Oil & Gas Services Division

**Cleaning of Crude Oil Storage Tanks**

Crude oil storage tanks will settle out the long chain and paraffin based materials over time and could lose 5 to 50% of the tank storage capacity. This material has been viewed as a waste product over the years, when in fact the paraffin waxes and asphaltenes will burn with a very high BTU value when the material has been put back into a stable emulsion and is made pump-able using OES processes.

In most cases, the recovered crude portion of the bottoms minus the solids and most of the water will offset the entire cleaning cost of the tank, in a fraction of the time of conventional cleaning methods.

**The Process**

First we determine how much static or dead material is in the tank. Once this is done either thru physical gauging or an infrared scan on the outer shell we determine how much of the proprietary chemical will be needed to loosen the heavy bottom.

The chemical along with the jetting system will allow the operator on the outside of the tank to "spin" the content, either clockwise or counter clockwise. This ensures 100% contact of the bottom material and the chemical allowing for a break in the surface tension along the walls and over the entire floor area of the tank.

**Benefits**

The tank is cleaned in a fraction of the time conventional cleaning takes. It is possible to clean and recover the crude portion, while leaving the tank in service. We eliminate the need for blind suction and discharge lines while the tank is being circulated and we prevent the tank from being taken out of service for long periods of time.

We allow the owner to recover for resale the crude portion of the bottom, thus eliminating costly offsite disposal to re-claimers.

Due to the nature of the proprietary chemical, the tank will be degassed as part of the circulation. The surfactant based solution will actually generate CO$_2$ when it interacts with small amounts of water that is tied up in the sludge and miniscule foaming is taking place. This is similar to DAF systems used in water treatment, meaning dissolved air flotation or in this case dissolved CO$_2$ flotation.

Manpower will be virtually eliminated with the exception of the in-organics that will end up in the center of the tank and will have to be removed the old fashioned way.

Once our system is in place, with one large diameter suction line and two jet assemblies mounted onto existing man ways, the system can be operated with one person (see drawing attached).
Oman Energy Services LLC

The system is safer, faster and a fraction of the cost of other systems.

Performance guarantees are available on request.

Oman Energy Services LLC (OES) will provide all necessary equipment, personnel and chemicals required to complete the in-service cleaning of the storage tanks.

Technical Proposal

1. The system requires the tapping the existing manways with a 6” figure 150 full opening gate valve. This valve will be mounted at approximately 180° from the water draws. The tap will consist of 1 - 4” hole to accommodate our pack off gland/stinger assembly.

2. Once the tapping is complete and the stinger is mounted we will close our circulating system c/w piping and circulating pump. The pump is a centrifugal trash pump capable of handling large solids.

3. Once the circulating system is installed and pressure tested we will introduce the chemical at concentrations beginning at 250 ppm chemical to the total volume of the oil/water bottoms matrix. This chemical will act as a very effective demulsifier, wetting agent and corrosion inhibitor and will remain in the water phase of the tank matrix once the process is complete.

4. This procedure will serve to clean the existing line and force the occluding material in the line back into the tank. The chemical will also reduce the surface tension of the heavy material and allow it to re-suspend into the oil phase.

5. Once the chemical is introduced we will commence our circulating procedures of the mix in the tank. We will circulate the tank clockwise and counter clockwise until we determine that we have achieved 3 phase separation in the tank. This will allow the inorganic portion of the matrix (the solids) to drop out and be consolidated in the centre of the tank.

6. The water in the tank will separate and will sit on top of the solids with the oil portion on top of the water. We will now be able to determine through physical gauging, using water paste or through an infrared scan on the outer shell of the tank the volume of water and oil in the tank.

7. During the procedures described above the foaming action of the chemical and the spinning action of the procedures will complete a de-gassing of the tanks in addition to breaking the existing emulsions. It should be noted that the chemical and water will produce miniscule foaming which in turn will generate small volumes of CO². This is similar to DAF (dissolved air flotation systems) used in wastewater treatment facilities. In this case it will be CO² as opposed to O².

8. We anticipate 5 to 7 days circulation time per tank allowing settling periods of the solids in the tank. This will leave the solids liberated and deposited in the centre of the tank with more than 95% of the oil released from the solids and able to be recovered. Once the oil phase has been transferred to the next tank the water phase will be left in the tank for further washing of the solids.
9. In the event the client wishes to have the clean solids removed from the tank it will be necessary to open the tank and have the solids physically removed or to incorporate a centrifuge/decanter into the circulating system. However the centrifuge is an expensive alternative but could be implemented for the future and ongoing cleaning of other tanks in the system.

**Equipment Provided by OES**

a) 1 – 4” x 4” 160 hp diesel driven centrifugal pump c/w positive air and emergency shutdown.

b) 2 – 3” stinger assemblies.

c) Hard piping and hoses for suction and discharge lines from the pump.

d) Proprietary surfactant blend chemical.

e) Tapping tool c/w 4” tungsten hole saws – if required.

f) Complete set of hand tools.

g) Fire extinguishers.

h) Spare parts as determined.

**Provided by Owner**

a) Vacuum truck services.

b) Cutter stock (light cycle oil or diesel) if required.

Respectfully Submitted,

Oman Energy Services LLC