UNITED STATES PATENT OFFICE

2,442,100

METHOD FOR REMOVING ASPHALT EMULSION FROM CONTAINERS

Jere C. Showalter, Goose Creek, Tex., assignor to Standard Oil Development Company, a corporation of Delaware

No Drawing. Application May 8, 1945, Serial No. 592,781

8 Claims. (Cl. 134—22)

The present invention is directed to a method of cleaning containers which have heavy viscous asphalt emulsions deposited therein.

Vessels employed as containers for petroleum or petroleum products often become contaminated by a heavy emulsified asphalt sediment so viscous in nature that it cannot be removed from the container by ordinary pumping methods. For example, the cargo tanks of ships used for transporting petroleum products may become fouled with a viscous emulsified asphalt sediment and similarly, stationary containers, such as tanks, and heat exchangers in a refinery also become fouled with such deposits. These viscous deposits or sediments may include, for example, asphalt, iron scale, carbonaceous matter and water and are of such a nature that they cannot be handled by usual pumping equipment; moreover they are insoluble or substantially insoluble in petroleum fractions, such as gas oil. These sediments are of such a nature that heretofore it has been considered necessary to remove them by mechanical means. The practice of the prior art is exemplified in the removal of sediments or deposits from the cargo tanks of ships manually by workmen employing shovels and buckets. Such mechanical methods for removing the emulsified asphalt sediments are expensive and in addition are hazardous to the safety of the workmen employed.

In accordance with the present invention, vessels or containers with emulsified asphalt sediments of such a nature as to be non-pumpable and substantially insoluble in hydrocarbon solvents are treated to convert the sediments into pumpable mixtures and the pumpable mixtures then removed from the containers. More specifically, aqueous alkaline sodium sulfonate solution is brought into contact with an emulsified asphalt sediment at a temperature substantially above atmospheric, the sediment and the solution thoroughly agitated to form a readily pumpable mixture, and the pumpable mixture removed by conventional liquid handling means.

It has been found convenient to employ sodium carbonate as an addition agent in combination with the sodium sulfonate solution in order to maintain the solution alkaline but other similar chemical agents may also be employed. Examples of suitable addition agents to maintain the pH of the solution above 7 are sodium hydroxide, barium hydroxide and potassium carbonate.

The sodium sulfonates employed in the practice of the present invention are well known to the art. Such a material is the extract produced by extracting a Coastal distillate having a viscosity in the range of 100 to 200 seconds Saybolt at 100° F.; phenol may be employed as the selective solvent in the extraction step although other equivalent materials are known to the art. The extract is then given a heavy treatment with sulfuric acid to form an acid sludge, for example, the extract may be treated in several steps with 400 lbs. of 98% sulfuric acid in each step. After the acid treatment, the acid sludge is separated from the remainder of the material by settling. The sulfonic acids remaining in the oil phase after the acid sludge has been separated are neutralized with sodium hydroxide to form a neutral oil and soap. The neutral oil and soap is then heated to 210° F. and washed with 5 to 10 volume per cent of hot water which causes the sulfonate to precipitate. The precipitate may be withdrawn and used as the sodium sulfonate in the process of the present invention.

In the practice of the present invention it is desirable to maintain the aqueous alkaline solution of sodium sulfonate in contact with the emulsified asphalt sediment at a temperature substantially above atmospheric over a substantial interval of time before the solution and the sediment are agitated to cause admixture thereof. After the body of the aqueous alkaline sodium sulfonate solution has been in contact with the body of the sediment over a substantial interval of time, the two bodies are agitated violently to produce a mixture capable of being readily pumped or otherwise handled as a liquid stream. The temperature of the aqueous alkaline sodium sulfonate solution which is brought into contact with the emulsified asphalt sediment may be varied over a substantial range and satisfactory results obtained; for example, a temperature within the range of 120° to 200° F. will be found suitable. It will be understood that often it will be desirable to have a heating means within the container which will allow the temperature of the aqueous alkaline sodium sulfonate solution to be maintained constant or even increased as it is contacted with the body of the heavy emulsified asphalt sediment preparatory to agitating the two bodies. For example, the solution may have an initial temperature of 120° F. and be heated to 180° F. within the container. Although it will often be found desirable to adjust the temperature of the solution and sediment to approximately 160° F. before they are agitated to produce a pumpable admixture, it will be understood that a temperature within the range of 120° to 200° F. will be found satisfactory.
The amount of sodium sulfonate employed in accordance with the present invention to convert the emulsified asphalt sediment into a pumpable mixture may be varied over a wide range and satisfactory results obtained. Usually, sodium sulfonate is employed in amounts within the range of 3 to 10% by weight of the heavy emulsified asphalt sediment, with the addition of at least sufficient water to the sulfonates to dissolve them completely and an alkaline agent added in an amount sufficient to maintain the sodium sulfonate solution alkaline. When sodium carbonate is employed as the alkaline agent, approximately 1/3 by weight of sodium carbonate with respect to the sodium sulfonate will be found adequate. For convenience, the total volume of solution in contact with the emulsified asphalt sediment may equal that of the sediment and when this volume of solution is used the concentration of sodium sulfonate therein is preferably within the range of 5% to 10% while the concentration of sodium carbonate may be within the range of 5% to 10%.

