

Petroleum Systems and Recent Exploration of the Permo-Carboniferous Unayzah and Devonian Jauf Reservoirs in Eastern Saudi Arabia

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Hydrocarbon exploration in the Permo-Carboniferous Unayzah and Devonian Jauf Reservoirs in Saudi Arabia has recently expanded east and south of the Ghawar Field in Eastern Saudi Arabia. The combination of well control and 3-D seismic coverage has aided our understanding of these petroleum systems in the area.

The Permo-Carboniferous Unayzah Reservoirs are a heterogeneous assemblage of continental clastics generalized as aeolian (Unayzah A), Glacial-lacustrine (Unayzah B), and braided stream (Unayzah C) sandstones. The Devonian Jauf Reservoir is composed of estuarine and intertidal sandstones. Both Unayzah and Jauf are sourced by the Lower Silurian Qusaiba shale. The Unayzah Reservoirs were deposited on the Hercynian Unconformity. The Hercynian event gently tilted and uplifted structures eroding an incised paleotopography on older Paleozoic strata including the Jauf Reservoir. In places, the tilted Jauf subcrop controls the incised valley trend. Unayzah C valley fill deposits can vary from zero to 1200 feet thick in a few kilometers distance. The Jauf truncation is an attractive play complicated by the fact that the Hercynian Unconformity is not easily imaged seismically. In places, the prolific Unayzah A Reservoir aeolian sandstones retain excellent porosity and permeability with low acoustic impedance that favors seismic imaging. Well control has defined a west-to-east trending aeolian reservoir belt distributed by prevailing winds. A string of exploration success has opened up new fields along this trend. The easternmost part of the exploration area tested parafinic lacustrine sourced oil that may be from a previously unknown source facies within the Unayzah.