

## Waste Recycling of Crude Tank Bottoms

The accumulation of crude tank bottoms is a problem experienced by most refineries the world over. The settling out of the sand, rust and heavy fractions in the crude oil results in a loss in ullage in refinery crude storage tanks and eventually refinery problems when slugs of this material are introduced into the plant. Most refineries have managed this problem by accumulating these sludges in a few of their crude tanks or in purpose built dams. The options available for the disposal of this material have been limited and economically prohibitive.

**FFS** Refiners have a practical and cost effective solution to this problem. Crude tank bottom sludges can be cleaned by centrifuge to a standard where the recovered oil can safely be reintroduced into the refinery either as crude, prior to the de-salters, or blended into heavy fuel oil.

A new plant has recently been commissioned at the SAPREF (Shell & BP) refinery, Durban South Africa, which is solving this difficult problem. The refiner has constructed two concrete lined dams into which they periodically clean their crude oil tank bottoms. The quantity of sludge removed from their 30 000 m<sup>3</sup> crude tanks varies from 2000 – 4000 m<sup>3</sup>. The concrete dams are sized to receive this amount of material and to ensure that tank cleaning can be done in as short a time as possible. The recovery and processing of the sludge from these dams can then continue over a longer period of time independent of any tank cleaning.

The process involves heating the material to around 90<sup>o</sup>C and then centrifuging out the solids. Water removal is optional as required either by static separation or by forced feed evaporator. The indicative specification on the feed and products is shown in the table below:

DESCRIPTION	MINIMUM	MAXIMUM	AVERAGE or TARGET
<b>FEED</b>			
Production rate	750 tons per month	1500 tons per month	1000 tons per month
Matter insoluble in toluene (MIT)	n/a	10%	5%
Water (as received)	n/a	40%	n/a
<b>RECOVERED PRODUCT</b>			
MIT	0,3%	0,8%	0,6%
Water content	15%	30%	20%
	1%	2%	1,5%
Solid size	n/a	250 µm	
<b>SLUDGE (waste)</b>			
MIT	65%	75%	68%

The plant is built to the highest environmental standards. Vapour emission control is achieved by tank void balancing, pressure damping, vent condensers. The vapour emissions from the plant meet international standards. The recovery ratio of the oil to waste, dependent on the level of contamination, is around 92%. This translates into 920 tons of recovered oil and 80 tons of waste for every 1000 tons of sludge processed. The sludge with its ~32% oil content can then be economically disposed of in an appropriate landfill site.

However, should it be required, this waste stream can be further minimised by a process of carbonisation. **FFS** Refiners have developed an indirectly fired coking drum capable of carbonising oily sludges in an oxygen free environment. The condensate is recovered for use as the heat source for this process and the resulting carbonaceous material, which contains less than 12% volatiles can then be landfilled in a lower

class site. This process renders the material inert, locking in the heavy metals and making it resistant to leaching. This is a more acceptable process than combustion.

The plant is built as a semi-permanent installation and to be economically viable should run for at least 24 months continuously. FFS Refiners are not vendors of equipment but build and operate plants such as these to run on a toll fee basis. The processing cost, per ton of oil recovered, is not much more than the cost of crude oil or the value of heavy fuel oil.

FFS Refiners have been involved in the processing and marketing of waste oils for the past 25 years in South Africa. We operate five plants around the country and process on average 53 700 tons per month and marketed 13 000 tons per month of tars and oils. The company's head office is in Durban. In our fabrication shop we build our own road tankers, filters, centrifuges, pressure vessels, heat exchangers and a vast array of plant and equipment, much of it designed specifically for waste oil treatment processes.

Should this process be of interest to you, we would welcome all inquiries.

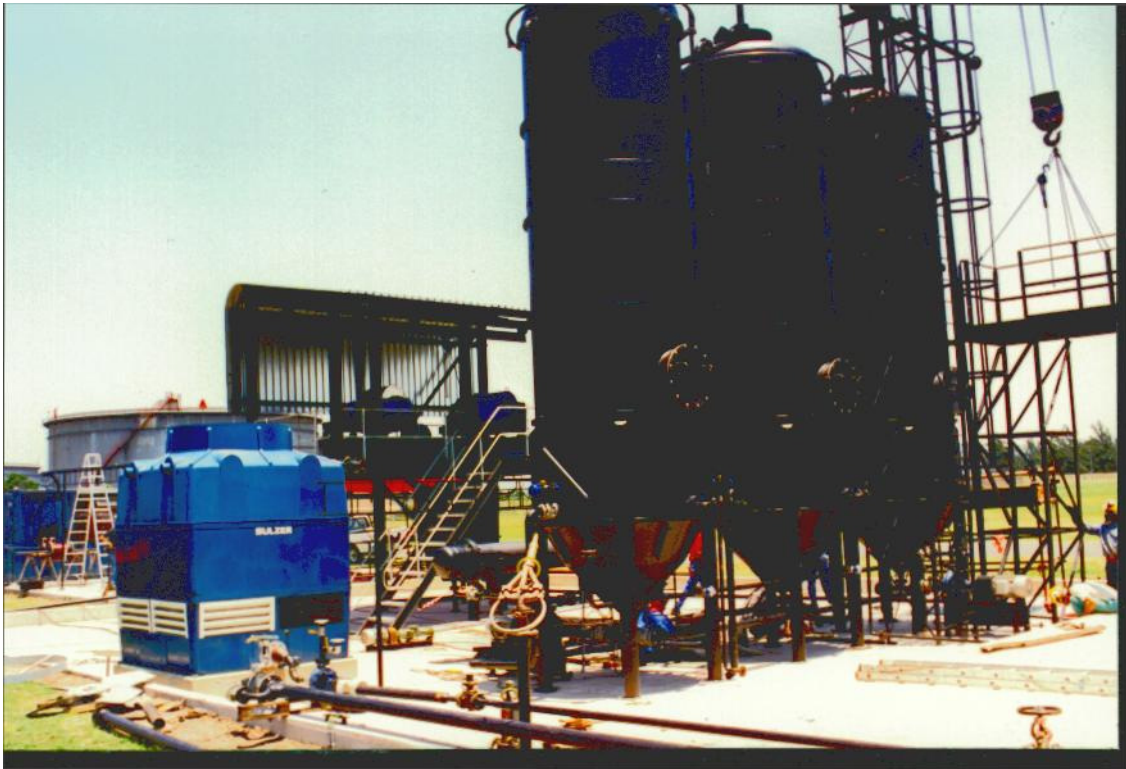
CONTACT: Mr Don W Hunter  
Div. General Manager  
Tel: (27) 31-465-3103  
Fax: (27) 31- 465-1430  
e-mail: [ffs@ffs.co.za](mailto:ffs@ffs.co.za)



Don Hunter, Divisional General Manager of FFS Refiners pointing out the very difficult waxy nature of the material.



An aerial view of the two waste dams for receiving the tank cleaning sludge and the plant under construction behind.



A close up of the plant showing the pressure vessel tanks, the vapour condenser with vacuum/pressure break above the tanks, the cooling water tower on the left and the concrete containment area.



One of the decanter centrifuges being installed. These hard-wearing machines with their tungsten tiles and discharge ports are purpose made for this application.



The FFS designed and built “PYROLISER”, showing the steam jacketed pin mill feeder (front left) and the hot air re-circulation system on the insulated rotary drum.