It is desirable for the heated aqueous alkaline sodium sulfonate solution to remain in contact with the emulsified asphalt sediment over a substantial interval before agitating the two bodies to render them pumpable. It will be found convenient to maintain the body of solution in contact with the sediment for an interval within the range of 6 to 18 hours; usually when the aqueous alkaline sodium sulfonate solution is in contact with the sediment 12 hours the bodies are conditioned to form a pumpable admixture readily upon agitation. It will be evident that the length of time during which the hot aqueous alkaline sodium sulfonate solution is maintained in contact with the sediment is a function of the initial temperature of the solution as well as a function of the amount of heat, if any, supplied to the container while the solution and sediment are in contact; in general, the higher the temperature, the shorter will be the interval required before the contents may be agitated to produce a liquefied mixture capable of being readily pumped.

The practice of the present invention will be further described by the following examples:

**Example**

Two cargo tanks of a ship employed to transport petroleum products were contaminated with a highly viscous sediment. In one of the tanks the sediment was approximately two feet thick and in the other tank approximately one foot in thickness, the tanks containing an estimated 120 barrels and 60 barrels of sediment, respectively. Upon analysis, the sediment was found to consist of asphalt, iron oxide, carbonaceous matter and water. This sediment was so viscous it could not be moved by pumping.

Into each cargo tank was placed 5 barrels of sodium sulfonate, 150 pounds of sodium carbonate and a volume of water at 120° F, equal to the volume of the sediment in the tank. Each tank was then heated for approximately 12 hours with closed steam coils and at the end of the 12-hour period the temperature of the tank contents was approximately 160° F. The contents of the tank were then violently agitated by injecting hot water at 120° F. through nozzles and this agitation soon caused the formation of a pumpable mixture or emulsion. The mixture was then discharged from the tanks while being washed with water at 120° F. The pumpable mixture discharged from the tank was sent to a separator and it was observed that after 20 mins. of settling the mixture separated into a top layer of fairly clean fuel oil and a bottom layer of dark gray emulsion including water, carbonaceous matter and some oil. After the washing of the tanks with hot water they were found to be thoroughly clean and free from sediment.

The nature and objects of the present invention having been fully described, what I wish to claim as new and useful and to secure by Letters Patent is:

1. A method for cleaning a container having a non-pumpable, gas oil-insoluble, emulsified asphalt sediment deposited therein including the steps of introducing into said container aqueous sodium sulfonate solution and an alkaline agent to form a cleaning solution, agitating said solution in contact with the emulsified asphalt sediment at a temperature substantially above atmospheric to form a mixture capable of being pumped, and removing said mixture from the container.

2. A method for cleaning a container having deposited therein a non-pumpable asphalt emulsion sediment insoluble in gas oil, including the steps of introducing into said container aqueous sodium sulfonate solution and an alkaline agent to form a cleaning solution, maintaining at least a portion of the emulsified asphalt sediment in contact with said cleaning solution at a temperature substantially above atmospheric, subsequently agitating the cleaning solution and the sediment to form a pumpable mixture, and removing said mixture from the container.

3. A method in accordance with claim 2 in which the alkaline agent is sodium carbonate.

4. A method in accordance with claim 2 in which the alkaline agent is sodium carbonate and in which the sodium sulfonate is present within the range of 5 to 10 parts per 100 parts of emulsified asphalt sediment.

5. A method in accordance with claim 2 in which the alkaline agent is sodium carbonate, in which sodium sulfonate is employed within the range of 5 to 10 parts per 100 parts of emulsified asphalt sediment and in which the cleaning solution is maintained in contact with the emulsified asphalt sediment approximately 12 hours prior to agitating the body of solution with the sediment.

6. A method for cleaning a container having deposited therein a layer of emulsified asphalt sediment insoluble in gas oil and of such viscosity as to resist pumping, including the steps of adding to the container an aqueous solution including sodium sulfonate within the range of 5 to 10 parts of sodium sulfonate per 100 parts of sediment and sodium carbonate within the range of .5 to 1 part of sodium carbonate per 100 parts of sediment, maintaining the body of aqueous solution in contact with the body of emulsified asphalt sediment at a temperature of approximately 160° F. for approximately 12 hours, subsequently violently agitating the body of aqueous solution and the body of sediment to produce a pumpable mixture, removing said mixture from the container and subsequently washing the container with water at a temperature substantially above atmospheric.

7. A method in accordance with claim 6 in which the volume of the aqueous solution in contact with the emulsified asphalt sediment is approximately equal to that of the sediment.

8. A method for treating a container having deposited therein a non-pumpable emulsified asphalt sediment, including the steps of adding
to the container a solution substantially equal in volume to the sediment at a temperature of approximately 120° F, and including sodium sulfonate within the range of 5% to 10% and sodium carbonate within the range of 0.5% to 1%, maintaining the body of solution in contact with the body of sediment for approximately 12 hours and heating to increase the temperature of the body to approximately 160° F, subsequently agitating the aqueous solution and asphalt emulsion sediment to form a liquefied readily pumpable mixture, removing said admixture from the container and subsequently washing the container with water at a temperature substantially above atmospheric.

JERE C. SHOWALTER.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

<table>
<thead>
<tr>
<th>Number</th>
<th>Name</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,722,211</td>
<td>Guardino</td>
<td>July 23, 1929</td>
</tr>
<tr>
<td>2,016,265</td>
<td>Doherty</td>
<td>Oct. 1, 1935</td>
</tr>
<tr>
<td>2,355,591</td>
<td>Flaxman</td>
<td>Aug. 6, 1944</td>
</tr>
</tbody>
</table>