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Reservoir Characterization of the Devonian Gordon Sandstone in Two West Virginia Oilfields: Using Modern Techniques to Understand an Old Reservoir

The Jacksonburg-Stringtown oilfield in northern West Virginia has produced 20 MMBO since 1895; the smaller Wileyville field, 9 miles to the north, has produced 1.6 MMBO since 1899. Waterflood projects in both have been beset by problems including very high injection pressures, low oil-to-water recovery ratios, and unpredictable water flowpaths. WVGES has undertaken geologic and petrophysical studies in each to assist the operator in optimizing waterflood performance. Six cores from Jacksonburg-Stringtown and two from Wileyville were described in detail, correlated to well logs, and permeability profiles were constructed using minipermeameter data. Five lithofacies were defined based on core and well log observations; statistical analysis of log data allowed the definition of four electrofacies. Lithofacies did not directly correspond to electrofacies, however, the Featureless Sandstone lithofacies (FSS), the pay sandstone in both fields, was identifiable as single, distinctive electrofacies. Correlation of log data allowed construction of a sequence stratigraphic framework for the Gordon. This framework consists of four parasequences, three containing reservoir quality sandstone. Creation of a 3-D electrofacies model for the Gordon in each field allowed the construction of horizontal and vertical slice maps demonstrating reservoir compartmentalization. The Gordon reservoir is composed of compartments isolated vertically and laterally by low permeability sandstones and shales. Poor waterflooding performance may be the result of injection of water into permeable sandstones of one parasequence and completion of production wells in permeable, but noncommunicating sandstones of a different parasequence. The completion of injectors and producers in porous but impermeable sandstones is another potential problem. This work was supported by U.S. Department of Energy Contract Number DE-AC26-98BC15104 and Stripper Well Consortium Contract Number 2285-WVGS-DOE-1025.