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Bob Wikan H. Adibrata[1], Neil F. Hurley[2] (1) Pertamina Upstream, Jakarta, Indonesia (2) Colorado School of Mines, Golden, CO

Flow-Unit Modeling Using Neural Networks, Logs, and Core in a Vuggy Dolomite Reservoir, Dagger Draw Field, New Mexico

This study presents a model that defines flow units using vertical variations of flow capacity (k-h) and storage capacity (phi-h) within a vuggy dolomite reservoir that consists of algal boundstones in the Upper Pennsylvanian Cisco-Canyon Formations at Dagger Draw field, New Mexico. The objective of this study is to design and to test a workflow whereby flow units can be determined in wells that have core and borehole images, and in wells that have only conventional log data.

Vuggy porosity had been previously quantified in 14 wells using: digital images of core in 4 wells, and borehole images in all wells. Neural network modeling was used to predict vuggy porosity from 1 cored training well. The model was tested in the wells that had core and borehole images, and other wells that had borehole images but no core. The selected model was then applied to 25 other wells that had only conventional logs, and then was used to delineate flow units.

Three main assumptions for flow unit determination are: high permeability from well-test analysis is assigned to vuggy intervals, low permeability from core analysis is assigned to non-vuggy intervals, and neutron porosity is used to calculate storage capacity in all depth intervals. Vertical variations in flow capacity and storage capacity were then used to define flow units. Each well has distinct flow units that do not necessarily correlate to nearby wells. The model shows that high flow potential occurs within vuggy intervals in the algal boundstone facies.