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OILS OF HIGH VISCOSITY INDEX AND PROCESS OF MAKING THE SAME

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The present invention relates to processes for making oils of high viscosity and of high viscosity index from crude petroleum oils which have hitherto been considered unsuitable for making such oils, and it relates more particularly to the manufacture of gear oils of high viscosities and high viscosity index, such as are suitable for the efficient lubrication of machinery requiring lubricants of this type.

The term "viscosity index", which herein will be designated by the commonly used abbreviation "V. I.", gives an indication of the extent to which an oil will retain its body, or viscosity, when the oil is subjected to considerable changes in temperatures, such as those to which crank-case and transmission oils for automobiles and other machinery are subjected.

Much consideration has been given to the production of crank-case oils for automobile engines, and oils of high V. I. have been manufactured for this purpose and are available. The V. I. of transmission oils has received less consideration than the V. I. of crank-case oils. However, the starting characteristics of transmission oils at low temperatures are as important as those of the crank-case oils. Ease of gear shifting depends on the V. I. of the oils and the lack of the necessary V. I. will become noticeable to the driver of a car by the difficulty of shifting gears during cold weather.

A low V. I. transmission oil is not safe for operation in climates where the temperature varies widely. When the weather is hot the viscosity of the oil may become too low for adequate lubrication and in cold weather the oil may become so viscous that it will not flow but will channel and not supply sufficient lubrication to the transmission gears. For these reasons high V. I. oils should be used in transmissions of automobiles since these oils are frequently not changed from season to season.

In accordance with the present invention, improved oils of the kind referred to are obtained at low cost, based on the utilization of distillation residues heretofore not considered suitable for this use.

When a given crude petroleum oil is fractionated by distillation, the fractions which distill over generally have a uniform V. I. which does not vary much over 10 points, but this V. I. depends on the source of the crude oil which is distilled. However, the V. I. of the still-bottoms changes with the extent of the fractionation, especially under refinery conditions where some cracking takes place. When the oil which is left in the bottoms has a viscosity of about 150 seconds Saybolt at 210° F. (after removal of wax, asphalt, and the like), its V. I. is still similar to that of the oil which distills over.

In the present invention, the viscosity is increased by further distillation, preferably with mild cracking. The oil (as distinguished from wax, asphalt, and other extraneous material) in the bottoms from all crudes appears to approach the same viscosity, namely, about 2,000 Saybolt at 210° F. This probably occurs because all of the unstable hydrocarbons are cracked, the cracked products distill over, and the fractions of lower V. I. are sufficiently volatile to distill out or are removed as asphalt in the process of decolorizing the oil. The resulting bottoms-oil is of a uniform character and blends with other oils as if it had a V. I. of around 120. Hence, when it is blended in equal volumes with an oil of 44 viscosity Saybolt at 210° F. and having a V. I. of 100, the blend will have a V. I. of about 113.

This high V. I. oil may be recovered from the crude bottoms-oil in several different ways. It may be obtained in purified form from vacuum-still, steam-still or flash-coil bottoms by any of the several well known solvent de-asphalting and/or dewaxing processes. It may also be obtained directly by dewaxing and decolorizing the crude still bottoms by clay or acid treatment, and then fractionating these, either by distillation or by solvent precipitation or other suitable means. The important result is, that when the heaviest portion is finally obtained free of asphalt and wax, it blends with other oils as if it had a high V. I.

For example, Pennsylvania bright stock of 150 Saybolt viscosity at 210° F., generally known as FFF valve oil, may be reduced still further to a 10% bottoms-oil by steam or vacuum distillation at a temperature of up to about 750° F. The bottoms-oil will then have a viscosity of about 1200 Saybolt at 210° F. If this bottoms-oil be blended with a 100 V. I. oil of lower viscosity than the overhead oil, the resulting blend will have a V. I. of above 100, for instance 115 V. I. The character of the resulting blend will depend upon the viscosity of the light oil blended and the V. I. required.

