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PROCESS FOR TREATING HEAVY RESIDUES

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2 Claims. (Cl. 196—13)

This invention relates to the treatment of heavy residues such as reduced crudes, primary tars, lignite tars, shale oils, etc., for the purpose of dewaxing and deasphalting the same and preparing a viscous lubricating oil stock. The treatment is carried out with a "light hydrocarbon" solvent which term is meant to include pentane and all the lighter hydrocarbons such as pentylene and those which are gaseous under conditions of normal temperature and pressure, such as butane, butylene, iso-butane, iso-butylene, propane, propylene, ethane, ethylene and methane, or mixtures of the same.

The invention is characterized by that only a comparatively small part of the residue to be treated is subjected to the deasphalting treatment and only the part containing heavy viscous lubricating oil fractions is subjected to the dewaxing treatment by means of a light hydrocarbon solvent while gas oil and light lubricating oil fractions are previously removed and are not present during these treatments.

The invention will be fully understood from the following description when read in conjunction with the drawing, the sole figure of which is a diagrammatic side elevation partly in section of the apparatus used for carrying out the invention.

The apparatus and the method of carrying out the process will now be conjointly described.

The residue, such as reduced crude, is passed from a storage tank (not shown) through line 1 into the heating coil 2 arranged in furnace 3. The heated oil is discharged into the flash zone of tower 4 provided with the usual fractionating means such as bell cap plates 5. Preferably a high vacuum is maintained on the tower 4 by means (not shown) well known in the art. The overhead product, such as gas oil, is removed through line 6, and condensed in condenser 7, part of the condensed gas oil being returned as reflux to the top of the tower through line 8. A light lubricating oil side stream is taken off through line 9 and cooler 10 into the storage tank (not shown). A viscous lubricating oil fraction is taken off as side stream through line 11, cooler 12 and then mixed with the deasphaltized bottoms as will be described below. The bottoms leaves the tower through line 13 and is cooled in cooler 14. The temperature at the outlet of heating coil 2 is regulated so as to produce as low bottoms as possible while minimizing the cracking and still obtaining good colored high viscosity lubricating oil as lower side stream. The cooled bottoms is taken up by the pump 15 and passed together with the light hydrocarbon solvent, such as liquid

propane from line 16 into mixing column 17 and thence into the settling tank 18. Separation of a bottom layer containing the asphalt of the bottoms together with some propane and a top layer containing the deasphaltized bottoms with the bulk of the propane are separated in the settling tank. The asphalt layer is removed through line 19 and freed from the propane, the top layer is removed through line 20, mixed with the cooled viscous lubricating oil side stream from line 11 and passed through the chiller 21 into the settling tank 22. The settling tanks 18 and 22 are held under sufficient pressure to keep the light hydrocarbon solvent in the liquid state. Instead of using a separate chiller the content of the settling tank 22 may be chilled by evaporating by release of the pressure part of the propane, compressing and cooling the propane vapors so as to liquefy them and returning them to the settling tank 22. In this tank again a separation of two layers occurs, the bottom layer containing the waxy material together with some oil and light hydrocarbon solvent and the top layer containing the dewaxed viscous lubricating oil fraction in solution in the light hydrocarbon solvent. The bottom layer is removed through line 23 and freed from the light hydrocarbon solvent while the top layer is removed through line 24 and may be subjected to further decolorization process by treatment with a light hydrocarbon solvent or may be directly passed through heater 25 into the flash tower 26, which is preferably operated under pressure. The bottoms from this tower passes to the stripping tower 27 operating at atmospheric pressure. Steam is introduced into the bottoms of this tower through line 28 to remove the last traces of light hydrocarbon from the treated oil. The gases from this tower are compressed by compressor 29, the condensed steam separated in a separator 30 and the light hydrocarbons returned to tower 26. The light hydrocarbons from tower 26 pass through condenser 31 into the line 16 to be returned to the process. An additional amount of light hydrocarbon may be added through line 32 to make up for losses. The treated oil is removed from the bottom of tower 27 through line 33 into a storage tank (not shown).

