
Integrated Static and Dynamic Modeling in One of the Major Gas Reservoirs of Onshore Abu Dhabi

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Integration of static and dynamic modeling is one of the issues often raised. It is the link between a facies-based model incorporating depositional and sequence stratigraphic characteristics, and its use during dynamic simulation. In this presentation, we will introduce a concept of modeling based on reservoir rock type approach.

This approach is used in one of the major producing gas reservoirs in a giant field in central onshore Abu Dhabi where the general structure trends is Northeast – Southwest and has dimensions of 40 by 30 kms. Its main reservoir zones are part of the Lower Cretaceous Thamama group. The overall depositional environment is characterized by its location on the Arabian carbonate platform within an intra-shelf basin.

Applying the sequence stratigraphy principles, the reservoir is divided into two parasequence sets. The lower part comprises of a progradational interval overlain by a retrogradational package, with the boundary between each package marking a stillstand. Five lithofacies were identified in the reservoir, bioclastic peloidal grainstone, algal packstone/floestone, bioclastic peloidal packstone, algal wackestone/floestone and bioclastic peloidal wackestone/packstone. These lithofacies are believed to be deposited on a homoclinal carbonate ramp that dipped gently seaward.

Porosity and permeability are well preserved in the reservoir section due to a lack of pore-filling cement. In the field, a clear general trend of down flank porosity deterioration of more than 10% from Crest down to the water-bearing zone occurs. This is mainly due to the compaction effect during hydrocarbon migration and infill of the structural trap.

Analysis of both thin section descriptions and high pressure mercury injection led to the identification of five distinctive rock types. Each reservoir rock type has a certain effective pore throat size distribution which will produce particular capillary pressure, relative permeability curves, control porosity and permeability estimation.
