Tight Paleozoic Reservoirs in North-West Arabia

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Exploration activities during the last two decade revealed potential tight Paleozoic reservoirs in North-West Arabia. These reservoirs are present in several horizons with different petroleum systems.

The older and deeper tight reservoirs are in the Upper Ordovician sandstones of the Khabour Formation (Iraq) and Dubaidib Formation (Jordan). The Silurian Akkas Formation is a new and potential tight sandstone reservoir in Iraq. The Carboniferous Doubayat and Markada Formations are tight carbonate and sandstone reservoirs respectively in Syria.

The Khabour Sandstone gas reservoir was first discovered in Khlesia-1 Well in NW Iraq in 1961. In the Akkas field (West Iraq), the Khabour gas and condensate reservoir was discovered in 1993. It occurs in the Upper Ordovician K1-K4 members and consists of fine grained sandstones with fracture porosity up to 7.6% and permeability of 0.13mD. The Risha Sandstone Member of the Upper Ordovician Dubaidib Formation was first discovered in Risha-3 Well in NE Jordan in 1986. The Risha reservoir is comprised of sandstone interbedded with silty shale and has a low porosity (3-7%) but in some locations, known as sweet spots, the porosity reached 12-15% with very low matrix permeability. There is evidence, however, of natural fractures in most of the wells. The Ordovician petroleum system is envisaged for these reservoirs, where the source of the dry gas is the Ordovician shale. In the case of the Khabour reservoir in the Akkas field, the Silurian source contributed to the condensates presence in the field.

The Silurian Akkas sandstone oil reservoir occurs in the upper part of the Akkas Formation (upper Qaim Member) and consists of sandstones with porosity of 6.5% and permeability of 0.2mD. The Silurian “Hot Shale” is the source for the 40º API oil in this reservoir.

In the Akash field, discovered in 1990, close to the Iraq border in Eastern Syria, the reservoir unit is the Carboniferous Doubayat Formation dolomite with a porosity <6% and permeability of 1,000mD. The oil is 38.8º API. The oil is sourced from the Silurian shale, and possibly mixed with Upper Cretaceous sourced oil.

In the Arak field in the Palmyra region of Central Syria, the Carboniferous Markada gas reservoir consists of fine-grained sandstone layers and lenses with pinchout porosities, reaching 13%, interbedded with shale layers. The source rocks occur locally within the Carboniferous Markada Formation and consist of silty shales, with organic-rich layers, present within the gas nd condensate window.

The Paleozoic reservoir potential is yet to be discovered, particularly in the North-West Arabian Desert stretching from Western Iraq, Eastern Jordan and Syria and Northern Saudi Arabia.