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CONFERENCE 2022 OF THE GEOLOGICAL SOCIETY OF TRINIDAD & TOBAGO
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Petrofacies: A new petrophysical approach to facies description in the Columbus Basin, Trinidad

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Theme: CG: Rock mechanics & petrophysical methods
Key Words: petrophysics, petrofacies, Columbus Basin

A comprehensive petrophysical refresh on the gas fields in the Columbus Basin was carried out in 2009 to provide consistency and continuity in petrophysical interpretations for conventional reservoirs. As many of the conventional reservoirs become depleted, attention has shifted towards lower net-to-gross, thinly-bedded or shaly sand reservoirs (Secondary Pay). In 2017, a core was acquired and was interpreted to be a reworked laminated system, with heavy bioturbation, resulting in a shaly sand with high dispersed clay content. A new petrophysical model, addressing net, permeability and water saturation, was needed to account for the dispersed clays in the reservoir. Analogous regions such as West Nile Delta and Angola successfully adopted petrophysical models that group facies types based on their log response and character called “petrofacies”.

For the Columbus Basin, five petrofacies were identified from core, ranging from conventional sands to shale-prone heterolithics, with a direct link to a decrease in grain size and increase in clay content. To propagate away from cored intervals and apply to all wells in the basin, an automated log blocking technique driven by Vshale, bed thickness, resistivity and neutron-density separation criteria was determined and the predictive power tested against the core.

This approach has resulted in a more robust petrophysical model which accounts for reservoir variability, and produces more refined concatenated near-wellbore permeability and corresponding saturation height function curves. These outputs lead to more technically sound rate and reserves prediction, with data-driven uncertainty ranges. Petrofacies has been integrated into depositional environment maps, recovery factor and completion design, and has become the common language spoken within the multi-disciplinary team.

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