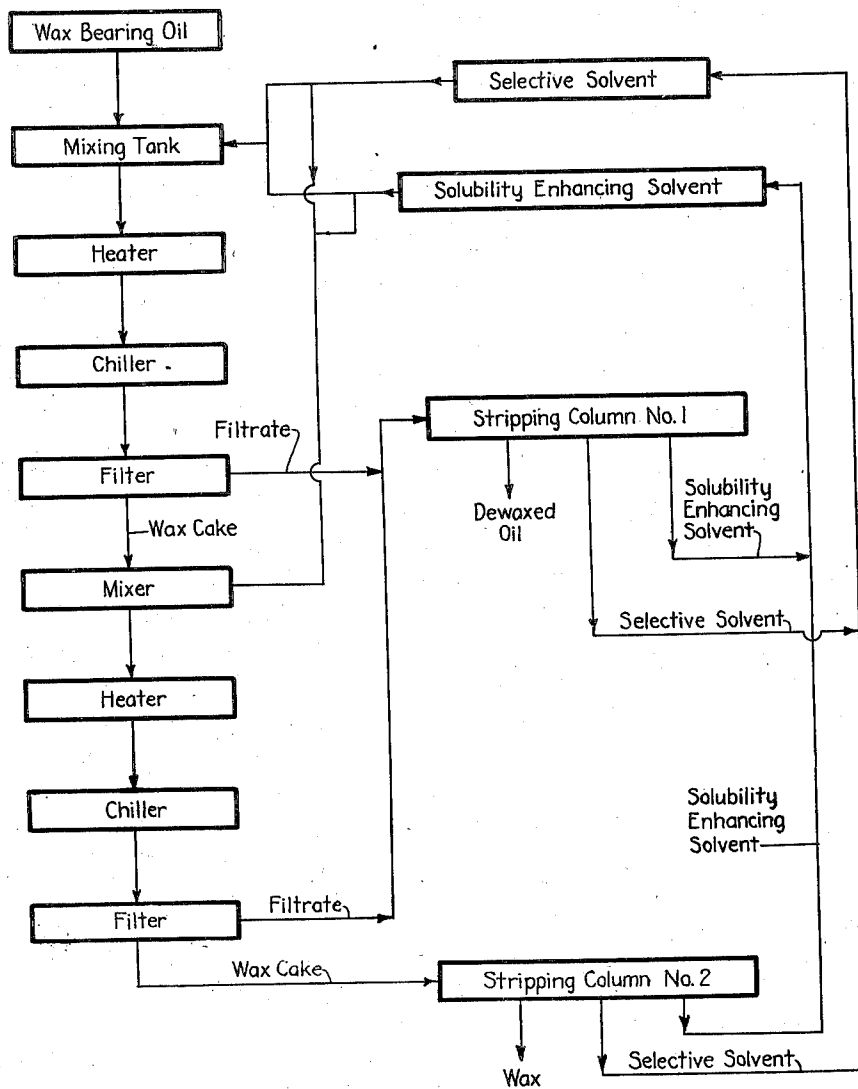


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## PROCESS FOR DEWAXING MINERAL OILS

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This invention relates to the production of low cold test hydrocarbon oils, especially those derived from petroleum. More particularly, it relates to a two stage process for dewaxing mineral oils, according to which the composition of the dewaxing diluent is different in the two stages, whereby the yield of dewaxed oil of a given pour point is increased.

Mineral oils, such as petroleum hydrocarbon products and tars, naturally contain varying amounts of waxy hydrocarbons or petrolatum, for convenience hereinafter referred to as waxes, which at normal or elevated temperatures are dissolved in the oil or are present in the oil in the liquid state, but which tend to solidify or become very viscous at low temperatures, causing the oil to resist flow, or to have a cloudy appearance.

The separation of wax from oil, and more particularly the removal of mineral wax from mineral oil, has heretofore been accomplished by diluting the waxy oil with diluent mixtures which, at low temperatures, exercise a selective solvent action between the solid or semi-solid wax and the oil, chilling the solution so formed to precipitate or solidify the wax, and separating the solidified wax from the oil solution by some suitable means, such as filter pressing, centrifuging, or cold settling, the method employed being determined by the nature of the wax, i. e., whether it is sufficiently crystalline to be filterable, or has a density sufficiently different from that of the oil solution to be separable by settling or centrifuging. The function of the diluent is to reduce the viscosity of the chilled mixture and to prevent the loss of oil by adherence to the solidified wax.

