RESERVOIR QUALITY IN A CLASTIC SEQUENCE USING WELLBORE IMAGES, NMR, FORMATION TESTER, CORE AND ACOUSTICS STONELEY MEASUREMENTS.

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Knowledge of reservoir flow capability is essential in optimizing hydrocarbon recovery.

In this paper we discuss the measurements of reservoir quality from nuclear magnetic resonance, wellbore images, formation tester drawdown mobility, acoustic Stoneley, conventional nuclear and resistivity logs and core and their relationships in a clastic deltaic environment. The results of this study have given us valuable insights into the application and limitation of these techniques.

The integration of these techniques proved to be the key in establishing the link between the fluid dynamics and static reservoir properties leading to improved understanding of the depositional energy, direction of the maximum permeability and providing a confident and continuous permeability and predicted inflow profile (KH).

The wellbore images were used to study the thickness of the cross beds for an illustration of the depositional energy and to provide an inference of the reservoir quality. The analysis of the dips and azimuth of the cross beds were used to indicate the direction of the maximum permeability of the sand packages. It was established that the permeability from the NMR is consistent with the formation tester when the cross bed thickness is greater than 0.5 feet and was valid to calibrate the NMR permeability coefficients. It also was established that the calibration of the NMR permeability is valid across the field when compared with the formation tester and core on the other study wells. The NMR, formation tester, core and Stoneley permeability tend to agree when the cross-bed thickness exceeds about 1.5 ft.

In this study, we identify the limitations of these techniques related to the differences in vertical scale, depth of investigation and physics of each measurement and illustrate that integration proved to be the key in improving our understanding of the reservoir quality.