Sedimentology, Structure and Reservoir Model of Late Miocene Fan Delta Successions from the West Dikirnis Field, Nile Delta (Egypt)

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The West Dikirnis field is located within the El Mansoura concession in the eastern part of the onshore Nile Delta (Egypt). Its reservoir interval comprises gas- and oil-bearing clastic sediments belonging to the Qawasim Fm. That were deposited during the Late Miocene by fan delta successions prograding into a tectonically active basin. A total of 4028 ft of high-resolution microresistivity borehole images from eight wells were interpreted in order to characterise the sedimentology and the structure of the sediments and to define internal reservoir geometries of the West Dikirnis field.

A WNW-ESE trending structural high is mapped in the central area of the field. This high developed above a fault zone with interpreted wrench component of movement and it seems to have influenced sand depositional trends.

Clastic sedimentation of the Qawasim Fm. was dominated by mass gravityflow processes. High- and low-density turbidity currents formed locally channelised, layered and amalgamated sand sheets. Voluminous quantities of coarse-grained sediments were deposited by the northerly progradation of a Gilbert-type fan delta across the field. Locally, in the proximity of the structural high, there is evidence of mass wastage and syndepositional failure events. Thick proximal sand deposits south of the high become thin and more distal to the north. Based on image lithofacies associations and palaeotransport directions, the Qawasim sediments were informally subdivided into three depositional cycles (A, B and C), each of which comprises a sand- and a mud-dominated unit. These cycles, and a field-wide unconformity or sequence boundary separating cycles A and B are correlatable across the field.

Faulting and the intra-Qawasim unconformity seem to play a significant role in the structural zonation of the field. The majority of imaged faults and natural fractures are electrically conductive and display a general ~WNW-ESE strike direction, parallel to the trend of the structural high. Their orientation and spacing locally significantly affect the characteristics of the reservoir, while production data indicate that faults and fractures act both as conduits and partial barriers or baffles to fluid flow.

This paper provides insights on the sedimentology of the Late Miocene Qawasim Fm. and on how high-resolution borehole images were used to model the internal geometry of the West Dikirnis reservoir.

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