

Sedimentological and Stratigraphic Zonation of the Lower Shuaiba Formation North West of Abu Dhabi, UAE

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ABSTRACT

Thamama Group is divided into four formations comprising, in ascending order, the Habshan, Lekhwair, Kharaib and Shuaiba. For the purposes of hydrocarbon development the Thamama is divided into several reservoir zones separated by dense, non-reservoir intervals. Each reservoir layer is in turn sub-divided into numerous porous intervals on the basis of gamma ray/neutron log characteristics, lithology and the occurrence of dense stylolitic intervals. The Lower Shuaiba Reservoir Layer at this Green Field, offshore Abu Dhabi lacks definition and usage of sub-layers. The aim is to establish a newly sub-layering scheme of Lower Shuaiba reservoir and then to compare it with previous studies of this field and nearby fields. The approach is based on the definition of sequence stratigraphic reservoir layers that involves i) identification of the smallest scale shallowing and deepening upward cycles in the cores and ii) consolidation of these small-scale cycles into geological reservoir layers. Accordingly, the identified cycles can be matched to the gamma ray, neutron porosity and bulk density logs to define the resolvable ones on wireline logs and the occurrence of dense stylolitic intervals that can be confidently correlated throughout the field. This reservoir is deposited in a shallow ramp environment and shows an overall deepening-upwards succession of lithofacies associations. In ascending order these are: lithocodium floatstone; rudisted peloidal packstone, skeletal peloidal packstone; and foraminiferal mudstone/wackestone. On overall, depositional environment ranges from Shoal to middle ramp. Analysis and investigation showed poor reservoir properties with abundant microporous system. Seven reservoir subzonation were found and correlated against log responses across the field. Six main stylolitic intervals were identified and indicated by reduction in porosity. The added value of this study involves reviewing and reworking available data to contribute into reservoir characterization. The proposed new sub-layering zonation scheme is important to characterize the Lower Shuaiba Reservoir paving the way to build a reliable 3D geological model for volumetric calculations and therefore for development.