

Shammar: Serendipitous Discovery of Stratigraphically Trapped Reservoir in North Oman

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ABSTRACT

The base Shammar clastic reservoir was accidentally discovered in 2014, while drilling a well targeting a deeper reservoir. This discovery triggered an exploration campaign (2015-2016), during which 14 wells were drilled and cored to assess the reservoir type, distribution, connectivity, and dynamic behavior.

A regional reservoir evaluation was carried out using an integration of 3D seismic interpretation, well log evaluations, and core sedimentological studies, complemented by petrological, diagenetic, mineralogical, sediment provenance, and biostratigraphical studies.

The oil-bearing, Early-Middle Paleocene, base Shammar clastic reservoir lies on Cretaceous Nahr Umr shales sub-cropping under a base Tertiary unconformity. It forms a stratigraphic pinch-out trap at the flank of a regional high, infilling localized erosive lows, and sealed by overlying lower Shammar shales. The reservoir package ranges in thickness from 0.5m to 7m, and it is below seismic resolution.

The base Shammar reservoir shows highly variable lithofacies, from pebbly conglomerates and very fine-grained sandstones to carbonaceous shales. These clastics are interpreted as deposited in delta front to marine shoreface environments during a sea level lowstand. They show a fining upwards trend and increasing marine influence and water depth, resulting from rapid marine transgression. Clast and sand composition, Qemscan mineralogical analysis, heavy mineral ratios, and detrital zircon geochronology all support clastic sediment provenance from the Semail Ophiolite and the Hawasina Nappes. Reservoir presence and distribution is controlled by pre-existing topography, and facies distribution, while reservoir quality is strongly controlled by primary facies (clay content). Well testing proved good reservoir connectivity across a large area with commercial steady oil flow.