

Digital Analysis of Core Images Provides High-Resolution Oil Saturation Data

Terence P. O'Sullivan¹, Bryan Bell², and Donald D. Miller¹

¹Aera Energy LLC, Bakersfield, CA

²Core Laboratories, Bakersfield, CA

Sullivan@aeraenergy.com

Core data represented by measurements made on selected plugs is undersampled when compared to high-resolution log data and especially when compared to the whole core. The difference in spatial sampling density makes it difficult to reconcile core data with log data and to upscale the core data to the reservoir scale. Digital processing of high-resolution core images leverages foot-by-foot routine core analysis to a 1-inch-and-finer resolution.

The technique of core image analysis was successfully applied to 400 ft of continuous core from heavy-oil sand in the Midway-Sunset field, San Joaquin Valley, California. For this upper Miocene, stratified, turbidite sand, high-resolution oil saturations were derived by calibrating image attributes to conventional plug data. The core images and log data were interactively reviewed using PC-based digital core image analysis software. The image-derived saturations tie closely to probe permeability measurements and to dielectric- and flushed-zone resistivity-log-derived saturations. Where differences exist between the core-plug and log-derived values, the image analysis shows that they are often the result of sampling-related, rather than actual, differences.