

## **The Lower Shammar Play: Integrating Forensic Geoscience, Petroleum Engineering and WRFM to Explore a Sub-Seismic Stratigraphic Trap**

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### **ABSTRACT**

The serendipitous discovery in 2014 of the basal Paleocene Shammar sandstone play on the north flank of the Lekhwair High, North Oman, has led to significant volume and value delivery. An asset appraisal well targeting deeper stratigraphy encountered Precambrian sourced hydrocarbons in thin sandstones in stratigraphy that was hitherto considered to be a competent shale formation for casing points and also acts as the main seal for the underlying Cretaceous carbonate reservoirs. The oil bearing Lower Shammar reservoir is a conglomeratic to fine grained sandstone, ranges in thickness from 0.5 m to 7 m and is interpreted to be deposited in a delta front to shoreface environment. Although it is currently below seismic resolution, it is inferred to be stratigraphically trapped in localized topographic lows on the base Cenozoic unconformity and sealed by shales of the overlying Shammar and underlying sub-cropping Nahr Umr. Following this 'dogma' busting discovery, Petroleum Development Oman (PDO) exploration committed to a dedicated 12 well campaign in 2015-2016 to assess the reservoir type, distribution, connectivity and dynamic behavior. The play is commercially attractive, because it lies at ~1000 m depth and is located in an area with existing surface facilities with ullage. A challenge was to optimally pick subsequent appraisal wells given an evolving understanding of the geological model as initial results came in. Although the encountered reservoir is thin, early hook up of wells indicate steady commercial rates of naturally gas lifted sweet dry oil. Well, reservoir and facilities management (WRFM) techniques were proven key enablers to appraise a risky stratigraphic opportunity. By conducting the appraisal programme in a campaign mode, wells were safely executed on time and below budget. Early monetization was achieved through an appraise-while-develop approach. The Shammar project turned an unknown play into a robust resource with demonstrated low unit technical cost (UTC), commercially attractive development options and accelerated production, in record time. With continued PDO focus on low UTC, high flow rate plays and with a need to further understand the Shammar play extent, PDO has kicked off an additional Shammar campaign in 2017 to extend the play fairway of high quality oil bearing Shammar sands up to 10 km around the 2016 discovery. The campaign is anticipated to deliver additional contingent resources for PDO in 2017 and beyond.