

Rock Type Analysis and Reservoir Characterization of 1000 Wells Using Computational Classification Techniques

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Abstract

The Lower Cretaceous Centenario Formation is a conventional shallow clastic reservoir developed close to the northeastern border of the Neuquen Basin, Argentina. This unit has only been recognized in the subsurface, and is composed of thick-bedded sandstones and conglomerates interbedded with shales. Its depositional model has not been deeply studied, and has been interpreted as fluvial, deltaic and shelfal deposits. Recently, a revision of the sedimentology of this unit was conducted throughout the study of 200.11 meters of cores corresponding to eight wells in the Rialto, Colorado Area. The deposits are dominated by m-thick massive sandstone beds with minor cross-bedded intervals and shales, which have been interpreted as shallow shelf sediments accumulated as channel-fills and lobes by hyperpycnal flows. Facies analysis allowed the recognition of twelve sedimentary facies suggesting traction and fallout processes from turbulent suspensions with limited bedload, and fallout deposits in an offshore marine/prodelta setting. Sedimentary facies were physically characterized by a number of conventional analyses and calibrated with logs, aimed to determine the main correlation between sedimentary facies and electrical well logs. In this case, GR (Gamma Ray) and SP (Spontaneous Potential) logs were selected as the best describing metrics. Using the selected registers, an electrofacies classification was independently performed taking into account SP and GR cut-off values in the eight studied wells. Four electrofacies were recognized from the aforementioned classification. The population of these electrofacies with facies and facies associations allowed the definition of four rock types. Based on the calibrated rock properties and cut-off values of rock types, an automated computational classification was applied to a larger available well database composed of more than 1000 wells, using in-house developed software. The results not only show an accurate correspondence between manual and automated classification, but also allow the construction of detailed reservoir maps focused in the understanding of sandbodies and properties distribution along the entire area.