For example, it is known to effect the separation of wax from oils by diluting the oil with mixtures of two liquids, one of which is a good solvent for hydrocarbons, and the other a poor solvent for solid or semi-solid paraffin wax. Thus, a mixture of benzol and acetone has been used for dewaxing lubricating oils.

In such selective dewaxing solvent or diluent mixtures, the function of the selective solvent (e. g., acetone in an acetone-benzol mixture) is to lower the solubility of the solidified or partly solidified wax in the diluted oil. The selective solvents which are suitable for dewaxing are, however, generally not sufficiently miscible with the oil at the dewaxing temperature to be dissolved therein in sufficient quantities to lower the viscosity of the oil to the desired degree and to prevent the separation of oil with the wax, and it is for this reason generally necessary to add another solvent (e. g., benzol) which is miscible with the oil and with the selective solvent. This latter solvent is hereinafter referred to as the solubility enhancing agent. When no

solubility enhancing agent, or an insufficient quantity of the solubility enhancing agent is employed, the wax-oil-diluent system, upon being chilled, separates into three phases, namely, a solid or semi-solid wax phase, a liquid oil phase containing a small amount of the selective solvent, and a solvent phase containing a smaller concentration of oil than the oil phase. For a given dilution ratio, i. e., the volume ratio of oil to diluent mixture, as progressively larger concentrations of solubility enhancing agent are employed in the diluent mixture, one of the liquid phases decreases in size, until at a definite concentration, hereinafter designated as the critical concentration, it disappears. The composition of such a dewaxing mixture may be designated as the critical composition. The critical composition will vary with the dilution ratio, with the dewaxing temperature, and with the nature of the oil being dewaxed. Employing concentrations of the solubility enhancing agent in excess of the critical concentration results in the formation of but one liquid phase in addition to the wax phase.

In accordance with the present invention we have found that the yield and/or the pour point of dewaxed oil can be materially improved by the following two stage process: The oil is first drastically dewaxed with a selective dewaxing mixture having a concentration of solubility enhancing agent below critical, to separate a first wax cake and produce a first oil derived from both liquid phases formed as a result of using such a dewaxing diluent. The separated first wax is then treated as an oil and dewaxed with a dewaxing diluent containing a greater quantity of solubility enhancing agent than corresponds to the critical concentration, whereby only a single liquid phase is formed, to produce a second oil and a second wax cake. The first and second oils may, if desired, be blended.

The yield of dewaxed first oil is generally lower than that which would be obtained by using sufficient solubility enhancing agent to prevent the formation of two liquid phases; but in most cases the pour point of the first oil is considerably lower, being frequently far below the temperature at which the wax is separated from the liquid phases. According to one embodiment of our process, the dewaxing diluent in the first stage consists entirely of selective solvent. In such cases it is often desirable to employ a selective solvent which has a substantial solvent power for oil, but which is still capable of causing the formation of two liquid phases at the dewaxing temperature. According to another embodiment, the concentration of the solubility enhancing agent in the diluent is such that the pour point of the first oil is the lowest obtainable with the particular components of the dewaxing

diluent employed and for the selected dewaxing temperature. We have found that this optimum concentration generally lies between 30 and 75% of the critical, and that the yield of a blend of first and second oils of a given pour point is often increased by employing such a diluent of this composition, although when dewaxing highly paraffinic oils even lower concentrations of solubility enhancing agent may correspond to minimum pour points for the first oil.

The process may be better understood from the following detailed description of a preferred embodiment thereof, the steps being schematically illustrated on the single figure of the drawing.

