AVO Analysis, Inversion and Spectral Decomposition to Detect Thin Channelized Sandstone Reservoir of BED-15, Western Desert, Egypt

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Abstract

BED-15 field is located within the Abu Gharadig basin, northern Western Desert. It was discovered in1988 based on two-dimensional (2D) seismic data, and production comes mainly from the Abu Roash-C sandstone oil-bearing reservoir. The hydrocarbon in BED-15 field is structurally trapped in a tilted fault block dip closed to the NE and bounded to the SW by a NW-SE heading normal fault. Minor faults dissect the culmination. They are however, laterally discontinuous and do not separate reservoir blocks at Abu Roash-C pay level. Abu Roash-C member-sediments were deposited in a costal to shallow marine setting. Whereas the Lower half of the member was deposited in a costal marine setting within a back barrier complex, the Upper half was deposited under shallow marine conditions. The Abu Roash-C reservoir is preserved in the form of tidal channels fill sandstone, ranging in average thickness from 2 to 20 meter. The channel sand boundary limit is playing the stratigraphic entrapment element. Therefore firstly, we focused on the AVO analysis of six wells located in the field to demonstrate that the appropriate use of AVO analysis is a valuable tool for both development and exploration purposes. The wells analyzed include four with hydrocarbons, and two wells failed to find hydrocarbons. The AVO different responses were linked directly to the corresponding wells and followed through the area to figure out their lateral extensions.

Secondly, we performed a feasibility study followed by pre-stack inversion, using three partial angle stacks, to delineate the channelized sandstone reservoir. The results are consistent with the AVO analysis findings.

A third aspect centers on the application of spectral decomposition to the seismic data relating to three wells, which provides further evidence that there are also apparent differences in the spectral characteristics between them. We demonstrated that the spectral decomposition is a very useful tool for the channel detection and delineate its boundaries quite well.

In summary, this study shows that the integration of geophysical different approaches leads to better reservoir detection and increases the field's potentiality.