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DEWAXING HYDROCARBON OILS

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This invention relates to an improved process for the removal of wax from oils and especially for the removal of hydrocarbon waxes from hydrocarbon lubricating oils. More particularly it relates to a diluent for use in the dewaxing process.

The object of the invention is to provide a more efficient and more economical means for removing wax from oil and for the production of lubricating oils having superior properties. Further objects will appear as the description of the invention proceeds.

It is well known in the art of dewaxing hydrocarbon lubricating oils to dilute such oils with petroleum naphtha, to chill the solution thus produced to low temperatures in order to precipitate the wax and to remove the wax thus precipitated by suitable means, for instance, by filter pressing.

It is also known that superior results can be obtained by the substitution of certain special diluents for the petroleum naphtha which has been generally used. The most important requirement to be met in the selection of such a special diluent, is that the diluent have the lowest possible solvent power for wax consistent with its retaining the lubricating oil in solution. Many other properties must also be present in order to render such a diluent satisfactory. One of the most important of these properties is that the diluent must be such as to produce a lubricating oil having a very low pour point. The pour point is the lowest temperature at which the oil will flow when it is chilled without disturbance. It may be determined in accordance with Method D97—30 of the American Society for Testing Materials. One of the chief disadvantages of the use of petroleum naphtha is the fact that the pour point of the dewaxed oil is from 20 to 40° F. higher than the dewaxing temperature.

The production of viscous hydrocarbon oils having pour points in the neighborhood of 0° F. from stocks containing certain types of paraffin wax is difficult or impossible by the use of petroleum naphtha or any ordinary diluent, since the refrigeration necessary to produce oils having these low pour points is expensive and since the wax is generally precipitated in a form which renders its separation from the oil very difficult and frequently impossible. This situation is aggravated by the fact that the low temperatures required cause the solution to become very viscous, thereby decreasing the rate of the filtration operation by which the wax is removed.

However, by the use of certain diluents, it is possible to separate out practically all the hydrocarbon wax at a temperature of -5 to -15° F.

This eliminates the necessity of using lower temperatures with their concomitant high refrigeration costs and low filter rates. The pour point of the resultant oil when using such a diluent is only slightly higher than the temperature of the dewaxing operation.

A satisfactory diluent or diluent mixture must not only have the properties of separating out substantially all the wax in order to give an oil having a pour point in the neighborhood of the dewaxing temperature, but it must also separate out the wax in a form suitable for the facilitation of its removal from the oil. Furthermore, the diluent should be inexpensive, should be relatively non-toxic and non-corrosive, should have a sufficiently high volatility to facilitate its removal from the products of the process and should have a sufficiently low volatility to prevent excessive evaporation losses. Another essential property of a satisfactory diluent or diluent mixture is that it must be capable of being cooled to suitable dewaxing temperatures without precipitating the dissolved hydrocarbon oil and without the separation of any additional solid or liquid phases other than the wax which it is desired to precipitate.

My present invention is concerned with the use of methyl acetate as a constituent of such diluent mixtures. I have found that methyl acetate has properties which adapt it remarkably well for use in dewaxing hydrocarbon oils, either alone or in combination with other solvents. One particular advantage which I found in methyl acetate is its low viscosity, as a result of which, filter slurries are obtained having high rates of filtration. Another advantage is the relatively low boiling point of methyl acetate which facilitates its removal from the dewaxed oil and from the filter cake. This entails an added advantage in that the methyl acetate can be removed at low temperatures, thereby avoiding the discoloration of the oil which frequently results from the use of higher temperatures. It has also been found that methyl acetate possesses to an unusual degree the desirable property of crystallizing out the wax in a form which facilitates its removal by filtration. This is attributed to the particular crystalline structure which the wax assumes. Furthermore, methyl acetate and its mixtures have to a high degree all of the other properties set out above as requisites of a satisfactory diluent.

Because of its relatively low solvent power for wax and oil, I prefer to use methyl acetate as a constituent of a diluent mixture rather than as a one-component diluent. In order to retain the

oil in solution in methyl acetate at the desired dewaxing temperature, that is in the neighborhood of -10°F. , it would be necessary when working with most oils, to use an excessive amount of methyl acetate for a given amount of oil. This difficulty has been overcome in the present invention by the use of methyl acetate in conjunction with another component which has a relatively high solvent power for oil and wax. For instance, methyl acetate may be used in combination with coal-tar benzol, isopropyl ether, or petroleum naphtha.

