Cost-effective integration of geologic and petrophysical characterization with material balance and decline curve analysis to develop a 3D reservoir model for PC-based reservoir simulation to design a waterflood in a mature Mississippian carbonate field with limited log data

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Abstract

Kansas Mississippian shelf carbonate reservoirs, operated by small independent operators, have produced over 1 trillion bbls since 1930 and probably represent 80% of the AEC’s oil reserves. Recovery efficiencies are low (10-15%) due to reservoir heterogeneity and waterflooding. An integrated approach was taken to develop an exploration and production strategy that included: 1. Consolidation of available data into a digital database; 2. Wireline log characterization and 3. Advanced computer modeling. The goals were to determine the workflow for each stage, to optimize wireline log interpretation, and to verify model results with measured production data.

The reservoir in the Wellington West field is a northeastern extension of the Anson-Bates field. The top dolomite is reported to have oil shows, but low permeability in this dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though a cross-plot of vertical permeability and horizontal permeability indicates that the high ratio might allow water injected during a waterflood operation to move into the dolomite, low permeability in the dolomite interval makes this part of the reservoir unproductive. Though