil volume ratio of about 7:1 with temperatures ranging from about 195° F. at the top to about 175° F. at the bottom of the tower an SAE 40 oil was separated in the overhead product. On the other hand, when a very similar Mid-Continent reduced crude oil stock was charged to the process under the same operating conditions a similar fraction of lubricating oil was initially obtained, but the column rapidly filled with a hard asphaltic material in the stripping section, thereby making continuous operation impossible. In this second case, the formation of a third phase, that is, a semi-fluid asphaltic phase was produced along with a propane-rich light oil phase and an oil-rich phase of propane in heavy oil. Upon contacting the charge oil with liquid propane this third phase when first formed was sufficiently fluid to flow nearly to the bottom of the column before the ascending propane had washed it sufficiently to cause it to set to a hard cake. Upon continued operation this cake builds up in the column until complete closure of the column occurs. Why one low asphalt-containing oil should deposit its asphalt while another low asphalt-containing oil does not when the two oils contain similar amounts of asphalt is not definitely known.

In a study of three well known Mid-Continent reduced crude oils which have been long recognized as excellent sources of lubricating oil stocks hard deposits were formed when treating two of these stocks with liquid propane while the third was fractionated with propane continuously and without difficulty. It has also been found that

3

some West Texas reduced crude oils can be fractionated with propane while others cannot on account of asphaltic deposition. It is therefore realized that propane fractionation cannot be universally applied to all so-called low-asphalt content reduced crude lubricating oil stocks.

We have discovered that the addition of aromatic and naphthenic extract oils, such as may be obtained from most any solvent extraction process, to the reduced crude oil feed to a fractionation column serves to modify the oil characteristics in such a manner that a hard third phase is not deposited in the propane solution. We have found further that by adding such extract oils to the feed stock to the propane column or to the feed plate of the column that the overall yield of high V. I. components is increased since some high V. I. components ordinarily lost in an extraction operation are recovered by our process. We have also found that in the propane fractionation of reduced crude oil stocks by our process for the production of such an oil as SAE 50 as overhead product the asphalt-containing bottoms may be further fractionated to produce an SAE 70 or 250 overhead oil, while bottoms from this last fractionation step may be still further fractionated. The aromatic and naphthenic extract oils may be introduced into the extraction column at or near the feed point.

The figure shows diagrammatically and in elevation one form of apparatus in which the process of our invention may be practiced.

The apparatus consists essentially of three main parts. The first part is a propane fractionation section consisting of columns 2 and 16. The second part consists of a solvent extraction system having a main extraction column 8 and a stripper column 12. The third portion is a more or less auxiliary portion of the apparatus and consists of a solvent extraction system having an extraction column 32 and a stripper 36.

Broadly speaking, our process consists in charging a reduced crude lubricating oil stock to the propane column 2 which has been previously filled with liquid propane under pressure. A solution of oil in propane leaves the top of this column through a line 4 and passes into a stripper column 5 at about its mid-section. The bottoms 23 which is an oil-rich phase containing some dissolved propane are removed from the propane column 2 through a line 21 to the second propane fractionation column 16. From this column a solution of oil in propane is removed from the top by way of a line 17 to recovery apparatus, not shown, for separating the oily constituents from the propane. An oil rich phase 25 containing some dissolved propane accumulates in the bottom of vessel 16. This phase may be withdrawn through a line 18 to a stripping vessel, not shown, for the separation of the propane from the asphaltic and other heavy oily constituents. Reference numeral 24 indicates the liquid-liquid interface between the upper propane solution containing dissolved oil and the lower oil rich phase containing some dissolved propane. Additional propane for this fractionation step is introduced through a line 19 into the oil rich phase 25.

The interface indicated by reference numeral 22 separates the propane solution of oil from the oil-rich phase in the primary fractionator 2. Propane for fractionation in this column is added through a line 3 directly into the oil-rich phase 23. A line 1A is provided for introduction of the reduced crude oil feed stock into column 2. Line 1 is also provided for introduction of the crude

4

oil feed stock into this column in case it is desired to mix some subsequently produced recycle stock with the feed charge prior to introduction of the latter into the column. The propane introduced into the oil phase 23 through line 3 and into the oil phase 25 through line 19 is introduced thereto by some distribution means, not shown. Good contact between rising propane globules and the heavy oil phase is intended so that the propane on reaching the interface 22 or the interface 24 is saturated or substantially saturated with propane-soluble oily constituents remaining in the oil-rich phase.