As an example of a process using such a diluent mixture, a distilled ("overhead") lubricating fraction of Mid-Continent crude having a viscosity of 74 seconds Saybolt at 210°F. may be diluted at ordinary temperatures with two and a half times its own volume of a mixture of equal parts of methyl acetate and benzol. Other ratios of methyl acetate to benzol and other ratios of diluent to wax-bearing oil may be used depending on the character of the oil being dewaxed and the particular conditions under which it is desired to use the process. In general, the amount of methyl acetate necessary in the mixture decreases as the oil being treated becomes more paraffinic and/or more viscous. It has been found most suitable to use 30 to 70% of methyl acetate and 70 to 30% benzol and to use from one to four volumes of diluent for every volume of oil to be dewaxed. The diluted wax-bearing oil may then be chilled by suitable means, preferably while undergoing agitation, to a temperature of about -5 to -15°F. The chilled solution may then be pumped through a suitable filter press and the resultant wax cake washed with additional diluent mixture. The oil solution which has been passed through the filter press is then redistilled in suitable distillation equipment and the oil and diluent separated by fractionation. These various steps of the process are well known to those skilled in the art of petroleum refining and they will therefore not be described in further detail.

Altho the invention has been particularly described in conjunction with the removal of the precipitated wax by filter pressing, it is to be understood that the wax may sometimes be removed by other suitable means, such as settling or centrifuging, which are well known in the art.

In addition to its use with benzol, methyl acetate may be used as a constituent of other diluent mixtures for dewaxing hydrocarbon oils. The other constituent or constituents should be substances having a greater solvent power for oil than does methyl acetate and should be present in such proportion that the solution will persist as a single phase down to the desired dewaxing temperature. Naturally this proportion will vary with the nature of the substance employed. Isopropyl ether, toluene and other substances may be used as constituents of such mixtures. I may also employ mixtures of methyl acetate with low boiling petroleum hydrocarbons such as hexane and butane. When butane is employed it is necessary to maintain the latter solvent mixture under super-atmospheric pressure because of its high volatility. Suitable diluent compositions may be determined as desired by

experimentation based on the disclosure of my invention. In dewaxing special oils, for instance, highly aromatic hydrocarbon oils it would be possible to use methyl acetate alone.

Altho I have described my invention by showing its application to specific examples, these are given for the purpose of illustration only and are not intended to limit the scope of the invention whose breadth is measured only by the limitations of the following claims.

I claim:

1. In the dewaxing of hydrocarbon oils, the step which comprises diluting the wax-bearing oil with a diluent comprising methyl acetate.
2. In the dewaxing of hydrocarbon oils, the step which comprises diluting the wax-bearing oil with a diluent mixture comprising between approximately 30% and approximately 70% methyl acetate.
3. In the dewaxing of hydrocarbon oils, the step which comprises diluting the wax-bearing oil with a large amount of a diluent comprising methyl acetate and a material having good solvent powers for the dewaxed hydrocarbon oils.
4. In a process for the removal of hydrocarbon waxes from hydrocarbon oils, the step which comprises diluting the wax-bearing oil with a diluent comprising methyl acetate and benzol.
5. In the dewaxing of hydrocarbon oils, the step which comprises diluting the wax-bearing oil with a diluent containing more than 30% methyl acetate.
6. A process for the removal of hydrocarbon wax from hydrocarbon oil which comprises diluting the wax-bearing oil with a large volume of a diluent mixture containing methyl acetate and a material having good solvent powers for the dewaxed hydrocarbon oils, chilling the solution thus produced to a low temperature to precipitate hydrocarbon wax, separation of the hydrocarbon wax, and removal of the diluent from the dewaxed hydrocarbon oil.
7. A process for the removal of hydrocarbon wax from hydrocarbon oil which comprises diluting the wax-bearing oil with from one to four times its own volume of a diluent mixture containing about equal quantities of methyl acetate and benzol, cooling the solution to a temperature of -5 to -15°F. to precipitate hydrocarbon wax, separating the hydrocarbon wax, and removing the diluent from the hydrocarbon oil.
8. In a process of removing wax from hydrocarbon oils wherein the oil is refrigerated to a low temperature and the wax is crystallized and separated by filtration, settling or centrifuging, the step which comprises diluting the oil with a diluent mixture comprising methyl acetate before refrigeration and recovering the said methyl acetate from the oil and wax subsequent to their separation.
9. In a process for the removal of hydrocarbon waxes from hydrocarbon oils, the step which comprises diluting the wax-bearing oil with a diluent comprising methyl acetate and isopropyl ether.
10. In a process for the removal of hydrocarbon waxes from hydrocarbon oils, the step which comprises diluting the wax-bearing oil with a diluent comprising methyl acetate and toluene.

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