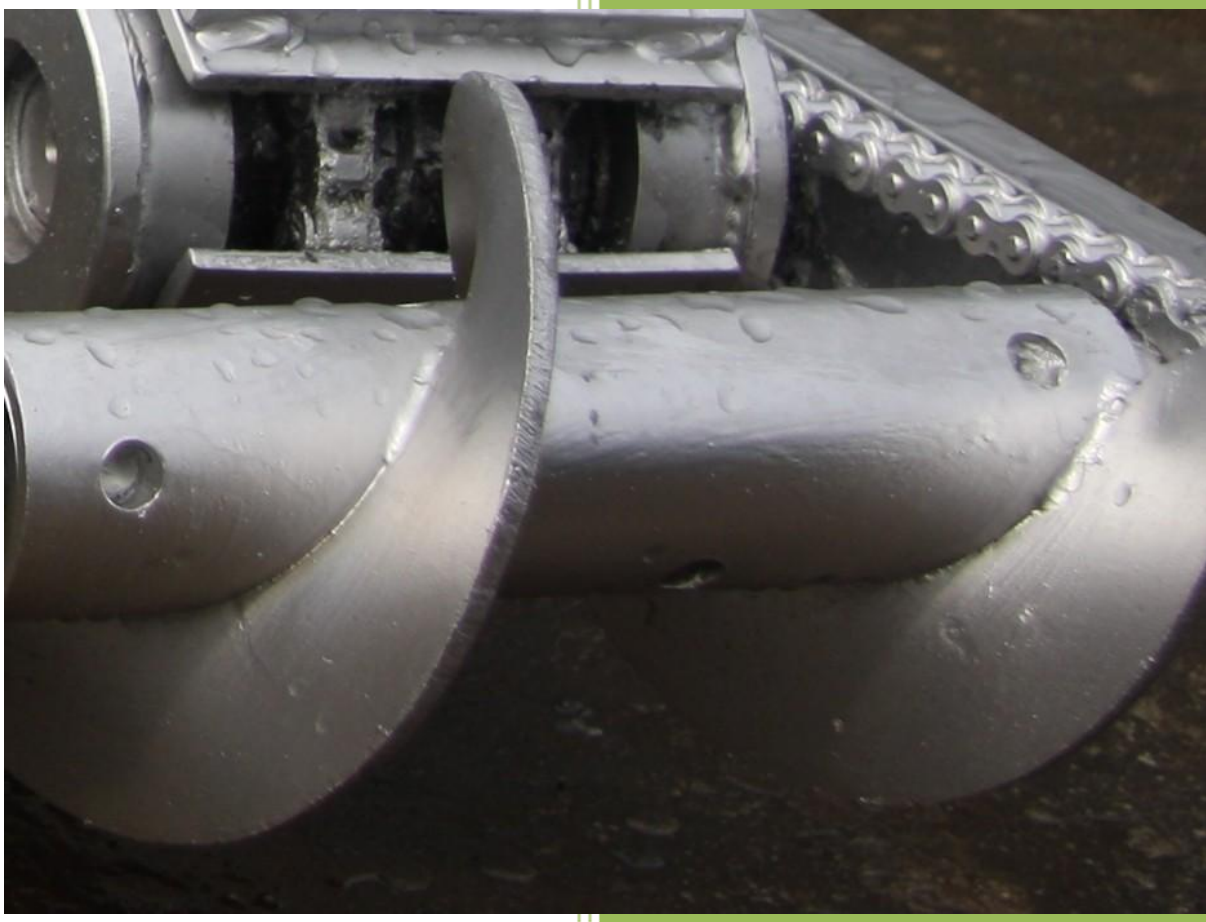
2009

No Man Entry Tank Cleaning Track Pump



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1.0 OUTLINE

This proposal shows a "No Manned Entry" method and equipment for extracting crude oil tank bottoms from Crude Oil Storage Tanks located across South East Asia.

The sludge product extracted by the method will be reformed into a homogenous liquid blend suitable for follow up treatment and separation.

The method is depicted in Figure 1.0. The method uses a powered cutting tool to break up crude oil tank bottoms, with optional injection of cutter stock to facilitate break-up of the sludge, an extraction pump to extract the sludge mixture combination chamber and cutter stock to reduce the particle size of solids to a uniform size range, to form a liquid blend that will be treated in a follow up process whereby substantially all of the oil product contained in the sludge and any cutting stock as necessary is recovered.