The stripper column 5 may be referred to as a depropanizer column since its function is primarily for the separation of propane from the oily constituents taken overhead through pipe 4 from fractionator 2. The separated propane leaves this depropanizer through an overhead line 6 and may be passed to a run storage, not shown; prior to recycling to the system. The propane-free oil is removed from the vessel 5 through a line 7 and passed into the lower portion of the extraction column 8. Into the top of this column through a line 9 is added an extraction solvent, for example, phenol. The oil from line 7 and the phenol from line 9 are countercurrently contacted in this column and the raffinate remaining after extraction is removed through an overhead line 10 to separation equipment, not shown. A line 20 is provided near the lower end of column 8 for introduction of some water in case a refluxing action in this part of the column is desired. The extract phase is removed through a line 11 and transferred to the stripper column 12 in which phenol is separated from the extract oil. From this separator the phenol may be transferred through a line 13 to a run storage vessel, not shown, while the extract oil is removed through a line 14 for passage to storage, not shown; or passage through a line 15 for cycling with the reduced crude oil charge stock into the primary propane fractionator 2.

The system of vessels 32 and 36 is provided for use when additional extract oil over that provided from vessel 12 is required for recycling into the primary fractionator 2. In column 32 phenol is introduced through a line 33 into the top of the column while an oil to be extracted is introduced through a line 31 at a point near the bottom of the column. Raffinate oil is removed through a line 34 at the top while the extract oil is removed through a line 35 from the bottom of this column and transferred into the stripper column 36 at about a mid-point. The stripped or recovered phenol is removed from this latter column through a line 37 and may be passed to storage, not shown, or recycled directly into the extraction column 32 through pipe 33. The extract oil accumulating in the bottom of the stripper 36 is removed through a line 38 and all or a portion thereof may be passed through a line 39 and line 40 for introduction into the stream of extract oil flowing in pipe 15 for charging to the main propane fractionator 2. That portion of oil from the bottom of vessel 36 not needed for recycling may be passed on through line 39 for such disposal as desired. The pipe 40 is shown in the drawing as a dotted line since under some conditions the oil from vessel 36 may not be used in the system and in this case vessels 32 and 36 are not needed.

Example I

A reduced crude oil of about 850° F. initial boiling point is prepared in apparatus, not shown, by

5

distillation of a Mid-Continent crude oil to remove the SAE 10 and 20 stocks. This reduced crude oil stock then contains all crude components heavier than the SAE 20 oil and it is then fractionated in the propane columns to produce SAE 50 and 70 oils as overhead products and a final oil-asphalt bottom product according to the following sequence of operations.

The reduced crude is charged into the propane column 2 through the line 1. This column, of course, is previously filled with liquid propane through line 3 and the column is maintained at a pressure of about 640 pounds per square inch gauge. The crude oil feed plate or ring is positioned at approximately midway between the top and bottom of the column or midway between the interface 22 and the top of the column. The temperature at the feed plate is maintained at about 185° F. During operation propane at about 175° F. is pumped into the column at the above mentioned pressure through line 3 at a rate such that the volume ratio of charged propane to oil feed is between 7:1 and 8:1. The ascending propane serves to strip the downflowing oil not dissolved by the propane solution at the feed plate while the fractionating section above the feed plate tends to precipitate the higher molecular weight and the more aromatic components from the propane-oil solution on account of the temperature gradient through the upper section of the column which ranges from about 185° at the feed plate to about 195° F. at the top. For maintenance of this relatively high top column temperature a heating coil 42 is provided.

The overhead product removed from column 2 is composed of a propane solution of SAE 40 to SAE 50 oil depending upon the particular operating conditions. The bottoms product from this column consists of the heavier lube oil components and the asphaltic components and is continuously removed through line 21 and charged into column 16 at a mid-point. In this column conditions of temperature, pressure and propane-to-oil ratio are so adjusted as to fractionate the feed into an SAE 70 or an SAE 250 stock which leaves this column through the line 17 as a propane solution. The asphaltic bottoms containing still some oily material and propane in solution is discharged through line 18 to such propane stripping and disposal as desired. In case an SAE 70 oil is taken overhead from column 16 and it is desired to produce also an SAE 250 oil, the bottoms oil from line 18 may then be passed into a third propane fractionator column similar to column 16. In this third column, then, the operating conditions will be maintained such that the 250 SAE oil will pass overhead in solution in propane and the asphaltic and still heavier oily material may be discharged from the bottom for still further treatment or for such disposal as desired. In both columns 2 and 16 the interface between the propane solutions of oil and the oil-rich phases are maintained at relatively low levels so that the main bodies of propane may have ample opportunity to extract soluble constituents from the oils charged to these two columns. However, these interfaces are sufficiently higher than the points of propane addition that by the time the propane reaches the interface it is almost saturated with soluble constituents from the respective oil-rich phases. The overhead stream of oil in propane from column 2 passes through the line 4 into the depropanizer column 5 in which the propane is separated from the oil. The separated propane is passed through a line

