Rock Typing and Characterization of Carbonate Reservoirs

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ABSTRACT

Reservoir rock typing (RRT) is a process of up-scaling detailed geological and petrophysical information to provide more accurate input for 3D geological and flow simulation models. The reservoir rocks that correspond to a particular rock type should have similar rock fabric, pore types and pore throat size distribution. The study integrated multi-scale data types to develop a robust and predictable rock type scheme. This consists of detailed sedimentological description of depositional environment and associated sedimentary features, detailed numerical petrographic analysis of rock texture, grain types, porosity types and rock mineralogy and petrophysical data grouping using openhole log and core plugs porosity-permeability relationship and pore throat size distribution (MICP). The main objective was to develop a reliable reservoir rock type scheme that captures the heterogeneity in Jurassic carbonate reservoir for the Middle Marrat Formation in South East Kuwait area and implementation of the RRT to the permeability prediction within the field. Integration of the thin sections, porosity-permeability, pore throat size and distribution has resulted in the identification of reservoir rock types. A total of 14 different rock types were identified within the reservoir interval in the cored wells, which is subsequently grouped into eight due to modelling limitation. The RRT up-scaling was done in a way to minimize the impact of grouping on permeability and saturation computations. The prediction success between the cored RRT and the predicted RRT using openhole data is more than 85%. As a result, the permeability computation success between core plugs and computed permeability using the RRT is more than 80%.