On certain stocks it may be desirable to give the viscous lube oil side stream from line 11 some treatment such as acid treatment and/or clay percolation or contacting previous to blending with the deasphaltized bottoms. Acid treatment and/or clay percolation may also be carried out in solution before or after the dewaxing step. The pressure under which the deasphalting and

dewaxing is carried out depends on the treating stock and on the solvent used. It may be within 10 to 30 atmospheres for treating down to 1 atmosphere for dewaxing or it may vary within

broader limits. The temperature at which the deasphaltizing is carried out is usually between 60 and 120° F. when propane or propane-ethane mixture is used and the temperature in the dewaxing tank 22 is usually between 0 and -40° F.

Instead of a pipe still a vacuum shell still may be used for the removal of gas oil and light lubricating oil fractions and the production of bottoms and a viscous lubricating oil fraction to be treated.

The expression "heavy residue" is meant to designate an oil containing asphaltic and waxy constituents. It may be reduced crude or it may be even a crude oil containing some kerosene and gasoline fractions although the use of a pipe still in case of such a crude is connected with some difficulties due to the light ends which have to be removed together with the gas oil and the light lubricating oil. However, such a crude may be very well distilled in a shell still and treated according to the present process.

The following example will illustrate my process:

50% Ranger crude bottoms is run in a vacuum pipe still at 700° F. flash temperature cutting 7% bottoms (on crude) having a 1700 viscosity @ 210° F. and 14.2° A. P. I. gravity, and a 10.7% side stream (on crude) having a 110° F. viscosity @ 210° F. The bottoms is then treated with 8 volumes of propane at 80° F. resulting in the precipitation of 2.8% of asphalt (on crude) having a 140° F. softening point. The oil solution is then blended with the proportional amount of side stream resulting in approximately a 3.5 to 1 solvent to oil ratio. This mixture is chilled to -40° F., wax settled out, clear solution withdrawn and solvent removed. The dewaxed product has a 21.8° A. P. I. gravity, 510° F. flash, 160 viscosity at 210° F., 85° F. pour, 1½ Robinson dilute color and 2.2% Conradson carbon.

My invention is not to be limited by any theory nor by the particular details given for illustration but merely by the attached claims in which it is

my intention to claim all novelty inherent in the process.

What I claim is:

1. The process of treating a heavy residue which comprises subjecting the residue to distillation to separate the same into a light lubricating oil fraction and all the lighter constituents, a viscous wax-containing fraction boiling in the lubricating oil range and bottoms, passing the bottoms under pressure together with a light hydrocarbon solvent comprising pentane and hydrocarbons lighter than pentane into a deasphaltizing zone in which an asphalt layer and a deasphaltized bottoms layer in light hydrocarbon solution is obtained, admixing the viscous lubricating oil fraction with the deasphaltizing bottoms solution, chilling the mixture and settling the same in a dewaxing zone to obtain a wax-containing bottom layer and a top layer containing a dewaxed heavy lubricating oil fraction in solution in light hydrocarbon solvent, removing the bottom layer and freeing the top layer from the light hydrocarbon solvent to obtain a heavy lubricating oil fraction.

2. The process of treating reduced crude which comprises passing the crude through an elongated narrow heating zone, into an enlarged distillation zone held under vacuum, removing a light lubricating oil fraction and any lighter fraction originally present in the crude, separately removing bottoms and a viscous wax-containing fraction boiling in the lubricating oil range, passing the bottoms together with a light hydrocarbon solvent comprising pentane and hydrocarbons lighter than pentane into a deasphaltizing zone held under pressure in which an asphalt layer and a deasphaltized bottoms layer in light hydrocarbon solution is obtained, admixing the viscous lubricating oil fraction with the deasphaltized bottoms solution, chilling the mixture and settling the same in a dewaxing zone to obtain a wax-containing bottom layer and a top layer containing a dewaxed heavy lubricating oil fraction in solution in light hydrocarbon solvent, removing the bottom layer and freeing the top layer from the light hydrocarbon solvent to obtain a heavy lubricating oil fraction.

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