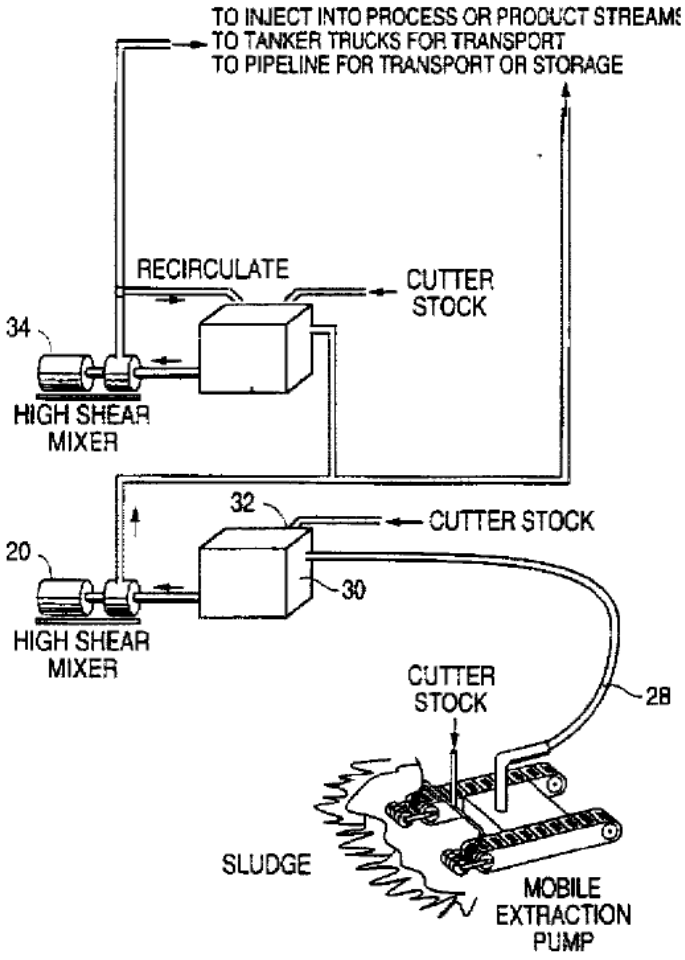

Figure 1.0 – Overview of tank cleaning apparatus

2.0 BACKGROUND OF TANK CLEANING PROCEDURE

The apparatus used to extract the sludge from the tanks is transportable on one or more flatbed trucks and/or trailers. The extraction pump is shown in Figure 2.0. The apparatus can be conveniently inserted into a crude oil tank and can pump out the sludge and process it to produce a liquid blend stock for follow up in-situ treatment and recovery of valuable oil.

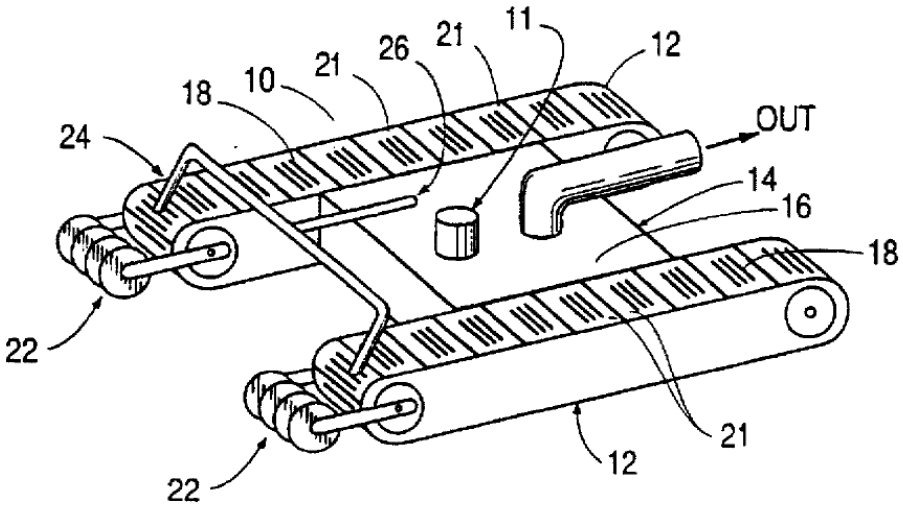

FIG. 2 - Tank Sludge Extraction Pump

3.0 DETAILED DESCRIPTION

The apparatus includes two component units; a mobile sludge Extraction Pump and at least one blending / processing unit. The mobile sludge Extraction Pump is a self-contained apparatus which can be moved around a site or refinery to the location of crude oil storage tanks which contain solid tank bottom sludge sought to be removed.

The Extraction Pump comprises a pump which is mounted between two continuous tracks on a carriage. The pump is hydraulically activated and may be controlled remotely and/or manually. The sludge extraction pump has a heavy duty impeller(s) capable of pumping heavy materials at rates as high as 300 gallons per minute. A heavy bar grid is installed over the input of the pump so that only particles smaller than 3/4" can pass through. The pump rotor clearance is 3/8", so only particles smaller than the clearance are pumped. Different size bar grids can also be installed with different size openings.

