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TREATMENT OF LUBRICATING OILS

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4 Claims. (Cl. 196—78)

This invention relates to a method for converting high boiling, very viscous lubricating oils into lubricating oils having a much lower viscosity and a viscosity index which is approximately the same as that of the original oil.

In refining petroleum there is usually a large fraction of heavy, very viscous oil obtained for which there is no very great demand. Some of this oil finds use as a lubricant in the cylinders of steam engines but it is not suitable for other types of lubrication, and is particularly unsuited for use in internal combustion engines of the automotive type. For lubricating internal combustion engines it is desirable to use an oil with a high viscosity index but having a much lower viscosity than the heavy oils used for lubricating steam engine cylinders. It is possible by distillation of the very viscous oil to obtain only a small amount of the so called neutral oil having the low viscosity and high viscosity index desired.

The object of the present invention is to provide a method whereby a considerable fraction of the highly viscous oil can be converted into an oil which has a much lower viscosity but approximately the same viscosity index as the original oil.

This object is accomplished by heating the oil, methanol and, if desired, some water to a high temperature in the presence of a hydrogenating catalyst and under superatmospheric pressure. By this treatment the heavy oil is broken down to products of much lower viscosity and approximately the same viscosity index.

It is well known that by heating these highly viscous oils to temperatures of 350° C. and higher they can be cracked into products of lower molecular weight, such as gases, gasoline fractions, kerosene and high fractions. The higher fractions, however, yield oils of the lubricating type which have a much lower viscosity index than that of the original oil. In many cases the cracking operation converts practically all of the heavy oil to low boiling fractions which contain no lubricating oils whatever. For example, if Pennsylvania Bright Stock is heated to about 380° C., it is entirely converted into gas, gasoline, kerosene and gas oil; no lubricating oil whatever remains. However, if there is some methanol or a mixture of methanol and water present along with a suitable catalyst, a large portion of the very viscous oil is converted to a lubricating oil of high viscosity index but of much lower viscosity than the original oil. At the same time the percentage of the lower boiling fractions is

considerably less than when no methanol and catalyst are present.

The catalyst used may be any of the usual reducing catalysts such as metallic nickel or one composed of the oxides of a hydrogenating metal and an acid-forming metal. The latter type may be, for example, copper-chromium oxides; copper, chromium, barium oxides; manganese, zinc, chromium oxides etc. Catalysts containing the oxides of copper, chromium and barium have been found to be very effective.

The temperature may vary within fairly wide limits but is more or less determined by the nature of the oil and the ease with which it decomposes. With a Pennsylvania Bright Stock, for example, temperatures of 300 to 400° C. give good results. At the higher temperatures there is a decided tendency for low boiling products to be formed whereas at the lower temperatures there usually is a large amount of heavy, highly viscous oil left after the neutral oil has been distilled from the reaction product.

The amount of methanol employed can also be varied within fairly wide limits. Good results have been obtained when the weight of methanol varied from about 8 to about 40% of the weight of the oil. The water present, if any, may be as much as 25% or more of the weight of the oil.

The pressure may vary from about 250 to 2000 pounds or more per square inch. The actual pressure can be adjusted by varying the temperature. At the lower temperatures the pressure will usually be lower because it is generated by the decomposition of the oil and methanol and there is less decomposition at these temperatures. Low pressures may also be maintained at the higher temperatures by suitably releasing some of the gas generated.

The process may be carried out continuously in a suitable apparatus or in individual batches. In the former case a mixture of the oil and the methanol or methanol and water may be flowed continuously over the catalyst at the desired temperature. For batch operations the alcohol or methanol and water may be forced into a reaction chamber filled with the oil and catalyst and allowed to bubble through, or a mixture of all the ingredients may be placed in a shaking bomb and agitated for a time sufficient to bring about the desired change.