6

6 to storage or may be condensed and passed directly to the propane inlet line 3. It is preferable, however, to use a run storage tank. The extract oil recovered in the depropanizer 5 is passed through the line 7 into the lower portion of the solvent extraction column 8. The column 8 has, of course, been previously filled with solvent which in this example is phenol. During continuous operation phenol is fed into the column through line 9 at such a rate so as to maintain an overall phenol-to-oil ratio of from 1:1 to 4:1 depending upon the extent of extraction desired. A temperature gradient of about 20° is maintained in this column ranging from about 200° F. at the top to about 180° F. at the bottom. If a refluxing action is desired to alter the solubility relationships of the oil in the phenol near the point of removal of extract some water may be added through the line 20 into the bottom of the column 8. Approximately 10 per cent of water based on the volume of phenol charged may be added. The volume of water may, of course, be varied as desired depending upon the extent of refluxing desired. The raffinate phase of oil containing some phenol is removed from this column through the line 10 for further finishing operations while the phenol-rich extract phase is discharged through line 11 into the stripper 12 in which the phenol and the extract oil are separated. The phenol is passed through a line 13 to a run storage tank, not shown, prior to recycling into the extraction column 8. The extract oil is removed from the bottom of the stripper 12 through the line 14 and is passed through the line 15 into line 1 in which crude oil charge stock is flowing. In line 1 the crude oil charge stock and the extract oil from line 15 are mixed and the mixture then is introduced as charge oil into the primary propane fractionator 2. In case the volume of extract oil from line 14 is larger than necessary for recycling purposes the excess may be passed on through the line 14 to a storage tank, not shown, for such disposal as desired. In this method of operating wherein the extract oil is mixed with the charge oil in line 1 a hard asphaltic deposit is not formed in the lower portion of the propane fractionator 2.

The phenol free extract oil recovered from the bottom of the stripper 12 is rich in aromatic and naphthenic hydrocarbons as is shown by the viscosity gravity constant which is in the neighborhood of 0.9. This material also contains from 5 to 20 per cent of material having a high viscosity index which latter material is lost in conventional extraction operations. In the present process, however, since most of the extract oil is ordinarily returned by way of lines 14, 15 and 1 to the propane fractionator 2 the overall yield of the high viscosity oil is increased. Most of the highly aromatic (low V. I.) components are ultimately discharged from the system in the asphaltic product through line 18 while the high viscosity index components are recovered as components of the overhead products from columns 8 and 16.

An optional method of operation of the present process involves the use of additional solvent extraction equipment in such a way that advantage may be taken of distillate extract oils from SAE 10 and SAE 20 oils which because of their high aromaticity are unusually useful in preventing the depositing of asphalt in the propane fractionator. This auxiliary system does not alter in any manner the previously given processing of material but it is supplementary in that the extract oil from the SAE 10 and 20 oils is blended

with the heavier extract oil from the stripper 12 and this mixture is then mixed with the raw charge of reduced crude oil. This operation then assists further in preventing the precipitation and deposition of the hard asphalt in the propane fractionator 2 in addition to increasing the yield of high viscosity index material.

In the operation of this auxiliary equipment which is essentially an extraction column 32 and the stripper 36 the raw SAE 10 and 20 distillate mixture which was previously separated by distillation from the reduced crude oil charge prior to passage of the latter stock into the propane fractionator 2, is charged to the phenol extraction column 32 through line 31. Sufficient phenol is introduced into the column through the line 33 to maintain a phenol-to-oil ratio of from about 1:1 to 3:1. A temperature gradient of from about 175° at the top of the column to about 155° at the bottom is maintained in this contacting vessel. The higher top tower temperature is maintained by passage of a heating medium through a heating coil 43. If additional refluxing of the extract phase is desired, some water may be added to the bottom of the extraction vessel through a line 41. The amount of this water added may vary from a trace up to about 10 per cent by volume based on the amount of phenol added to line 33. The raffinate oil from this extractor passes through the overhead line 34 to a phenol recovery stripper vessel, not shown, from which the oil may pass to a storage vessel, not shown, while the recovered phenol may pass to a run storage, also not shown, prior to recycling through line 33 into this extractor. The extract phase is passed from the bottom of this vessel through the line 35 into the stripper 36 in which the phenol, water and oil are separated. The phenol and water may be withdrawn from the stripper through line 37 to further separation apparatus in which the water and phenol may be separated while the extract oil is withdrawn through the line 38. All or a portion of this extract oil may be recirculated through the line 39 and line 40 into line 15 for admixture with the raw crude oil charge in line 1 prior to passage into the primary propane fractionator 2. If more extract oil is produced in column 36 than is necessary for recycling into column 2 for the prevention of the asphalt deposits the excess oil may be passed on through line 38 to a storage or to other processing or disposal as desired. However, by passing extract oil from the stripper 36 into the primary fractionator 2 the yield of high viscosity oils from the process is increased and accordingly, it is usually desired for this reason to pass the entire amount of extract oil from stripper 36 into column 2. The addition of more aromatic and naphthenic oil to the raw crude oil charge stock than is necessary to just prevent the deposition of hard asphalt does not in any way hinder the operation of our process. More extract oil than is just required to cause asphalt to just not deposit will merely cause the asphalt accumulating in the bottom of the propane extractor to be somewhat more fluid than it would otherwise be.

