

Steam Piloting in the Aruma Reservoir Awali Field, Bahrain

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ABSTRACT

The Aruma Reservoir is the shallowest hydrocarbon-bearing reservoir in the Awali Field, found at depths of between 600 and 800 feet. It is a shallow-water carbonate reservoir that contains very viscous tar and bitumen. It thins over the crest of the Awali Anticline, varying in thickness from 800 feet on the crest to 1,200 feet on the flanks.

The principle characteristics of the Aruma Reservoir are:

Fractured limestone and dolomite reservoir with karst caves and vugs

High oil viscosities

Low pressure

Heterogeneous tar saturation

There are two principal types of hydrocarbons found in the Aruma -- a liquid form of tar with API gravities of between approximately 4 to 8 degrees and bitumen that is a solid under in situ conditions. Both the tar and the bitumen have viscosities low enough to be mobile at temperatures of 200° C.

The best analog reservoir for the Aruma is the Grosmont Bitumen Carbonate Reservoir in Alberta, Canada. Both reservoirs have a wide range of hydrocarbon viscosities, ranging up to 10's of millions of cP at reservoir conditions, and both have similar heterogeneous distributions of tar and bitumen due to the fractured and karsted character of the reservoirs.

In January, 2015 Tatweer Petroleum began a steam enhanced-oil-recovery (EOR) pilot in the Aruma Reservoir.

Cyclic-steam-stimulation (CSS) in a single vertical-well is being attempted to demonstrate that tar and bitumen can be mobilized in the reservoir and produced to the surface. Three separate high-porosity zones in the upper Aruma will be tested sequentially. The lift system utilizes an all-metal progressive-cavity-pump in combination with diluent injection. Specialized surface testing and production facilities have been constructed for the very viscous tar/bitumen. Early results from the steam EOR pilot show that steam confinement in the vicinity of the CSS well is a challenge.