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PROCESS OF PREPARING LUBRICATING OILS

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1 Claim. (Cl. 196—14.46)

This invention relates to lubricating oil compositions and in particular relates to a process for obtaining improved non-additive lubricating oil compositions especially adapted for use in aircraft engines.

Certain manufacturers of aircraft engines have indicated that lubricating oil compositions having greater than a 500 milligram corrosion loss (lead loss of a lead coated steel bearing) as indicated by the MacCoull-Ryder corrosion-oxidation test (see SAE Journal, August 1942) are considered excessively corrosive and advise watchfulness to avoid parts failure when such oils are in service. Frequently in manufacturing a saleable product the lead loss must be less than 50 milligrams. The need for reliable lubricants for aircraft engines is obvious since failure to lubricate in service cannot be tolerated as a plurality of opportunities may not exist. Further, a lubricating oil composition requiring frequent tests as a control on corrosion raises maintenance costs and can militate against its use.

The production of lubricating oils is in many respects an essentially empirical art notwithstanding the intensive research activity in this field. The applicability of a given processing step on a certain oil fraction derived from a defined crude is not necessarily conclusive that such processing step will even aid a comparable oil derived from an entirely different base stock. Thus, it is common procedure to produce lubricating oils having substantially the same characteristics from different base stocks by entirely different routes or processing steps. The present invention relates particularly to a method of producing refined heavy mineral lubricating oil stocks, and compositions containing them, from intermediate or mixed base crudes such as East Texas and sweet West Texas reduced crudes.

We have now discovered that an improved lubricating oil stock can be prepared, from an intermediate or mixed base crude, which is especially suitable as a non-additive aircraft engine lubricating oil. Lubricating oil stock, and compositions prepared therefrom, which are produced according to our invention are characterized by a low corrosion indication by the MacCoull-Ryder corrosion-oxidation test (lead loss from a lead-lined steel bearing). The invention is effected by subjecting a defined feed stock to a particular series of refining operations including deasphalting, phenol treating, dewaxing and clay contacting.

Improved lubricating oil fractions are produced according to our invention from heavy residua or reduced crudes of intermediate or mixed base crudes such as East Texas or sweet West Texas reduced crude or a blend of such crudes. Reduced crudes are the bottoms resulting upon distilling a crude oil to recover the naturally occurring gasoline, kerosene and similar light products. For purposes of the invention reduced crudes or heavy residua having viscosities of at least about 400 S. U. S. at 210° F., for example, viscosities of from about 400 to 750 S. U. S. at 210° F., are employed. The reduced crudes are subjected to a very critical series of steps which, in general, consist of contacting the feed fraction with a particular

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amount of liquid propane at defined temperatures to obtain a deasphalted reduced crude which is then phenol extracted under defined conditions, dewaxed employing known techniques, and percolated through a neutral clay at a defined rate. It is essential in the invention that each of these steps be employed and that they be employed in the sequence disclosed and under the conditions hereinafter established. For example, it is essential in the propane deasphalting step that sufficient propane be employed at a particular temperature so that a yield of about 40 to 59 percent of deasphalted oil is obtained on the basis of the heavy reduced crude employed. While lower yields can be employed, higher yields generally result in final compositions which can be characterized by unsatisfactory lead loss by the MacCoull-Ryder test. For example, it has been found that a reduced crude which was deasphalted to a yield of 68 percent evidenced a MacCoull-Ryder test bearing loss of as much as 760 mg. whereas the same crude deasphalted to a 50 percent yield showed only about a 7 mg. loss, all subsequent treatment on each crude being identical. Accordingly, the details disclosed hereinafter must be followed carefully in order to practice the present invention and obtain the results described.

The reduced crude in the first of the sequential operations which must be employed in our invention is contacted with about 6 to 12 volumes of liquid propane, advantageously in a liquid-liquid contacting tower, at a tower top temperature of about 160° to 185° F., the particular amount of propane and particular temperature employed being chosen to result in a highly selective deasphalted yield of about 40 to 59 volume percent based on the reduced crude feed. The deasphalting step can be accomplished in any of the equipment which is now conventional in the art for liquid-liquid contact. The propane normally is recovered by flashing it from the deasphalted fraction.

