

# Source Rock Evaluation of Najmah Formation in West Kuwait- A possible Unconventional Reservoir

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## Abstract

An integration study has been made on geochemical, organic and inorganic, results derived from core samples, as well as, results derived from wireline logs. The purpose of this study is to assess the hydrocarbon potential of the Najmah Formation in three different fields; Minagish, Dharif and Umm Gudair from west Kuwait.

Najmah Formation is an organic rich bituminous source rock which is composed of mixed argillaceous wackestones and mudstones. It ranges in thickness from 63 to 90 m. Najmah III interval, the main target in this study, is located in the middle of the formation with an average thickness of 45 m. Najmah III unit has a very high in TOC values (5-15%). It is in the oil generation window where V<sub>Ro</sub> is in the range of 0.7 to 1%, with notable variation within individual fields. This kerogen is dominated with type II but with some scattered type I and III organic matter. Porosity is associated with the pore-filling (pyro) bitumen and it is mostly occurs as porosity associated with the organic matter, as visible in the SEM pictures.

X-Ray diffraction results show that the formation is dominated with calcite and dolomite with variable amount of quartz, clay and pyrite. The clay minerals are illite and smectite. The concentration of some rare elements such as Vanadium, Nickel and Molybdenum is relatively high (626, 730, 1342 ppm respectively) in the organic rich layers. Higher percentage of carbonate and lower percentage of clay makes this formation brittle and prone for fracking to extract any fluid trapped in these unconventional and tight formations.

The prospective interval of Najmah III layer is found to be lower in clay content and high in TOC. In this area, west Kuwait, there is a lateral increasing trend in TOC content towards the north. Thus, high TOC values are in the northern Dharif field and the lower values are in the Minagish fields. The hydrocarbon potential of this Najmah III interval, is best in the Dharif oil field.