In practicing our invention, we mix a wax-bearing oil with a selective dewaxing mixture of the above described composition in any desired manner, as by continuously mixing concurrent streams of oil and diluent, or by mixing the diluent with a small amount of heated oil and introducing the resulting mixture into a body of oil at ordinary temperature. However, when the oil contains solidified wax it is often preferable to warm the oil-wax-diluent mixture to liquefy all of the wax before chilling the mixture. We have, further, found that the filterability of the wax is materially improved by heating the oil-diluent mixture to an elevated temperature, which varies with the oil, the dilution ratio and the composition of the diluent, but usually lies between 60° and 100° C. If necessary, to prevent diluent losses, this heating may be carried out under pressure. The heating has the effect of conditioning the waxy hydrocarbons or changing their state to cause them to solidify in a form in which they can be separated from the oil solution in filters at a greater filtration rate, and with a greater yield of filtrate than are obtained without this heat treatment.

The resulting mixture of wax-bearing oil and diluent, whether heat treated or not, is then chilled to solidify the wax or "precipitate" it, the wax being then separated from the two liquid phases by any suitable means, preferably by filtration, although centrifuging or settling may be employed. The two liquid phases may then be treated to separate them into oil and diluent portions, by any suitable method, as by distillation. While we normally run these liquid phases off into a common receiving vessel, we may separate them, and then distill each separately, thereby producing two first oils of different properties, the portion derived from the liquid phase which is poor in the dewaxing diluent being richer in paraffinic hydrocarbons and having a higher viscosity index.

The first wax cake may be further washed with fresh dewaxing diluent, or sweated to recover additional amounts of first oil; but since oil retained on the wax cake is recovered in the second stage of our process this step is normally omitted.

The wax cake, whether washed or not, is then warmed, preferably at least to a temperature at which the wax is melted and mixed with a suitable quantity of a dewaxing diluent having a composition which will cause the wax-oil-diluent system, upon being chilled, to form only one liquid phase. Since considerable quantities of the diluent employed in the first stage are generally retained in the wax cake, the diluent added in the second stage must contain a greater concentration of solubility enhancing agent than it is desired to have present in the total diluent in

the second stage. In certain cases pure solubility enhancing agent may be added in this stage. If filtration is to be employed, it is desirable to condition the wax before chilling, as described in connection with the first stage. The resulting mixture is then again chilled, to the same or to a different temperature from the first stage. This temperature may be selected so that the pour point of the second oil is the same as that of the first oil, although it is generally most convenient to employ the same temperature in both stages. The second wax and second filtrate are separated and treated to recover the diluent as described above.

The components of the dewaxing diluent employed in the two stages need not be the same, although it is generally most convenient to employ the same substances, and vary only the concentration of the solubility enhancing agent. Moreover, the dilution ratios in the two stages may be the same or different. These ratios may be varied within wide limits, and we have found that ratios between 1:1 and 1:8 are generally suitable. The optimum dilution ratio will depend upon the viscosity of the oil, the dewaxing temperature, and the nature of the diluent, and can be readily determined by one skilled in the art. It should be noted that the dilution ratio in the second stage will often be partly determined by the quantity of diluent which is retained in the first wax cake, since it is necessary to add to the first wax cake a sufficient quantity of solubility enhancing agent to cause the concentration of the latter in the total diluent present in the second stage to be above the critical. This ratio can, however, be lowered by subjecting the first wax to a vacuum distillation treatment to remove a portion of the selective solvent.

It is, moreover, possible to improve the separation of the wax in either or both of the stages of our process by adding suitable filter aids to the oil, as is well known in the art; and/or by adding a pour point reducing agent, such as activated cracked residue, or certain pour-point reducing esters, or metallic soaps, such as aluminum stearate.

The selective solvent component of our dewaxing diluent mixtures may be any compound or mixture of compounds which has the property of creating in the chilled wax-oil-diluent system a condition under which the wax has a minimum solubility in the liquid phase or phases, and which will, upon being mixed with the oil, and at the dewaxing temperature, cause the oil-diluent system to form two liquid phases. Among such compounds, may be mentioned oxycyclic and nitrocyclic compounds, and non-hydrocarbon derivatives of benzene and heterocyclic ring compounds, such as benzene nitrile, benzene nitrite, nitrobenzene, nitrotoluene, aniline, diphenyl amine, phenol, chlorophenol, cresol, cresylic acid, quinoline, isoquinoline, pyridine, furfural, furfuryl alcohol, thiophene, lutidine, picoline, and thionaphthol; lower aliphatic acids, hydroxy or keto aliphatic acids, anhydrides of aliphatic acids, esters, and lower aliphatic alcohols and ketones, all containing not more than about four carbon atoms in the molecule, and the acids, ketones and alcohols containing not more than about three carbon atoms, such as diacetone alcohol, acetic acid, butyric acid, lactic acid, acetic anhydride, ethyl formate, acetone, methyl alcohol, and thioacetic acid; aliphatic alcohols, aldehydes, ketones, ethers, acids, acid anhydrides, and sulfur analogues of the same, all containing not more

