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Reservoir Geology of Giant Permian Gas Fields in the Arabian Gulf Basin

In 1948, Significant volumes of non-associated gas was discovered in Bahrain from the Permian carbonate reservoir. However, a major discovery was made in 1971, in the North Field (Qatar), with recoverable reserves of 900 TCF, confirms this as one of the world's largest gas fields. At the present time, the Khuff Formation has proved the presence of large volumes of gas and is a major exploration target in Saudi Arabia, Bahrain, Qatar, Iran, Oman and United Arab Emirates. The Formation is predominantly shallow marine carbonates formed during transgressive-regressive depositional cycles. Reservoir characteristics indicate that the principal hydrocarbon accumulations lie in the subtidal to intertidal reservoir lithologies. Areas with good reservoir potential including oolitic and peloidal packstone/grainstone facies and less anhydrite have been predicted near shelf edges and shelf breaks bordering the Gulf countries. Primary porosity and permeability tend to be low, but may be enhanced by a system of open fractures, thereby making the Khuff sequence a good to very good reservoir. Dolomitization has enhanced original porosity in grainstones of the best reservoir facies by creating intercrystalline porosity. The Permian carbonates have been buried sufficiently deep for the generation of late dry gas from liquid oil. The source of the gas is the Lower Silurian Qusaiba Shales. The discovery of oil from this formation in some of Oman and Saudi Arabia fields is somewhat unusual and has led to suggestions that the source of the oil is different from that of the gas.