

Evaluation of the Aptian Lower Shuaiba Formation in the Downthrown Block of the Natih Fault Sultanate of Oman

Sulaiman AlBadi^{1,2}, Mohammed Farfour¹, Khalid AlShuaili²

¹Sultan Qaboos University

²Petroleum Development Oman

Abstract

The Aptian Lower Shuaiba reservoir is one of the very extensively studied hydrocarbon reservoirs in the northern part of Oman. However, in the Natih field in Northern Oman, the Shuaiba reservoir is poorly understood. This study involves two areas: the upthrown block and the downthrown block of the Natih fault. The downthrown block of the Natih fault is a green field and only one well has penetrated the Shuaiba Formation. However, a good number of wells and data are available from the Shuaiba Formation in the upthrown block. The aim of this study is to evaluate the Shuaiba play in both the downthrown block of the Natih fault and the upthrown of the. The upthrown area will be used as an analog for the downthrown area.

Through the analysis of the available data from the Shuaiba in the upthrown block of the Natih fault, a structural model, depositional and facies models, diagenesis, and reservoir quality are studied to understand the Shuaiba and extend our understanding to the Shuaiba formation in the downthrown block. In addition, seismic attributes like the Root-Mean-Square (RMS) and amplitude attributes are used as lithology and hydrocarbon indicators. The attributes have been applied to both blocks simultaneously. Lastly, to validate the interpretations from seismic, we use the core data and well data collected from one well penetrating the Shuaiba formation.

In addition, different models including depositional and facies models, diagenetic, and property models have been developed. Three facies have been identified in the upper 35 meters of the Shuaiba reservoir. The three facies are (1) Oncoidal packstone, which was most likely deposited in a shoal flank setting; (2) Bioclastic mudstone, which was most likely deposited in an open, relatively deep, marine shelf; and (3) Bioclastic wackestone, which was most likely deposited in a shallow marine shelf. Each of the three facies has a different reservoir quality based on the grain type and size, and the amount of mud. The diagenetic model shows that early and late cementation with dissolution has affected the Shuaiba reservoir, as well as compaction and fractures. The model also shows that the faulted/fractured areas have been cemented by the highly saturated salt fluids that went through them.

In conclusion, the Shuaiba formation in the downthrown block of the Natih Fault is worth exploring.