than about sixteen carbon atoms in the molecule, and containing at least one substituent from the group: —Cl, —Br, —CN, —SH, —CS, —CONH<sub>2</sub>, —SCN, and —NH<sub>2</sub>, such as Chlorex (BB' dichloroethyl ether), dichlorobutyl ether, dibromomethyl ether, chloroacetic acid, ethanol amine and triethanol amine; liquid sulfur dioxide, and stannic chloride. Although we have enumerated a number of selective solvents which are suitable, our invention is not limited thereto, but may be practiced with many other similar substances.

We may employ as the solubility enhancing agent any liquid which is a mutual solvent for the selective solvent and for the oil. Preferably, the solubility enhancing agent is selected so as to exercise some selective solvent action, or at least not to destroy the selectivity of the selective solvent. For this reason aromatic hydrocarbons are preferred to aliphatic hydrocarbons, and polar substances to hydrocarbons. Moreover, it is preferable to employ a solubility enhancing agent which may be readily separated from the oil and from the selective solvent by a convenient method, as by distillation. Among suitable solubility enhancing agents may be mentioned the following: Butyl and higher aliphatic alcohols, aliphatic aldehydes, aliphatic ethers, methyl ethyl and higher symmetrical or mixed ketones, and sulfur analogues of the above oxygenated aliphatic compounds, all containing not more than about twelve carbon atoms in the molecule, such as various butyl alcohols, amyl aldehydes, diethyl ketone, diethyl ether and diethyl thioether; esters of lower aliphatic alcohols and lower fatty acids, containing more than four and not over twelve carbon atoms in the molecule, such as butyl acetate; certain chlorinated aliphatic compounds, such as ethylene dichloride; aliphatic amines, such as amyl amine; carbon bisulfide; aromatic hydrocarbon, such as benzol, toluene, and particularly bicyclic aromatic hydrocarbons, such as naphthalene and its homologues; and branched chain and cyclic aliphatic hydrocarbons containing not more than twelve carbon atoms in the molecule, such as isopentane and cyclohexane. The above enumerated compounds are, however, exemplary only, and our invention is not to be construed as being limited to the use of these solubility enhancing agents.

Moreover, mixtures of substances may be employed for either or both of the components of the dewaxing diluents.

The aromatic hydrocarbons recited in the above list may be an extract obtained by extracting a low boiling distillate, boiling somewhere within the range of about 100° to 300° C., with a selective solvent for aromatics, such as sulfur dioxide, furfural or Chlorex. This extract is herein designated as kerosene extract. We have found that excellent results are obtained by employing such a kerosene extract, or one which has been repeatedly treated with selective solvents to increase its aromatic content, and is known as recycled kerosene extract.

It should be further noted that the above classification may not rigidly apply to all dewaxing conditions. For example, such compounds as propyl alcohol, methyl ethyl ketone, and ethyl acetate may, under different conditions be either selective solvents or solubility enhancing agents. Thus, at very low dewaxing temperatures, and/or when dewaxing a highly paraffinic oil, they may be capable of causing the formation of two liq-

uid phases, and for this reason be selective solvents; while at higher dewaxing temperatures and/or with less paraffinic oils, they may be employed as solubility enhancing agents. Moreover, under the former conditions, it may be desirable to select both of the components of the mixtures from the class of solvents classified as solubility enhancing agents, as for example, by using a mixture of ethylene dichloride with amyl alcohol or butyl ether. Our invention is not, therefore, to be limited strictly to the use of dewaxing diluents the components of which are selected in accordance with the above classification, but rather to be construed to cover the two stage dewaxing process described herein in which the solvents are selected with reference to their solvent characteristics at the particular dewaxing temperature and with relation to the particular oil being dewaxed.

