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PROCESS FOR BURNING OILY RESIDUES IN TANKERS

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ABSTRACT OF THE DISCLOSURE

A method for disposing of low flash point crude oil residues recovered from cargo tanks of ships by blending the low flash point residue with high flash point fuel oil to provide a blended fuel of sufficiently high flash point for safely burning on board ships. The blended fuel may then be burned in the propulsion system of the ship or for steam generation on board the ship.

This invention relates to a method for disposing of low flash point crude oil residues remaining in cargo tanks of tankers or other ships after the bulk of the crude oil has been discharged therefrom.

In recent years pollution of the seas by oil has become an increasingly serious problem. One cause of pollution has been the practice of washing residual crude oil from cargo tanks of tankers at sea and discharging the washings or "slops" overboard. In the operation of a tanker, it is normally necessary to clean one or more of the cargo tanks on the return voyage to the loading port and refill these tanks with sea water as ballast to enable the tanker to be safely handled during the docking operations. Afterwards the clean ballast water is pumped overboard to make room for fresh cargo. For many years it was the practice of the industry to pump the slops from such tank cleaning operations overboard in non-prohibited areas on the return trip to the loading port. However, even though carried out at a considerable distance from land, the discharge of slops, especially slops resulting from washing of crude oil cargo tanks, may add to the pollution of the seas and the possible killing of marine, plant and bird life as well as damage to coasts and beaches.

Previously, a method known as "load on top" has been proposed to restrict pollution due to the pumping of slops overboard. In accordance with this method, the slops are collected in one or more of the ship's cargo tanks, commonly called "slop tanks," and are permitted to settle to effect separation into an oil phase floating on top of a water phase. The water is then slowly withdrawn from the bottom of the tank and discharged to the sea until oil is observed in the discharge. At this point, there is left in the bottom of the slop tank, a small amount of free water on top of which is a layer of oily residue which contains some water emulsified therewith. Fresh oil cargo is loaded on top of the retained oily residue when the vessel reaches the loading port and the layer of residue is discharged at the discharge port together with the regular cargo.

The load on top system has a number of serious disadvantages, among which is the fact that some refineries object to receiving cargo contaminated with the oily residues from tank washings. These residues are generally of very poor quality as compared with crude oil and are contaminated with large amounts of water and salts. The salt water present in such residues will, if not removed at considerable expense, cause serious corrosion of metal in refinery units.

In the past, some consideration has been given to the possibility of burning recovered slops as fuel for the propulsion system of ships. Such disposition of the slops has the obvious advantage of recovering fuel values as well as avoiding contamination of the seas. Unfortunately, the relatively low flash point of most crude oil and slops obtained by washing crude oil cargo tanks has in the past made crude oil itself and recovered slops unsafe for burning on board ship.

More recently, means have been found to burn crude oil and slops safely on shipboard. For instance, U.S. Pat. 3,362,370 to Morrell describes apparatus which has been devised for safely burning low flash point crude oils and slops as fuel for the propulsion systems of tankers or other ships. While the Morrell system is highly advantageous where large quantities of crude oil are to be burned, the use of such a system does of course involve additional expense in the initial construction or modification of tankers. Such expense is easily justified for shipping operations in which it is anticipated crude oil will be available at a lower price than bunker fuel but is difficult to justify merely to handle slops recovered by washing crude oil cargo tanks. A cheaper method of disposing of such slops is highly desirable in such situations. Accordingly, it is an object of the present invention to provide a method for safely burning such slops without the need for special equipment.

The present invention contemplates blending low flash point oily residue or slops recovered from washing crude oil cargo tanks with high flash point fuel oil to form a blended fuel of sufficiently high flash point that it can be safely burned in the propulsion system of ships or for generation of steam on board ships without the necessity for special equipment or safety precautions, such as are needed for burning low flash point material.

The American Bureau of Shipping specifies that fuels for ships must have a flash point not less than 120° F. unless special equipment such as that described in the above-mentioned Morrell patent is to be used to protect against the danger of explosions. The present invention is useful in the burning of residual crude oil having a flash point below 120° F., preferably below 100°F. and frequently in the range of 80 to 100° F.

The base fuel oil with which residual crude oil is blended in accordance with the invention may be any suitable fuel oil having a flash point of at least about 170° F. Conventional bunker fuel oil frequently has flash points between about 170 and 180° F. and is entirely satisfactory for this purpose.

