AAPG Datapages/Search and Discovery Article #90254 ©2016, GEO-2016, 12th Middle East Geosciences Conference & Exhibition, Manama, Bahrain, March 7-10, 2016

Integrated Field Scale mapping of Gharif Formation

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ABSTRACT

The Gharif formation contains a significant amount of the Sultanate of Oman oil reserves. It comprises clastic reservoirs deposited in a range of environments from transgressive shallow marine deposits and terrestiral fluvial systems.

As part of the Gharif Thematic Study, intensive work was done at field scale level as well the regional scale to understand the facies variations and flow units in different fields. Petrophysical logs, core, BHI, pressure data, production data, structure , sequence stratigraphy and palynological data were all integrated to define and map the flow units.

Fields X, Y and Z are examples of this process. In Field X, six subunits were mapped in Upper Gharif and three subunits in Middle Gharif. Most of the subunits show fluvial depositional settings and the channel belts were mapped. The direction of these channel belts were interpreted from the facies distribution and BHI. A lacustrine deltaic system is also identified in one subunit.

Field Y is a good example of full integration of dynamic, static and structural data. Four flow units were identified in Upper Gharif. The extension and direction of the channel fairways were interpreted using the maximum continuity of pressure communication between wells along the channel belts. The resulting channel belt orientations showed a high consistency with the existing faults and BHI.

Lower Gharif deposits were mapped in field Z. A deltaic system is interpreted in the three subunits with the influx of sediments and relative sea level controlling deposition in each unit. Dynamic and production data were used to confirm the extension of the deltaic lobes. Facies interpretations from BHI helped in defining the proximal and distal parts of the deltaic lobes.
This work added great value in defining the optimal new well locations and sidetracks in some fields. A down flank well encountered poor reservoir and a planned sidetrack, with the help of the Gharif reservoir fairway maps, was successful with confirmed oil leading to extension of the field.
In addition, the maps were used as input to the static model. Variograms were defined for each unit and probability maps were created in petrel to guide the distribution of different properties. The maps could potentially be used to guide horizontal wells.
The accuracy of the maps was tested in some fields by checking the new drilled wells in the existing map. Statistics were done and a matching of 86% is found in X field using 17 new drilled wells.