

Lower Shuaiba Facies Mapping in Al Huwaisah Field, North of Sultanate of Oman

Ahmed M. Al Sulaimi¹, Asad Ilyas¹

¹Petroleum Development Oman

Abstract

Shuaiba carbonate reservoir is the main contributor of oil production in the north of Oman. The formation itself was deposited in the Aptian times of Lower Cretaceous and it is divided into the lower and upper members. The Lower Shuaiba Member represents a shallow water carbonate depositional system in the southeast and central areas of Oman moving towards basinal and organic rich carbonates in the northwest. In Al Huwaisah Field, Lower Shuaiba represents a shelf break with mound complex depositional environment which largely contribute in making this field one of the complex carbonate reservoirs that PDO is developing. In addition of being a naturally fractured reservoir, the different types of facies and their distribution elevated the degree of heterogeneity. This is mainly related to the discrepant settings during Shuaiba deposition in this area as well diagenesis impact which, in multiple cases, had a severe alteration of the original properties. Facies types and distribution, as well known, have a great impact on STOIP estimation, development of the reservoir, movement of fluid and production behavior of the wells. Consequently, understanding the facies trends and reservoir quality distribution will help obtaining a better insight of the reservoir architecture. Despite the challenging task, many efforts were done to map out the Lower Shuaiba facies in Al Huwaisah field like; Morrison, W. 2000; Kerans, C. 2002 and Amthor, J. et. al, 2010. The presented work utilised different available data including publications and previous studies, seismic data, descriptions of well cores and side-well-samples, average wells pressure data and a long wellbore, gas chromatography fingerprinting, available modern day analogues, well logs and bore hole image logs. These different datasets were integrated to provide an in depth and detailed facies mapping of the top 20 meters of the reservoir in the area of interest. The workflow started by looking at the more fieldwide data of average reservoir properties, pressure and chromatography fingerprinting. This helped to study any apparent trends. Then, the seismic utilisation came into play using different seismic attributes to examine large scale geological features. Finally comes the detailed analysis of the reservoir which was done using the available data at well level. The product of this work was presented in 2D integrated facies distribution maps highlighting the different expected facies, their trends, and the expected reservoir quality through set of polygons using PETREL tool. The study outcomes were utilised to identify new opportunities such as the one resulted in drilling wells with 150-300 m3/d net oil in the flank of such a high water cut producing field. It also utilised for further development studies, well planning assessment, well placement while drilling and in well and reservoir management.