The blended fuel formed according to the present invention comprises a base fuel oil as described immediately above having a flash point of at least 170° F. and may contain between about 1 and about 15 vol. percent residual crude oil, preferably of the type described above and

in any event having a flash point less than 120° F., preferably less than 100° F. A preferred blended fuel is one containing between about 5 and about 10 vol. percent residual crude oil having a flash point between about 80 and about 100° F. and between about 90 and 95 vol. percent base fuel oil such as bunker fuel having a flash point between about 170° F. and about 180° F.

Blended fuels of the present invention preferably contain no more than about 20 lbs. of salt per thousand barrels of oil, no more than about 5 volume percent (vol. percent) water, no more than about 0.1 weight percent (wt. percent) sediment and less than about 40 weight percent (wt. percent) wax. Excessive amounts of wax make it difficult to pump the resulting blended fuel while too much sediment tends to clog screens in the fuel system, too much water tends to make burning difficult and excessive quantities of salt can cause excessive corrosion of lines and equipment.

Base fuel oil and the residual crude oil can be blended in any suitable manner. Recovered residual crude oil can be accumulated in a tank suitable for low flash point material. Suitable base fuel, such as conventional bunker fuel, can then be loaded on top. Ordinary loading techniques usually provide sufficient mixing to insure a proper blend of the two ingredients of the blended fuel. Alternatively, the base fuel oil and residual crude oil may be mixed in any conventional mixing equipment and then stored for use as needed.

Residual crude oil may be recovered from empty crude oil cargo tanks in any suitable manner such as by the use of conventional tank washing techniques followed by separation to remove excess water. A particularly effective technique for recovery of residual crude oil from cargo tanks of tankers is described in U.S. Pat. 3,364,893 to Edward G. Maddock.

The following examples will illustrate the practical application of the present invention to burning of a typical recovered residual crude oil (slop oil).

EXAMPLE I

Crude oil cargo was unloaded from a tanker and residual crude oil having the following properties was recovered from emptied crude oil cargo tanks in accordance with the technique described in the above-mentioned patent to Edward G. Maddock.

Flash point (ASTM D93–61): 89° F.
Salt content (using Precision Scientific Company salt-in-crude monitor): 22 lbs. of salt per thousand barrels of oil
Sediment plus wax: 38 wt. percent

Mixtures of the above residual crude oil with Bunker C fuel having a flash point of 212° F. were made and found to have the flash points indicated below:

Composition		
Residual crude oil (volume percent)	Bunker C (volume percent)	Flash point (° F.)
15	85	146
10	90	149
5	95	164

EXAMPLE II

Additional samples of the same recovered residual crude oil described above in Example I were blended with the Bunker C fuel having a flash point of 172° F. to obtain

blended fuels suitable for burning directly in the boilers of tankers or other ships as follows:

Composition of blended fuel		
Recovered crude oil (volume percent)	Bunker C (volume percent)	Flash point (° F.)
2	98	126
10	90	139
5	95	154

While the invention has been described in connection with certain preferred embodiments thereof, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention and it is intended to cover all such changes and modifications in the appended claims.

We claim:

1. A method for safely burning residual crude oil having a flash point less than 120° F. on board a ship which comprises mixing such residual crude oil with a hydrocarbon fuel oil having a flash point above about 170° F. to produce a blended fuel having a flash point above 120° F. and then burning such blended fuel on board a ship.

2. The method of claim 1 in which the blended fuel comprises between about 1 and about 15 vol. percent residual crude oil and between about 85 and 99 vol. percent of the hydrocarbon fuel oil having a flash point above about 170° F.

3. The method of claim 2 in which the residual crude oil is residual crude oil recovered from crude oil cargo tanks of a tanker and in which the blended fuel is used as fuel for the propulsion system of the tanker.

4. The process of claim 2 in which the flash point of the residual crude oil is between about 80 and about 100° F. and in which the blended fuel consists essentially of between 5 and about 10 vol. percent residual crude oil and between about 90 and about 95 vol. percent fuel oil having a flash point above about 170° F.

5. The method of claim 4 in which the hydrocarbon fuel oil has a flash point between about 170 and about 180° F.

6. The process of claim 5 in which the blended fuel contains less than about 20 lbs. of salt per thousand barrels of oil, less than about 5 volume percent water, less than about 0.1 wt. percent sediment and less than about 40 wt. percent wax.

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