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METHOD OF REMOVING ASH-FORMING COMPONENTS FROM CRUDE PETROLEUM OIL

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2 Claims. (Cl. 196—40)

This invention relates to improvements in removing ash-forming components, such as mineral salts and the like, from oils. The invention is particularly directed to the removal of salt from crude petroleum oil. It is applicable, however, in general to oils which do not form substantial amounts of sediment when treated with dilute mineral acids. Sediment-forming oils are satisfactorily treated by the methods of my Patents Nos. 1,660,294 and 1,660,295 granted February 21, 1928.

Many oils, particularly crude petroleum oils, contain substantial amounts of mineral salts in substantially permanent suspension. Even after long standing there is little diminution of the salt content.

I have found that the salt may be removed by blending the salt containing oil with a cracked petroleum residue, such as is obtained from the operation of pressure stills, cracking coils, and the like. Cracked materials of the type contemplated in this invention are described in the patents mentioned above. In these patents I have described the effect of adding dilute acidic substances to cracked residues and have shown that there is a substantially complete precipitation of carbonaceous sediment from the treated oils.

I have discovered that the precipitation of this sediment can be used as a means for freeing crude oils or the like from their salt content. The invention is best carried into effect by mixing the crude oil with for example 25 to 40% by volume of cracking coil tar having an A. P. I. gravity of about 7 to 10°. The mixture is then treated with dilute sulphuric acid. Ordinarily a small percentage of acid, ½ to 1% by volume of the oil treated, is sufficient. However, larger proportions of acid may be used without disadvantage.

Sulphuric acid is most economical, but other acids having the property of precipitating the sediment may be used, for example, dilute hydrochloric acid, dilute acetic acid, and dilute solutions of salts, such as sodium acid sulfate or aluminum sulfate, which hydrolyze to form acids. Sulphuric acid of 30° to 60° Bé. is suitable. Weaker acids sometimes fail to act completely, and stronger acids may give trouble by the formation of sludge which interferes with the subsequent treatment. The acid used may be diluted treating acid, such as is ordinarily sent to the acid recovery plants operated in connection with refineries. When the oil to be treated contains water, a more concentrated acid may be used so as to allow for dilution when added to the oil. In all cases the use of strong acids in sludge-forming concentration, is avoided.

The oil may be treated with the acid at ordinary pressure; sometimes, however, it is advantageous to use pressures above or below atmospheric, depending particularly on the character of the oil and the arrangements for taking care of vapors evolved during the treatment.

Heating facilitates the process. It is advantageous to run the cracking coil tar, while hot, into the cold crude oil. In this way the blend is brought to the desired temperature. This is about 200° to 275° F., though considerably higher temperatures, up to 500 or 600° are permissible. The mixture of cracking coil tar and crude oil, heated as above described or in any other suitable way, is treated with the dilute acid. Carbonaceous sediment settles out rapidly, carrying with it the greater part of the salt content of the crude oil and also any mineral matter which may be in the cracking coil tar. This may be naturally occurring mineral matter or may be such as has been added in the form of lime or the like to prevent corrosion of the cracking equipment.

The upper layer from which the sediment has been precipitated is substantially free from ash-forming components and is also stabilized with respect to the formation of carbonaceous sediment.

Any preferred method of mixing the crude oil and the cracking coil tar with each other and with the acid may be adopted. I prefer a continuous treatment such as by the use of mixing columns in which the three streams of material are fed at one end and discharged at the other into a settling tank. The equipment for separating the sediment from the oil may take the form of so-called thickeners, such as are now used in connection with the operation of the methods described in my patents mentioned above.

The oil product is not only improved by the removal of ash-forming components, but its viscosity is advantageously lowered. The treated product may be run while hot into the crude stills or the cracking stills. It will be understood that suitable condensers should be provided to collect any low boiling oils which are distilled off during the treatment.

While, in the foregoing, emphasis has been laid on the treatment of crude oil, it will be understood that the method is applicable to any oil containing ash-forming components, and insufficiently cracked to yield enough sediment on

acid treating to throw out ash-forming components. Thus the invention may be applied also to reduced crudes which have been run under non-cracking conditions, to certain fuel oils, and the like.

Various changes and alternative procedures may be adopted within the scope of the appended claims, in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. Method of removing ash-forming components from a substantially non-sediment-forming petroleum fuel oil, which comprises mixing with the oil about 25 to 40 per cent by volume of cracking coil tar, heating the mixture to between 200 degrees Fahrenheit and 600 degrees Fahrenheit, treating the mixture with about ½ to 1 per cent of sulfuric acid of 30 to 60 degrees Baumé, whereby a carbonaceous precipitate is formed carrying with it the ash-forming components of the oil, and separating the precipitated material from the oil.

2. Method of removing ash-forming components from a crude petroleum oil, comprising mixing with the oil about 25%–40% by volume of cracking coil tar, heating the mixture and treating the same with about ½%–1% of sulfuric acid of 30°–60° Baumé, whereby a carbonaceous precipitate is formed carrying with it the ash-forming components of the oil, and separating the precipitated material from the oil.

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