

An Innovative Approach For Successful Exploration of Shallow Heavy Oil Play, Kuwait.

Anjaneyulu Singavarapu¹, Sunil K. Singh¹, Afrah S. Al-Ajmi¹, Sarah Al-Rashidi¹, Hanan Al-Owihan¹

¹Exploration, Kuwait Oil Company, Kuwait, KUWAIT

ABSTRACT

Till couple of years back heavy oil development in Kuwait was associated with Ratqa Field only. Recently significant discovery of heavy oil has been made in Ummniqa area in the Lower Fars Formations. Lower Fars is a clastic reservoir at the depth ranging from 400-1200ft in northeastern part of Kuwait. The present paper describes the unconventional integrated exploration approach for identifying and characterizing of Lower Fars prospectivity in an area where no well was drilled targeting Lower Fars.

In the absence of optimal log data, mud log data from deep Jurassic wells was used to build up the gross oil accumulation model. From the study it was clear that present day structural configuration has a limited role in accumulation of hydrocarbons and the play primarily appeared to be strati-structural in nature. Keeping this in mind an integrated unconventional approach had been adopted. Hydrocarbon indications in wells were correlated with seismic data through a combination of seismic attributes as well as waveform classification.

Analysis of the RMS amplitude attribute extracted from consistently high amplitude anomalous event shows that this event is correlatable with the hydrocarbon corridor identified from the mudlogs. The analyses was further refined by means of seismic horizon slices, Frequency, Phase, Sweetness attributes and Seismic waveform classifications. The extracted seismic attributes clearly brought out a geobody which appeared to be a meandering channel and amplitude bursts corresponding to point bar development. Detailed study of these seismic attributes indicates both vertical and horizontal segmentation into individual channel bars. Wave form classification study also confirms the geometry, subsurface lithology and facies variations within the geobody. Six exploratory wells were drilled based on the study and all proved to be hydrocarbon bearing with thick stacked sands separated by silty clay/clay. Log motifs suggest that the lower sand layer was deposited in the trunk of the channel and upper layers are deposited as point bars stacked vertically separated by thin clay layers suggesting lateral migration of depositional environment from point bar to levee associated with minor channel shift. The integrated approach has demonstrated the crucial role of seismic attribute analyses in defining facies changes, reservoir geometry and hydrocarbon charging in successful exploration of Lower Fars play and establishing substantial reserves in NEK.