Core to Seismic Reservoir Characterization of a Carbonate Heavy Oil Reservoir, Grosmont, Canada

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ABSTRACT

Shell's leasehold of the Grosmont carbonate reservoir exhibits a triple porosity system ranging from 5% to 37% porosity with oil filling the fracture porosity, the vuggy porosity, and the matrix porosity. The complex nature of the pore system is confirmed by core observations and non-standard log analysis. The hydrocarbon volume and producibility of the Grosmont reservoir are influenced by diagenesis effects that are difficult to capture with conventional subsurface data analysis inside and outside of well control. This reservoir type can be seen as an analogue for other fractured, heavy oil carbonate plays, such as those in the Southern Gulf of Mexico.

Quantitative seismic interpretation is one approach helping to constrain reservoir parameters between wellbores. Critical to this effort is the integration of core and log data to put the elastic properties in the context of reservoir performance drivers. Therefore we utilized core information to calibrate our non-standard well logs (image logs, dipole logs) to characterize the rock facies.

We identify field specific controls on the elastic rock properties that range from fractures, to porosity and pore types, and to fluid types. We illustrate how elastic rock property trends from sonic logs are derived by calibration with relevant image log, core, and thin-section observations. Using field specific, calibrated rock physics model parameters as input for our XStream Probabilistic Seismic Inversion (PSI), we improved the porosity predictions by successfully executing a "3D Close-the-Loop" workflow.