Specific examples of pairs of selective solvents and solubility enhancing agents are: Acetone and benzol, acetone and tetralin, acetone and kerosene extract, Chlorex and isopentane, Chlorex and ethyl ether, Chlorex and secondary butyl alcohol, quinoline and secondary amyl alcohol, furfural and tertiary butyl alcohol, furfural and secondary butyl alcohol, aniline and secondary butyl alcohol, and nitrobenzene and secondary butyl alcohol.

Our invention may be further understood from the following examples.

*Example 1.*—100 volumes of a lubricating oil distillate derived from a Ventura crude oil, having a pour point of 95° F. were mixed with 400 volumes of Chlorex, the resulting solution was heated for about two hours at 100° C., and then chilled for about nine hours to lower the temperature to 0° C. The chilled mixture, consisting of solidified wax and two liquid phases, was filtered under atmospheric pressure between 0° and 1° C., to produce 398 volumes of a filtrate which, upon distillation, yielded 33 volumes of a first oil having a pour point of 15° F. The wax cake was mixed with 272 volumes of a diluent consisting of 30% Chlorex and 70% secondary butyl alcohol. The Chlorex retained in the wax cake after the first filtration caused the overall composition of the diluent to be 38% Chlorex and 62% secondary butyl alcohol, and the dilution ratio to be 1:4.5. The resulting mixture was heated to 100° C. and chilled and filtered as described above, to produce a homogeneous filtrate and a wax cake containing some filtrate, which could be separated from the wax cake by further washing at 0° C. with a mixture of 38% Chlorex and 62% secondary butyl alcohol without changing the composition of the wax. The dewaxed second oil derived from the second filtrate and the wash liquor amounted to 56 volumes, and had a pour point of 35° F. Upon blending the first and second oils, 89 volumes of a blended dewaxed oil with a pour point of 25° F. were obtained.

It should be noted that the second wax cake could have been freed from entrained oil solution by washing with a liquid of another composition, or by sweating, etc.

For purposes of comparison, other portions of the same initial oil were dewaxed with various dewaxing diluents consisting of Chlorex and secondary butyl alcohol, always employing the same dilution ratio (1:4) and the same wax conditioning and filtration conditions, but employing a single stage. For the dewaxing diluent composition (70% Chlorex, 30% secondary butyl al-

cohol) which gave the best yield of a 25° F. pour point oil, the yield was 87%; and for the dewaxing diluent composition (50% Chlorex, 50% secondary butyl alcohol) which gave the lowest pour point for a yield of 89% the pour point was 35° F. These comparisons indicate the improved results obtainable by our two stage process.

*Example II.*—100 volumes of the same distillate were diluted with 400 volumes of a dewaxing diluent consisting of 85% Chlorex and 15% secondary butyl alcohol, and dewaxed as described in Example I to produce 397 volumes of a filtrate containing 50.4 volumes of a first oil having a pour point of 15° F. The wax cake was mixed with 272 volumes of a diluent consisting of 60% Chlorex and 40% secondary butyl alcohol, whereby the overall composition of the diluent was 64% Chlorex and 36% secondary butyl alcohol and the dilution ratio was 1:6. Upon dewaxing this mixture the yield and pour point of the second oil were found to be 36.6 volumes and 30° F. The blend of the first and second oils amounted to 87 volumes and had a pour point of 20° F.

For comparison, the best yield of 20° F. pour point oil obtainable in a single stage dewaxing at 0° C. and with the same components of the dewaxing diluents was 73%; and the lowest pour point obtainable when operating for a yield of 87% was 25° F.

