METHODS AND COMPOSITIONS FOR PACKING COAL

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5 Claims

ABSTRACT OF THE DISCLOSURE

A method and composition are provided for treating coal to improve its packed bulk density by mixing light fuel oil distillate, water and sufficient surfactant to emulsify the oil and water, treating the coal with the mixture and packing the treated coal into a desired vessel.

This invention relates to methods and compositions for packing coal and particularly to a method and a composition useful in increasing the density of packing of coal in containers such as cars, coke ovens, boats, and like vessels or containers.

It has long been recognized that the productivity of coke ovens and the load capacity in cars and boats could be increased if it were possible to increase the bulk density of finely divided coal being loaded into such vessels. It has been recognized that this is a problem of lubricating the coal particles so that they will slide against one another and thus pack more tightly with less air space. In the past this has been attempted to be accomplished by spraying the crushed coal with petroleum oils such as diesel fuel, kerosene and the like. This has produced some improvement in bulk density but has not been completely satisfactory because most coals are water washed or treated at the mine and contain a film of water averaging about 6% by weight of the coal. The oils used for lubricating the coal to increase its density would not wet the water-coated coal and the result was little improvement in many cases. In addition, the resulting mixture was highly inflammable and therefore more dangerous to handle than the coal alone.

I have discovered a method and composition for treating coal to improve its packing qualities which eliminates both the problems of the prior art. The method and composition of this invention are compatible with and use the water on the coal to improve packing. Moreover, the method of the invention uses a composition which is not inflammable.

In a preferred practice of my invention, I apply to the crushed coal to be packed a composition comprising a petroleum oil, water and a surfactant or mixture of surfactants having a hydrophilic-lipophilic balance of 10 or less and thereafter load the coal and lubricant in the vessel to be packed. Preferably, I apply the composition to the coal as a spray onto the coal. The composition is preferably a mixture of a surfactant having a relatively low hydrophilic-lipophilic balance (HLB) and a surfactant having a relatively high HLB, the average HLB of the two surfactants being 10 or less with water as a water in oil or invert emulsion. The HLB of a given surfactant is the percentage weight of the hydrophilic portion of the emulsifier molecule divided by five.

The practice of the present invention can perhaps be best understood by reference to the following examples:

EXAMPLE I

A composition was prepared consisting of 48.75% of #2 Fuel Oil, 1% of polyol oleate (Atlas IL-801), 0.25% of ethoxylated polyol oleate (Atlas IL-812) and 50% of water. The composition was applied to a bituminous coal crushed to minus ½ inch (70% through ½ inch) in various amounts. The treated coal was then subjected to the standard cone test for bulk density of coke oven coal (Standard ASTM D291-60) as was also an untreated coal. The results appear in Table 1 below.

<table>
<thead>
<tr>
<th>Treatment, pints/ton:</th>
<th>Bulk density</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>42.0</td>
</tr>
<tr>
<td>1</td>
<td>41.0</td>
</tr>
<tr>
<td>2</td>
<td>41.5</td>
</tr>
<tr>
<td>3</td>
<td>43.74</td>
</tr>
<tr>
<td>4</td>
<td>43.64</td>
</tr>
<tr>
<td>5</td>
<td>44.5</td>
</tr>
<tr>
<td>6</td>
<td>44.4</td>
</tr>
<tr>
<td>7</td>
<td>44.6</td>
</tr>
<tr>
<td>8</td>
<td>44.6</td>
</tr>
</tbody>
</table>

It will be noted from the foregoing table that additions of my composition markedly increased the bulk density of the treated coal. This means that there is more coal packed in a given area.

EXAMPLE II

A like test was run on the same coal using 38.75% of #2 Fuel Oil, 1% of Atlas IL-801, 0.25% of Atlas IL-812 and 60% water. The results were substantially the same as those reported in Table 1.

The oil used in my process and composition may be any light fuel oil distillate such as #1 Fuel Oil, #2 Fuel Oil, kerosene, mineral seal oil, etc. The Saybolt viscosity at 100°F. should be between 35 and 100 seconds. The water content of the treating mixture should be in the range 10% to 265%. Water hardness for best results should not exceed 250 p.p.m. and if the hardness is greater, it should be treated prior to use or appropriate softening additives included such as sodium hexametaphosphate or the like.

The surfactant may be any one of a combination having an average HLB of 10 or less. It should be in the minimum amount of about 1%. Higher amounts may be used, and the preferred amount is about 1.25% to 3% based on the composition weight. While I prefer mixtures of polyol oleates such as Atlas IL-801 and ethoxylated polyol oleates such as Atlas IL-812, other surfactants may be used as defined above. Among the surfactants which I have found satisfactory are the following mixtures:

75 parts Atmos 300+25 parts Tween 80
87 parts Span 80+13 parts Myrij 52S
81 parts Span 80+19 parts Renex 20
86 parts Span 80+14 parts Brij 35
82 parts Span 80+18 parts Renex 30
93 parts Span 80+7 parts G-263
88 parts Span 80+12 parts G-3634A
77 parts Span 80+23 parts G-3300
83 parts Span 80+73 parts Tween 80

The amount of composition added to the coal is preferably in the range 1 to 5 pints/ton. This amount is adjusted to suit the coal and the end result desired in terms of bulk density.

While I have illustrated and described certain preferred practices and compositions of my invention, it will be
understood that this invention may be otherwise practiced within the scope of the following claims.

I claim:

1. A method of increasing the bulk density of packed coal by reducing the particle friction comprising the steps of:
   (a) forming an invert emulsion of a light fuel oil distillate, having a Saybolt viscosity of 100° F. between 35 and 100 seconds, water and sufficient surfactant to form an emulsion of said oil and water,
   (b) treating coal to be packed with said invert emulsion, and
   (c) packing said treated coal into a desired vessel.

2. The method as claimed in claim 1 wherein the surfactant has an average HLB value less than 10.

3. The method as claimed in claim 1 wherein the surfactant is a mixture of about 4 parts polyol oleate and 1 part ethoxylated polyol oleate.

4. A composition as claimed in claim 1 wherein the water content is in the range 10% to 60%, the surfactant is at least 1% and the balance light fuel oil distillate.

5. A composition as claimed in claim 1 having substantially equal amounts of water and fuel oil and about 1.25% surfactant.
UNIVERS STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,563,714 Dated February 16, 1971

Inventor(s) Arthur G. Brewer

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 43, "265%" should read -- 65% --. Column line 8, "of" should read -- at --.

Signed and sealed this 29th day of June 1971.

(SEAL) Attest: EDWARD M. FLETCHER, JR. WILLIAM E. SCHUYLER, JR.
Attesting Officer Commissioner of Patents.