Facies Modeling of a Giant Carbonate Gas Reservoir Severely Affected by Secondary Overprint – an Example from the Khuff Gas Reservoir, Awali Field, Bahrain

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ABSTRACT

The Awali Field in Bahrain is the first hydrocarbon discovery in the Arabian Gulf region in the year 1932. It has oil and gas accumulations in different stratigraphic intervals. The Permian Khuff carbonates hosts a giant gas accumulation that meets the energy requirements of the Kingdom of Bahrain. Lithologically, the Khuff is dominantly dolomite with minor limestone and occasional thin shale intervals. Core coverage is limited and mostly concentrated in the reservoir zones. Studies on the limited available cores suggest presence of atleast six diagenetic events. This has completely obliterated the original fabrics. Identifying facies from well logs with poor core control is therefore an extremely daunting task. Presence of dolomite and anhydrite as part of both the matrix as well as cement further compounds the problem. Different vintages of open hole well logs are available in most of the wells. Mineral volume curves generated from elemental spectroscopy logging in the wells drilled in the recent past have been used to define a practical and usable facies classification. This input was used in Petrel to generate a 3D facies model. The facies-controlled porosity model prepared subsequently provides a realistic picture of the subsurface reservoir architecture.