*Example III.*—100 volumes of the same distillate were mixed with 400 volumes of acetone, heated to 60° C., cooled for about 8½ hours to -20° C., and filtered at atmospheric pressure between -19° C. and -20° C., to produce 366 volumes of a filtrate containing 24 volumes of a first oil with a pour point of 20° F. The wax cake was mixed with 272 volumes of a diluent consisting of 45% acetone and 55% recycled kerosene extract, the latter having a boiling temperature range of 230° C. to 300° C., and being an aromatic extract obtained by extracting lubricating oils with sulfur dioxide in the presence of kerosene distillate, the aromatic kerosene extract being repeatedly recycled with the solvent. The resulting diluent contained 54% acetone and 46% recycled kerosene extract, and the dilution ratio was 1:4.2. The resulting mixture was heated to 60° C., chilled to -20° C. and dewaxed between -19° C. and -20° C. as described in Example I. The combined yield of second oil from the second stage filtrate and wash liquor was 65 volumes, and had a pour point of 5° F. The blend of the first and second oils amounted to 89 volumes and had a pour point of 0° F. It should be noted that in this case the pour point of the second oil was lower than that of the first, while the pour point of the blend was lower than either the first or second oils.

For comparison, the best yield of 0° F. pour point oil obtainable with acetone and recycled kerosene extract in single stage dewaxing at -20° C. was found to be 85%; and the lowest pour point obtainable when operating for a yield of 89% was 10° F.

We claim as our invention:

1. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing phases at a dewaxing temperature and containing a selective solvent which, at the dewaxing temperature, has a lower solvent power for wax than for oil, chilling the oil and diluent to the dewaxing temperature to form two freely

flowing liquid oil-containing phases and to precipitate wax, and separating the precipitated wax from the two liquid phases by filtration to form a wax cake and a combined filtrate consisting of two liquid oil-containing phases.

2. The process according to claim 1, in which the mineral oil and the diluent are mixed before being chilled to the dewaxing temperature.

3. The process according to claim 1, in which the dewaxing diluent is a mixture of said selective solvent and a solubility enhancing agent which increases the solvent power of the diluent for oil, the quantity of the solubility enhancing agent being insufficient to prevent the formation of two liquid phases at the dewaxing temperature.

4. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing phases at a dewaxing temperature and containing a selective solvent which, at the dewaxing temperature, has a lower solvent power for wax than for oil, heating the resulting mixture to a temperature above 60° C., chilling the heated mixture to the dewaxing temperature to form two freely flowing liquid oil-containing phases and to precipitate wax, and separating the precipitated wax from the two liquid phases by filtration to form a wax cake and a combined filtrate consisting of two liquid oil-containing phases.

5. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a first dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing phases at a dewaxing temperature and containing a selective solvent which, at said dewaxing temperature, has a lower solvent power for wax than for oil, chilling said oil and diluent to said dewaxing temperature to form two freely flowing liquid oil-containing phases and to precipitate wax, separating the precipitated wax in a single operation from the combined mixture of the two liquid phases, warming the separated wax to liquefy at least a portion thereof, mixing the separated wax with a second dewaxing diluent, chilling the resulting mixture to precipitate wax, and separating the precipitated wax from the oil solution, said second diluent containing a sufficient quantity of a solubility enhancing agent to cause the solution of oil and diluent to be homogeneous at the temperature of the second separation of wax and being a better solvent for oil than said first dewaxing diluent.

6. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a first dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing phases at a dewaxing temperature and containing a selective solvent which, at said dewaxing temperature, has a lower solvent power for wax than for oil, chilling said oil and diluent to said dewaxing temperature to form two freely flowing liquid oil-containing phases and to precipitate wax, separating the precipitated wax in a single operation from the combined mixture of the two liquid phases, heating the separated wax to produce a homogeneous liquid phase, mixing the separated wax with a second dewaxing diluent, chilling the resulting mixture to precipitate wax, and separating the precipitated wax from the oil solution, said second diluent containing a sufficient quantity of a solubility enhancing agent to cause the solution of oil and diluent to be

homogeneous at the temperature of the second separation of wax and being a better solvent for oil than said first dewaxing diluent.

7. The process according to claim 6 in which the second diluent contains the same selective solvent which is contained in the first diluent.

8. The process according to claim 6 in which both diluents contain the same selective solvent and the same solubility enhancing agent, but in different proportions.

9. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a first dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing phases at a dewaxing temperature and containing a selective solvent which, at said dewaxing temperature, has a lower solvent power for wax than for oil, chilling said oil and diluent to said dewaxing temperature to form two freely flowing liquid oil-containing phases and to precipitate wax, separating the precipitated wax from the two liquid phases, warming the separated wax to liquefy at least a portion thereof, mixing the separated wax with a second dewaxing diluent, chilling the resulting mixture to precipitate wax, separating the precipitated wax from the oil solution, said second diluent containing a sufficient quantity of a solubility enhancing agent to cause the solution of oil and diluent to be homogeneous at the temperature of the second separation of wax, and having a greater solvent power for oil than said first dewaxing diluent and blending the dewaxed oils from the two wax-separating stages.

10. The process according to claim 5 in which the wax precipitated from the chilled solution of the initial oil in the first dewaxing diluent is separated from the two liquid phases by filtration in the presence of a filter aid to produce a wax cake and a combined filtrate consisting of two liquid oil-containing phases.

11. The process according to claim 5 in which the wax is separated from the oil in the presence of a substance capable of lowering the pour-point of the mineral oil.

12. The process according to claim 9 in which the temperatures at which the wax is separated from the oil are the same in each stage.

13. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a first dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing phases at a dewaxing temperature and containing a selective solvent which, at said dewaxing temperature, has a lower solvent power for wax than for oil, heating the resulting mixture to a temperature above 60° C., chilling the heated mixture to said dewaxing temperature to form two freely flowing liquid oil-containing phases and to precipitate wax, separating the precipitated wax from the two liquid phases by filtration to form a wax cake and a combined filtrate consisting of two liquid phases, heating the separated wax cake to produce a homogeneous liquid phase, mixing the separated wax with a second dewaxing diluent, chilling the resulting mixture to precipitate wax, and separating the precipitated wax from the oil solution, said second diluent containing a sufficient quantity of a solubility enhancing agent to cause the solution of oil and diluent to be homogeneous at the temperature of the second separation of wax.

14. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a first dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing phases at a dewaxing temperature and containing a selective solvent which, at said dewaxing temperature, has a lower solvent power for wax than for oil, chilling said oil and diluent to said dewaxing temperature to form two freely flowing liquid oil-containing phases and to precipitate wax, separating the precipitated wax from the two liquid phases by filtration to form a wax cake and a combined filtrate consisting of two liquid oil-containing phases, mixing the separated wax cake with a second dewaxing diluent, heating the resulting mixture to a temperature above 60° C., chilling the heated solution to precipitate wax, and separating the precipitated wax from the oil solution by filtration, said second diluent containing a sufficient quantity of a solubility enhancing agent to cause the solution of oil and diluent to be homogeneous at the temperature of the second separation of wax.

15. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a first dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing liquid phases at a dewaxing temperature and containing a selective solvent which, at said dewaxing temperature, has a lower solvent power for wax than for oil, heating the resulting mixture to a temperature at which the oil is free from visible wax, chilling the heated mixture to said dewaxing temperature to form two freely flowing liquid oil-containing phases and to precipitate wax, separating the precipitated wax from the two liquid phases by filtration to form a wax cake and a combined filtrate consisting of two liquid phases, heating the separated wax cake to produce a homogeneous liquid phase, mixing the separated wax with a second dewaxing diluent, chilling the resulting mixture to precipitate wax, and separating the precipitated wax from the oil solution, said second diluent containing a sufficient quantity of a solubility enhancing agent to cause the solution of oil and diluent to be homogeneous at the temperature of the second separation of wax and having a greater solvent power for oil than said first dewaxing diluent.

16. A process for dewaxing a wax-bearing mineral oil, comprising the steps of mixing said oil with a first dewaxing diluent capable of causing the oil to separate into two freely flowing liquid oil-containing phases at a dewaxing temperature and containing a selective solvent which, at said dewaxing temperature, has a lower solvent power for wax than for oil, chilling said oil and diluent to said dewaxing temperature to form two freely flowing liquid oil-containing phases and to precipitate wax, separating the precipitated wax from the two liquid phases by filtration to form a wax cake and a combined filtrate consisting of two liquid oil-containing phases, mixing the separated wax cake with a second dewaxing diluent, heating the resulting mixture to a temperature at which the oil is free from visible wax, chilling the heated solution to precipitate wax, and separating the precipitated wax from the oil solution.

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