

Mesozoic Stratigraphy and Hydrocarbon Habitats of Kuwait

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Kuwait proven oil reserves reached about 97 Bbbl, and producing about 2.5 mmbbl/d, from supergiant and giant fields such as Greater Burgan Raudhatain, Sabriya and Minagish fields. These fields are associated with very gentle oval anticlines interpreted as drape structures over deep-seated fault scarps or as growth structures related to salt pillows. These structures are generally very simple, consisting of a series of roughly parallel, anticlinal uplifts trending generally N NW S SE, with a few having a more north-south to north northeast south southwesterly trends. Reservoir rocks are found in carbonates of the Lower and Middle Jurassic (Marrat and Sargelu formation), Lower Cretaceous carbonates of the Ratawi and Minagish formations, Middle Cretaceous sandstones of the Burgan and Wara formations and limestones of the Mauddud and Mishrif formations.

The most important reservoirs are the Lower and Middle Cretaceous sandstones, which are sealed by interbedded and overlying shales. Several Jurassic and Cretaceous limestone units form additional but subordinate reservoirs, generally sealed by shales. Only the Upper Jurassic Gotnia Anhydrites seems to act as a minor seal for Middle Jurassic limestone reservoirs.

Proved and potential source rocks with high TOC values characterized by mixture of marine and terrestrial sapropelic organic matter are permanent in Lower and Middle Cretaceous and Lower and Middle Jurassic. Kerogens from these rocks fall between type II and II-III. The shaly parts of the Zubair and Burgan formations are dominated by type III kerogens, and played a minor role as gas source rocks. The maturity level and quality of the kerogen in the Sulaiy and Minagish formations indicates that they are the most probable source rocks within the Lower and Middle Cretaceous reservoirs, and responsible for generating oil which has accumulated in the present structures.

Source rock characteristics for the Jurassic succession varies, ranges for the lower TOC values in the Dhurma and Marrat formations to moderate to good TOC values in the Sargelu Formation and the Najmah Formation, but the entire Jurassic succession appears to be mature for oil generation. Oil generation from Jurassic source rocks began in the Late Cretaceous at the time when structural traps had already started to form. The Cretaceous source rocks entered the oil window during the Late Cretaceous and Early Tertiary, whereas oil expulsion occurred throughout Tertiary time.