Al Mawrid: An Arab D Limestone Sequence Stratigraphic Facies and Petrophysical Properties Database for Full Field Modelling and Reservoir Simulation

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ABSTRACT

The Al Mawrid project is a major expansion of the Arab D limestone reservoir property database required by the use of fourteen sequence stratigraphic (SSP) facies. For each of the SSP facies, a statistically significant petrophysical property database is constructed. This database includes: routine core analysis data, mercury injection capillary pressure, MICP, data (with Thomeer analysis), Rosetta Stone petrophysical rock types (PRT), pore system modality, classified pore type presence (M, Type 1, Type 2, Type 3) and, for a selected PRT subset, centrifuge waterflood recovery. Few years ago, Rosetta Stone project acquired 484 samples, using MICP data (with Thomeer analysis) and these were assigned membership in the six HWMC (Hadley-Wendte-Mitchell-Clerke) limestone facies. Since that effort, a new set of fourteen Arab D sequence-stratigraphic project limestone facies has emerged requiring a major expansion of the petrophysical database for maintaining robust facies statistics. The reservoir property database retains the established Rosetta Stone petrophysical rock types (PRT). These petrophysical rock types are defined by assigning for each sample, the maximum pore throat diameters from Thomeer analysis to defined maximum pore throat diameter classes (porositons). The new database, Al Mawrid, will eventually include over 1500 samples. Al Mawrid, presently contains close to 1000 samples. The Al Mawrid SSP-PRT database by design, enables a straightforward statistical workflow for translating SSP facies to PRTs and then to reservoir properties. This database demonstrate the behavior of the 14 SSP facies in terms of: porosity, permeability, porosity-permeability crossplot, pore system modality, pore type presence and Rosetta Stone PRT composition. Porosity and permeability distinctions in the SSP facies are not sharp. However, trends in the petrophysical behaviors of the facies are clearly present and the stratigraphic presence of the macropores (M) and the three types of microporosity (Type 1, Type 2 and Type 3) are now directly linked. This database is used with deterministic stratigraphic reservoir models to populate the static reservoir model with reservoir properties.