The Extraction Pump is independently powered, and includes two continuous track assemblies which have a platform mounted between them. The track assemblies are about six inches in width and five feet in length. The tracks are made of stainless steel.

The Extraction Pump is configured to be inserted into the interior of the oil storage tank. See Figure 3.0. In addition to this most the unit can also be inserted through a manway as small as 24" diameter flanged opening on the side of the tank.

It is contemplated that at least one powered cutting tool such as a helical auger, will be mounted on a front section of the Extraction Pump. In a preferred embodiment, one cutting tool or auger is mounted in front of each continuous track assembly. This preferred arrangement will permit the augers to break up the solid globular sludge and channel it into the pump intake.

Separate hydraulic motors (not shown) power the augers, so the mobile recovery unit may be either stationary or mobile while the augers are cutting into the sludge or mixing the sludge into a pumpable consistency. In addition the augers are also powered by chains, which are in turn driven by the movement of the tracks through a gear train.

The Extraction Pump will be provided with 2 injectors which are in fluid communication with an inlet. The injector serves to inject cutter stock directly into the storage tank. It is contemplated that the cutter stock injectors are positioned such that the cutter stock is injected at a location in front of the recovery unit. In this way, the cutter stock will aid in loosening and removing the solid, globular crude oil sludge from the bottom of the storage tank. From inlet an additional hose (not shown) may be connected, on the outside, to a separate pump (not shown) which pumps diluent from an exterior reservoir.

The cutter stock may be of any composition which is capable of being employed as a diluent, solvent or suspending agent for solid or semi-solid hydrocarbons such as globular sludge. The cutter stock is preferably a liquid hydrocarbon. As an alternative, a portion of the liquid sludge mixture either from the storage tank or from the processing operations which are downstream from the recovery unit may be recycled and used as a cutter stock. For instance, there may be a vacuum source (not shown) disposed on the Extraction Pump serves to withdraw a quantity of liquid into a holding tank. The liquid from the holding tank is then recycled to the injection ports and injected back into the storage tank to aid in the loosening and removing of the solid sludge. In this way, a relatively small quantity of fresh cutter stock would be necessary as the liquid from the storage tank is continuously recycled and reused. As a further alternative, effluent from downstream processing operations of the sludge may be fed to the injectors of the Extraction Pump and utilized as cutter stock.

Once inside the tank, positioning of the Extraction Pump within the storage tank is preferably accomplished by energizing hydraulic motors (not shown) driving the tracks to move the machine forward, reverse, or rotating it left or right. The hydraulic motors are powered by pressurized hydraulic fluid fed from an external hydraulic power pack and controls through hoses connected between the hydraulic power pack and controls to the Extraction Pump. Position of the Extraction Pump inside the tank may be monitored by a closed circuit TV system mounted at the manway. Alternatively, a closed circuit TV system could be mounted directly on the Extraction Pump, with any necessary accessory lighting mounted on the recovery unit or at the perimeter of the tank. It is contemplated that the monitoring unit is mounted in a position which is convenient to the operator controlling the operation of the recovery unit.

After extraction, the recovered sludge, which now forms a liquid/solid suspension, is transferred out of the storage tank via a hose. The extracted sludge is then fed to an intermediate reservoir or tank. The intermediate reservoir will hold the liquid sludge prior to further treatment operations. In addition, the intermediate reservoir may be provided with an inlet for the addition of cutter stock and/or other additives. The inclusion of at least one intermediate reservoir permits a continuous flow of material to a downstream processor. The reservoir also may serve as a surge accumulator for material being pumped from the extraction pump. At times when the flow from the extraction pump is low, processed material can be recirculated into the intermediate reservoir tank to ensure material being available to the input of the processor. The intermediate reservoir may be connected to the input side of the extracting unit, and the bottom of the reservoir may serve as a sump to divert any large particles from entering the processor.

The extracted sludge is then transferred, either from the intermediate reservoir or directly from the storage tank if no intermediate reservoir is included, to the recovery processing plant.

Equipment List

1. Stainless Steel Tracked Extractor Pump c/w augers, pumps, tracks
2. Hydraulic Power Pack
3. Hydraulic Hose on Reels
4. CCTV and monitoring station
5. Recirculation jetting pump
6. Recirculation jetting tank
7. Lobe Pump
8. Hydraulic Power Pack for Lobe Pump
9. 4” Oil Discharge Hose
10. 4” Oil Discharge Hose / Hydraulic Feed Hose Dollies 1 lot

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