The amount of extract oil from the stripper 12 when producing an SAE 50 high viscosity index stock as a raffinate from extraction vessel 8 will usually range from about 3 to 10 per cent of the original reduced crude oil charged to the propane fractionator 2.

In the modified process in which extract oils from the extraction columns 8 and 32 are combined for recycling there is frequently available

as much as 20 to 25 per cent by volume of extract oil based on the crude oil charge.

In this process it has been found that the quantity of extract oil required to prevent asphaltic depositions in the propane column when processing Mid-Continent crude oils ranges from 5 to about 25 per cent by volume based on the reduced crude oil charged to the propane column. It is not disadvantageous to recirculate a larger amount of extract oil since larger volumes of extract oil do not interfere with the operation of the propane fractionator but actually the use of larger volumes of extract oil makes the asphaltic product more fluid and more pumpable than it would be if an excess of extract oil were not used. A further advantage of recycling an excess of extract oil is that some high viscosity index hydrocarbons which normally remain in the extract are recovered in the oil fractions and the overall yield of high viscosity index oil is increased.

In the drawing the aromatic and naphthenic oil added to the extraction column 2 is shown as mixed with the feed stocks and the mixture then introduced into the column. The aromatic and naphthenic oil stream need not be mixed with the charge oil, as mentioned hereinbefore, but may be introduced by itself into the column. It should preferably be introduced at a point near the feed point, and not more than 5 trays or contacting stages above or below the feed point, and preferably at the feed point.

While the process of the present invention has been described with phenol as the example of the extraction solvent employed, it is to be understood that any extraction solvent may be used providing, of course, that the solvent will produce a sufficient quantity of highly aromatic and naphthenic oils for recycling for the prevention of the asphaltic deposits.

To maintain uniform or controlled temperature gradients over the length of the fractionators 2 and 16 and in extractors 3 and 32 it may be desirable to employ a series of heat exchange coils through the length of these vessels. Such heaters are not shown herein for purposes of simplicity since installations and operations of such heat exchange equipment are well known to those skilled in the art.

Contacting trays or baffles or other apparatus may be used in the propane fractionators 2 and 16 for promoting efficient contact between the propane and oil. These fractionators, however, may be operated without any packing but efficiency of contacting is not ordinarily very high and it is preferred to use some type of packing apparatus in these towers. Since our process provides a method of operation in which the asphaltic material does not adhere to the packing within tower 2 any type of packing desired may be used and of course it is usually desirable to employ that packing which will promote most efficient contacting between the several liquid phases. Likewise any desired type of liquid-liquid contacting equipment may be used in extraction vessels 8 and 32. Such liquid-liquid contacting equipment is readily available on the market and its installation and use is well understood by those skilled in the art. No special equipment is required for our process other than the tanks and pipes, etc., should be sufficiently strong to withstand high operating pressures, such as the 640 pounds pressure mentioned in relation to the operation of the fractionator 2. Pressures in the extraction vessels 8 and 32 may be atmospheric or slightly higher than atmospheric since there

is present in these vessels no highly volatile material like propane.

It will be understood by those skilled in the art that many variations and alterations in the operating conditions of our process may be made without departing from the intended spirit and scope of our invention.