The bottoms stock, reduced as previously described, may be used to thicken light oils of above 100 V. I. and to increase the V. I. of even high V. I. oils. These light oils may be synthetic oils, such as those prepared by the aluminum chloride synthesis of unsaturated hydrocarbons from cracked wax or from other sources. These light

oils may also be prepared by the solvent extraction of high V. I. overhead oil, such as Pennsylvania stock of 42 to 70 Saybolt viscosity at 210° F.

By blending the heavy bottoms with what may be called super-V. I. neutral oils, made by selective solvent extraction of Pennsylvania distillates, it is possible to prepare what are believed to be the highest V. I. mineral oils ever made from petroleum oils.

The oils blended with the heavy bottoms-oil may also be of the glyceride type, such as palm, olive, sperm or rape-seed oils. Blends of the purified oil from the crude bottoms with these oils will have viscosity-temperature characteristics depending upon the nature of the light oil used in the blends. Thus it is possible to make a transmission oil of 250 Saybolt viscosity at 210° F. and with a V. I. of 120. This transmission oil has good load-bearing qualities as well as high V. I. and its viscosity does not break down during use. For example, a good grade of high V. I. bottoms-oil suitable for blending with light oils to obtain oils with a high V. I. has been prepared from a Palembang crude oil by the extraction of the heavy pitch bottoms, from a pipe-still operation, by means of light hydrocarbons, such as liquid propane or butane.

The effect of the addition of an oil of 1375 viscosity, Saybolt Universal at 210° F., recovered from Palembang pipe-still bottoms by extraction with light hydrocarbons and dewaxing is shown by the following examples:

	Vis. at 100° F.	Vis. at 210° F.	V. I.
Original oil	474	32	7
Do. + 2.5% of Palembang oil	510	55	33
Do. + 5.0% of Palembang oil	579	58.2	43
FFF valve oil (Penn. bright stock)	----------	148	100
Do. + 20% Palembang oil	----------	223	107.5
Special gravity Manchester spindle oil	----------	44	100
Do. + 60% Palembang oil	----------	290.6	113

Inspection of the oil made from Palembang crude oil gave the following results:

A. P. I. gravity ---------- degrees -- 16.5
Viscosity at 210° F. ---------- seconds Saybolt -- 1375
Pour ---------- °F. (viscosity pour) -- 85
Conradson carbon ---------- per cent -- 4.92

The viscosity of the above oil made from Palembang crude, at 85° F., is so high that the oil seems to be solid at the conditions of the A. S. T. M. pour test, being near 2,000,000 seconds at 85° F. The oil will flow at 85° F. if given sufficient time.

Hitherto, the main source of high V. I. oils has been chiefly Pennsylvania and some other paraffinic crude oils of which there has been a limited supply. The present invention makes it possible to produce high quality, high V. I. lubricating oils from other crude oils which are more abundant and less costly and to conserve the limited supply of natural crude oils from which high V. I. oils are now made.

The foregoing description is illustrative only and various alternative methods and compositions may be used within the scope of the appended claims, in which it is intended to include all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. The process of preparing residual petroleum lubricating oil of high viscosity and high viscosity index from crude oil residual stocks, comprising distilling therefrom under mild cracking conditions, the lower viscosity oil fractions and the cracked fractions produced during the distillation until the residual oil, when freed from asphalt and wax, reaches a viscosity considerably in excess of 150 seconds Saybolt at 210° F., and separating waxy and asphaltic constituents from the undistilled residue.

2. A process according to claim 1 in which the distillation is continued until the viscosity of the residual oil freed from wax, asphalt and other extraneous substances approach 2,000 seconds Saybolt at 210° F., and thereafter wax and asphalt are removed.

3. A process according to claim 1 in which the residual is reduced to viscosity of the order of about 1200 secs. Saybolt at 210° F. or higher.

4. A process for preparing an improved lubricating oil, comprising distilling a crude oil residue under mild cracking conditions whereby the constituents of lower viscosity index are cracked and removed as vapor, continuing distillation until the viscosity of the residue is of the order of 1200 to 2000 seconds Saybolt at 210° F., separating the wax and asphalt from said residual, then blending this residue with a lighter oil to increase the viscosity and viscosity index of the same.

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