The results obtained by this method of treating very viscous lubricating oils may be seen from the following table. These results were obtained by heating 125 g. of Pennsylvania Bright Stock with 10 g. of catalyst consisting of copper, chro-

mium and barium oxides, and the indicated amount of methanol or methanol and water for four hours at the temperature shown. The pressure given in the fifth column is that which developed in the bomb due to decomposition and vaporization of the materials. The percentage of neutral oil obtained is given in the sixth column, the last figure in the column being the amount of neutral oil distilled under 10 mm. pressure directly from the original oil. The seventh column gives the viscosity index of the neutral oil as calculated from the Saybolt viscosities at 100 and 210° F. The eighth and ninth columns show the amount of light oil and heavy residue obtained from the treated oil by distillation. The distillation was carried out as follows:

At atmospheric pressure up to 201° C. Gasoline fraction
At atmospheric pressure 202 to 289° C. Kerosene
At 10 mm. mercury column up to 246° C. Gas oil
At 10 mm. mercury column 247 to 348° C. Neutral
At 10 mm. mercury column above 348° C. Bottoms

The amount of neutral oil in the original viscous oil was determined by the same method of distillation.

Run No.	° C.	G. CH ₃ OH	G. H ₂ O	Pounds pressure	Percent neutral oil	V. I.	Percent lighter oils	Percent heavier oils
1	380	50	0	850	26	93	53	18
2	380	10	0	690	14	73	73	5
3	325	50	0	1,045	21	99	4	70
4	325	10	0	270	20	96	3	70
5	380	50	28	2,000	29	99	39	32
6	380	10	10	600	35	102	39	28
7	325	50	28	1,400	18	97	4	72
8	380	0	0	600	0	97	80	12
Original oil distilled					15	97		80

The effect of the methanol or of the mixture of methanol and water can be seen by comparing the figures for Run No. 8 where no methanol was present with the other runs. When no methanol is present, the oil is simply cracked into the lighter hydrocarbons, no neutral oil being formed. When methanol is present, a large percentage of the heavy, highly viscous oil is converted into a desirable lubricating oil of high viscosity index.

The presence of water has a beneficial effect on the reactions, particularly at the higher temperatures, which results in higher yields and better viscosity index than are obtained when no water is present.

The foregoing table has been given as illustrative of the results which can be obtained. The process may, however, be applied to other oils of Pennsylvania or other origin with beneficial results.

This application is a continuation-in-part of

our co-pending application, Serial No. 755,356 filed November 30, 1934.

We claim:

1. The process of converting lubricating oils of high viscosity and high viscosity index to lubricating oils of lower viscosity and substantially the same viscosity index, which comprises heating a mixture consisting essentially of the high viscosity oil and methanol at a temperature of from about 300 to about 400° C. under a pressure of from about 250 to about 2000 pounds per square inch in the presence of a reducing catalyst.

2. The process of converting lubricating oils of high viscosity and high viscosity index to lubricating oils of lower viscosity and substantially the same viscosity index, which comprises heating a mixture consisting essentially of the high viscosity oil and methanol at a temperature of from about 300 to about 400° C. under a pressure of from about 250 to about 2000 pounds per square inch in the presence of a catalyst consisting essentially of the oxides of copper, chromium and barium.

3. The process of converting lubricating oils of high viscosity and high viscosity index to lubricating oils of lower viscosity and substantially the same viscosity index, which comprises heating a mixture consisting essentially of the high viscosity oil, methanol and water at a temperature of from about 300 to about 400° C. under a pressure of from about 250 to about 2000 pounds per square inch in the presence of a reducing catalyst.

4. The process of converting lubricating oils of high viscosity and high viscosity index to lubricating oils of lower viscosity and substantially the same viscosity index, which comprises heating a mixture consisting essentially of the high viscosity oil, methanol and water at a temperature of from about 300 to about 400° C. under a pressure of from about 250 to about 2000 pounds per square inch in the presence of a catalyst consisting essentially of the oxides of copper, chromium and barium.

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