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Reservoir Geochemistry Application In A Fractured Carbonate Reservoir

Reservoir geochemistry was applied to a fractured carbonate reservoir to address issues of a suspected tar mat, connectivity, and reservoir recovery factor. Extract composition (iatroscan and soxhlet) of samples representative of the reservoir matrix and fractures indicate different compositions. Extracts from fractures are higher in asphaltenes and may have been interpreted as part of a pervasive tar mat in the field. Extract samples from both the reservoir oil leg and suspected tar mat zones are nearly identical in composition and not comparable to previously identified carbonate reservoir tar mats. Comparison of oil and rock extract composition suggests that production is from both the reservoir matrix and fractures. The reservoir extracts and oils are only mildly biodegraded and show little evidence of water washing. The high asphaltene and resin content is interpreted to be due to early heavy oil expulsion from a marine anoxic carbonate or calcareous high sulfur source rock. Produced oil is higher in maturity than extracts, suggesting an earlier lower maturity heavy oil charge that was slightly biodegraded followed by slightly more mature oil charge. Solvent extract yields are congruent with an observed bimodal reservoir pore size distribution, both which suggest more than half of the hydrocarbon volume is in the fracture network. Comparison of extract and oil composition data suggest that oil recovery could easily be 25-36% despite an oil API gravity of ~ 17 degrees. Oil composition is relatively homogeneous through the field suggesting limited flow barriers.