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# An Integrated Approach for Modelling Depositional facies and Diagenetic Trends to Capture Heterogeneities in a Lower Cretaceous Carbonate Reservoir

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## ABSTRACT

Carbonate reservoirs are mostly heterogeneous. The ultimate goal when developing a reservoir geological model is to be as accurate as possible to capture this heterogeneity. The main objective of this paper is to present an integrated three dimensional static model that incorporates the sequence stratigraphic zonation scheme, captures the facies distribution as well as the diagenetic overprint and as a result successfully predicts our reservoir rock types within the reservoirs. Subsequently, porosity, permeability, and water saturation modeling are also discussed.

This paper used data from an undeveloped, data-poor field M, located in the Middle East. Thus, during the presentation, the authors aim to present the challenges with the integration of the depositional heterogeneity within a sequence stratigraphic framework for each reservoir interval for input into static model using the available cored wells and logs. Being a very heterogeneous, and data-poor carbonate oilfield, the major challenges would be in the techniques used for spatial distribution of reservoir attributes such as facies, diagenetic overprint, rock types, porosity, and permeability. Thus, firstly, different workflows for facies modeling would be presented until we arrive at the best workflow or combination of workflows. Subsequently, the authors would attempt to find the best possible method of capturing the diagenetic overprint which will mainly focus on cementation, being the most prominent diagenetic event in the facies under study.

Finally, the authors would then try to find a relationship between these diagenetic facies and the petrophysical properties and capillary pressure curves in order to classify the rock types through several iterations. Once reached, means to predict these RRTs in uncored wells will be discussed so that for all future wells, these RRTs can be successfully predicted without the need for cores. Finally, petrophysical modeling would be discussed honoring the reservoir facies/rock types. Capturing and integrating facies and diagenetic trends, with petrophysical properties, should lead to a development plan optimization through the detection of the sweet spot areas and improvements on the STOIIP calculation.