

Rock-Typing: An Integrated Reservoir Characterization Tool for Tight Jurassic Carbonates, West Kuwait

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ABSTRACT

Najmah-Sargelu Formation of Middle Jurassic is tight, fractured Carbonate reservoirs, spread across whole Kuwait. These reservoirs are often vertically and laterally heterogeneous because of depositional variability and diagenetic alteration through space and time. Understanding the distribution of hydrocarbons in relation with porosity / permeability heterogeneities is thus of major importance in effective field development and production. Rock-typing provides reservoir characterization linked fluid flows through time in order to support development scenarios. Rock-type is defined as "a rock unit characterized by similar depositional and diagenetic processes resulting in a unique ϕ -K relationship and capillary pressure curve at given wettability". The rock-types are based on core observation of the main sedimentary facies, dynamic properties measured in special and conventional core analyses and logs using 27 well data. Three major steps- - Electrofacies determination is the step which associates a facies name to a typical response of a log combination - A comparison of electrofacies with lithofacies described on cores will associate a geological meaning to log signatures. - Rock-type definition is the step where electrofacies are characterized by reservoir petrophysical properties from CCAL/SCAL data This approach reconciles sedimentology, petrophysics and dynamic characteristics of rocks. In order to maximize the quantity of rock-type data, their identification in wells has been based on log signature. This also allows identifying the rock-types in non-cored intervals. During the electrofacies analysis, both non-supervised and supervised approaches were carried out successively to characterize electrofacies on cored wells and to propagate this signature to other wells. Interpreted electrofacies were tied to petrophysical information to build the rock-types. Thus rock-type can gather several electrofacies if their dynamic behavior is similar; conversely, electrofacies must be refined if it appears that their group points have no consistent petrophysical characteristics. Najmah and Sargelu formations were treated separately due to strong impact of bitumen which reduces the weight of other facies. Total of 10 rock-types (5 in Najmah and 5 in Sargelu) have been defined. This paper establishes a deterministic rock-type scheme in Najmah-Sargelu reservoir and presents a methodology to distribute these rock types vertically and laterally in the 3D geological model.