Having described our invention we claim:

1. In the process for separating and recovering a lubricating oil fraction from a low asphalt-content crude lubricating oil stock with propane wherein a hard deposit of asphalt is formed and adheres to and plugs the oil fractionating apparatus, a method for continuously carrying out said fractionating operation without plugging of said apparatus by deposited asphalt comprising maintaining a body of liquid propane in a contacting zone, introducing said oil into said zone at a midpoint, introducing liquid propane into said zone at a point near the bottom thereof, withdrawing propane containing dissolved oil from the top and withdrawing an oil-rich liquid phase free from precipitated asphalt from the bottom of said zone; separating the oil from the propane containing said dissolved oil; maintaining a body of phenol in a second contacting zone, introducing the separated oil into said body of phenol at a point near the bottom and introducing phenol at a point near the top thereof, removing a raffinate phase from the top and an extract phase from the bottom of said second zone, separating a mixture of aromatic and naphthenic oils from said extract phase and introducing the separated mixture of aromatic and naphthenic oils free from phenol into said body of propane at the point of introduction of said low asphalt-content crude lubricating oil stock.

2. In the process for separating and recovering a lubricating oil fraction from a low asphalt content lubricating oil stock with propane wherein a hard deposit of asphalt is formed and adheres to and plugs the oil fractionating apparatus, a method for continuously carrying out said fractionating operation without plugging of said apparatus by deposited asphalt comprising contacting liquid propane and said oil stock in a contacting zone, removing an oil rich phase and a propane rich phase from said zone, separating oil from said propane rich phase, admixing the separated oil and a quantity of phenol, from this admixture removing an extract phase and a raffinate phase, separating a mixture of aromatic and naphthenic oils from the phenol of said extract phase and returning the separated mixture of oils free from phenol with said low asphalt content lubricating oil stock into the first mentioned contacting step; further treating said oil rich phase from the first mentioned contacting step with liquid propane, from this admixture separating a propane rich phase and an oil rich phase, recovering asphalt as one product of the process from this latter oil rich phase, and recovering a raffinate oil from said raffinate phase as the second product of the process.

3. In the fractionation of low asphalt content crude lubricating oil stocks with propane wherein a deposit of asphaltic material is formed and adheres to and plugs the contacting apparatus, a process for carrying out said fractionating operation without plugging of said apparatus by deposited asphalt and maintaining the asphalt in solution comprising maintaining a body of liquid propane in a contacting zone, introducing said low asphalt content crude lubricating oil stock

into said body of propane at the midpoint thereof, introducing a mixture consisting of naphthenic and aromatic oils into said body of propane at said midpoint, removing propane containing dissolved oil from the top of said zone and recovering the oil therefrom as one product of the process, removing an oil-rich phase containing the asphalt in solution from the bottom of said zone and recovering the asphalt from said oil-rich phase as the second product of the process.

4. The process of claim 3 wherein said naphthenic and aromatic oil mixture is admixed with said low asphalt content lubricating oil stock just prior to introduction of the latter into the contacting zone.

5. In the fractionation and recovery of lubricating oil constituents from a low asphalt-content lubricating oil stock with propane wherein a hard deposit of asphalt precipitates and adheres to and plugs the oil fractionating apparatus, a process for continuously carrying out said fractionating operation without plugging said apparatus by deposited asphalt comprising maintaining a body of liquid propane containing oil in solution in a first vertically disposed and elongated contacting zone, introducing said oil stock into said first zone at a midpoint, introducing liquid propane into said first zone at a point near the bottom thereof, withdrawing propane containing dissolved oil from the top and withdrawing an oil-rich liquid phase containing dissolved propane and free from precipitated asphalt from the bottom of said first zone, separating the oil from the withdrawn propane containing dissolved oil, maintaining a body of phenol in a second elongated and vertically disposed contacting zone, introducing the separated oil into the body of phenol in said second zone at a point near the bottom thereof, introducing phenol into said second zone at a point near the top thereof, removing a raffinate phase from the top and an extract phase comprising a mixture of aromatic and naphthenic oils from the bottom of said second zone, separating said mixture of aromatic and naphthenic oils from the last mentioned extract phase, introducing the separated mixture of aromatic and naphthenic oils free from phenol into said body of propane at the point of introduction of said low asphalt content lubricating oil stock.

6. In the process of claim 5, introducing the separated mixture of aromatic and naphthenic oils free from phenol into said body of propane in the ratio of from 3 to 25 per cent by volume based on the low asphalt-content lubricating oil stock introduced into said first zone.

7. In the process of claim 6, maintaining the ratio of the volume of propane to oil feed between the limits of 7:1 to 8:1 and maintaining the temperatures at the top and midpoint of said body of liquid propane at 195° F. and 185° F., respectively, and maintaining said body of propane under a pressure of 640 pounds per square inch.

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