Rock-Type-Based Reservoir Modelling in Carbonates, the Upper Sarvak Formation: A Case Study, Southwest Iran

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Upper Sarvak Formation in SW Iran is a complex reservoir unit because of heterogeneity by depositional facies and diagenesis. The facies analysis and sequence stratigraphy study showed this interval is a layer cake without lateral facies change.

Core and thin section studies supported with well log data were used to recognize facies, diagenesis, rock types and pore-perm distribution. Lagoonal and open marine deposits were classified into four rock types, based on dissolution and resulting vuggy porosity. Barrier deposits include shoal and reef related facies were classified (into three rock types), according to cementation volume. Intrashelf basin was used as one non-reservoir rock type. The rock types were modeled by different scenarios (facies modeling tools), i.e. composites and belts (object- and pixel based algorithms) to capture heterogeneity and uncertainty. The rock type models were later used as constraints for modeling petrophysical properties.

The petrophysical data were transformed to a Gaussian distribution with mean zero and standard division 1 after removing trends. Co-simulation was also done for transformed data i.e. porosity and permeability. The Gaussian distributions are used as input to the algorithm simulating the different petrophysical properties. Later variogram modeling was done for each rock type to see the variability (or similarity) of the properties as a function of the distance between the data points.

The results show facies and diagenetic processes control the reservoir properties. The model reveals that the vertical changes in rock types are a function of depositional facies and diagenesis, while the lateral variation is mainly controlled by diagenesis at the same facies. The results of the rock type based modeling will be further used for simulation and flow performance evaluation.