The deasphalted oil is then contacted with about 2 to 6 volumes of phenol at a temperature of about 180° to 220° F. in any known manner to produce a raffinate. As a general rule the amount of phenol and the temperature employed are chosen to result in a raffinate having a viscosity index of about 94 to 103. The raffinate is then dewaxed both to remove the normal paraffinic waxes and the microcrystalline waxes such as petrolatum. Conditions, equipment and the like employed in dewaxing are well known. However, particularly satisfactory results are obtained when the methylethyl ketone process is employed using about 200 to 600 volume percent of the solvent per volume of raffinate. The temperatures employed during dewaxing normally are 0 to -20° F. The resulting dewaxed material then, preferably, percolates through a neutral clay, such as fuller's earth or bauxite, at a temperature of about 100 to 300° F. and a yield rate of about 30 to 100 barrels per ton of clay employed. A neutral clay found to be especially suited for use in the present invention is available commercially as Attapulug clay. While percolation constitutes the preferred clay treatment procedure, contact filtration also can be employed. Apparatus and procedures for clay treatment in accordance with the present invention may be those commonly employed in refinery operations.

The resulting refined heavy lubricating oil fraction, i. e. bright stock, can be employed as such as an aircraft engine lubricating oil or, in the event that its viscosity does not conform to specification viscosity, a portion of a lighter lubricating oil, such as a neutral oil, can be added to cut the material to the desired viscosity. Normally, where neutral oil is employed, the resulting compositions contain about 5 to 20 volume percent of the neutral oil and 80 to 95 volume percent of the bright stock. The neutral oils employed for the purpose of reducing vis-

cosity to specification requirements can be those produced by conventional refinery procedure providing the resulting composition does not show a materially different lead loss than would the bright stock alone.

The invention will be described further in conjunction with the following example, it being understood that the specific details disclosed are not to be considered limiting.

Example

A blend having a viscosity of 402 S. U. S. at 210° F. and consisting of 53 volume percent sweet West Texas reduced crude and 47 volume percent East Texas reduced crude was contacted with about 11.6 volumes of liquid propane in a liquid-liquid contacting tower at a tower top temperature of 169° F. to remove asphalts and recover a propane soluble fraction in an amount equivalent to about a 58.7 volume percent yield based on the blend. The propane was recovered by flashing and the deasphalted oil was then passed into a phenol treating unit and contacted with 2 volumes of phenol at a temperature of 190° F. The raffinate was then dewaxed employing 5 volumes of methylethyl ketone at -10° F. The resulting dewaxed material was percolated through Attapulugus clay at a rate which resulted in a yield of 62 barrels per ton of clay. The temperature of the clay during the percolation was maintained at about 100 to 200° F.

A lubricating oil composition was then made from the resulting refined bright stock by adding a neutral oil having a viscosity of 600 S. U. S. at 100° F. to the bright stock until a viscosity of 1246 S. U. S. at 100° F. was obtained. The resulting composition contained about 88 volume percent bright stock and 12 volume percent of the neutral oil. The composition was then subjected to carbon residue analysis and the MacCoull-Ryder test. The results obtained showed a carbon residue of 0.28 percent and a lead loss by the MacCoull-Ryder test of 11 mgs.

The untreated blend had a lead bearing loss of well over 700 milligrams. It can be seen, therefore, that significant improvement resulted as the composition produced evidenced the very low lead loss of 11 mgs.

In another experiment employing blends of the East Texas and sweet West Texas reduced crudes wherein the blends had viscosities which were below 400 S. U. S. at 210° F., i. e. 317 and 295 S. U. S., propane deasphalting was effected to a yield of 62.3 volume percent in one instance and to 65.1 volume percent in the second instance.

The runs were otherwise comparable to that of the example. The lead loss of the resulting bright stocks were not satisfactory being 496 mgs. in the instance of the 317 S. U. S. blend deasphalted to the 62.3 percent yield and 562 mgs. for the other blend.

In still another experiment, an intermediate base reduced crude evidencing a satisfactorily high viscosity, i. e. 480 S. U. S. at 210° F., was propane deasphalted to a 66 percent yield, with subsequent treatment being comparable to that of the example. The MacCoull-Ryder lead loss of the resulting bright stock was 475 mgs. Thus, it is apparent that both a high viscosity charge stock and a highly selective, highly severe propane deasphalting step must be employed to result in the low lead losses of the order of below 50 mgs. of the lubricating oil stocks produced.

We claim:

The method of producing improved non-additive aircraft engine lubricating oil stock from mixed base reduced crudes which comprises contacting a mixed base reduced crude having a viscosity of at least about 400 S. U. S. at 210° F. with about 6 to 12 volumes of liquid propane at a temperature of about 160 to 185° F. to obtain a deasphalted crude at a yield of about 40 to 59 volume percent based on the charge stock, extracting the resulting deasphalted oil with about 2 to 6 volumes of phenol at a temperature of about 180 to 220° F. to obtain a raffinate, dewaxing the resulting raffinate, and percolating the resulting dewaxed raffinate through a neutral clay at a yield rate of about 30 to 100 barrels per ton of clay at a temperature of about 100 to 300° F.

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