



Sludge treatment

demonstrating successful cleaning of heavy oil sand slurry.

Tore®Scrub sand cleaning is a technology used around the world for cleaning sand recovered from oil/water separators to enable disposal. The trial at Campo La Hocha demonstrated that the Tore®OVD and ToreScrub can be used in the most demanding of applications with heavy oils.

The Campo La Hocha oil field is located approximately 186 miles south of Bogota, Colombia. Hocol performed a pilot test to evaluate the applicability of Cold Heavy Oil Production with Sand (CHOPS), which has been widely and successfully used in other heavy oil fields, particularly in Canada. The pilot project targeted Campo La Hocha's heavy oil (16.5° API) and tested the well recovery and surface production equipment.

The CHOPS is characterized by low heavy oil production initially, in the order of 20-100 barrels of oil per day with up to 50% sand production. As wells develop, oil production rises and the proportion of produced sand decreases, typically to 1-2% after about 6 months production.

The high sand production as well as the viscous heavy oil require special surface facilities. The ToreOVD online vessel desanding technology and the ToreScrub sand cleaning technology was demonstrated successfully at the field. Heavy oil associated with the accumulated solids was reduced from approximately 30 to 0.4%.

Project details

Operating conditions

- CHOPS facility
- 16.5° API Oil
- Sand sludge with 25.7 to 34.5 wt.% oil

Scope of work

Pilot tests of Tore®OVD online vessel desanding technology and Tore®Scrub sand cleaning technology.

Key facts

- Location: Colombia
- Client: Hocol

Facilities

At Campo La Hocha, the heavy oil is treated in vertical heater treaters which also accumulate an oil-laden sludge of solids in the conical bottom of the vessels. This sludge is moved to portable tanks utilizing a screw conveyor and then transported offsite for further treatment.



Figure: Heater-treater conical bottom with screw conveyor.

Alternative sludge handling

A ToreOVD was fitted within the bottom of the heater treaters and connected to a ToreScrub unit. The ToreOVD fluidizes the slurry with utility water and moves the dirty solids to the ToreScrub for cleaning.



Figure: ToreScrub sand cleaning unit located next to the heater treaters (top). ToreOVD fluidization device in treater (bottom).

Results

The Tore fluidization and hydro-transportation device successfully transported the oily sludge from the bottom of the heater-treater to the ToreScrub sand cleaning unit. The heavy oil sludge contained 25.7 to 34.5% oil by weight prior to treatment.



Figure: Oily sludge removed from heater-treaters.

Once filled with slurry, the ToreScrub vessel was isolated from the upstream process and cleaning was initiated. In cleaning mode, the slurry from the ToreScrub vessel is pushed back through the cyclones at the top of the vessel. High centrifugal forces and shear in the jet pump and cyclones strip the oil from the surface of the sand and releases it into the water phase. Oily water is separated from the sand by the cyclones.



Figure: Clean sand sample from ToreScrub discharge.

After cleaning, without the use of chemicals, the sand only contained 0.19–0.56% of oil. Approximately 2.1 barrels of oil could be recovered from 1 metric ton of produced sludge.

Compared to the offsite thermal process for sludge treatment which is energy intensive, costly, and resulting in loss of the oil, the onsite method utilizing the ToreScrub process offers several advantages. Moreover, the trials demonstrated the robustness of the Tore technology for handling heavy oil sludge.