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PS Application of Mechanical Stratigraphy to the Development of a Fracture-Enhanced Reservoir Model, Polvo Field, Campos Basin, Brazil*

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Abstract

A fracture model was developed for a sequence of passive-margin carbonates in Polvo Field, Campos Basin, Brazil, by applying concepts of mechanical stratigraphy to datasets derived from core, image logs and 3D seismic surveys. Upper Cretaceous carbonate rocks of the Quissama Member of the Macaé Formation include a highly porous and permeable grainstone reservoir facies underlain by various combinations of wackestone, packstone and grainstone. Systematic description of ~100m of core from a vertical well reveals a complex relationship between brittle deformation and diagenetic processes related to burial and compaction. Fractures and fabrics were subdivided into twelve distinct categories, with identification of four major mechanical units based on their vertical distribution.

Thirty-one of 126 fractures measured in core can be precisely matched to features interpreted independently on the FMI log, allowing verification of the orientations of prominent fracture sets and establishing criteria to identify bed-confined and throughgoing fractures on image logs. The latter were used to map the occurrence of hierarchical fracture populations in FMI logs from two horizontal wells by distinguishing among bed-confined, incipient throughgoing, and mature throughgoing fractures. A conceptual model for the fractured reservoir was developed by incorporating attributes of ~ 3000 fractures identified on FMI logs, including computed apertures, into the mechanical stratigraphy established from core description, which was then correlated to seismically mapped facies. Ranges for spacing, height, length and aperture were estimated for each fracture set and mechanical unit based on scaling relations, bed thicknesses and relative strain magnitudes, providing important constraints on subsequent DFN models and reservoir flow simulations

References

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