

Sequence Stratigraphy and 3-D Reservoir Characterization of the South Buckeye Field, Dundee Formation (Devonian), Michigan Basin, USA

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Middle Devonian Dundee carbonates are prolific hydrocarbon reservoirs throughout the Michigan Basin that have produced in excess of 375 million barrels of oil from more than 100 fields. The South Buckeye field is driven by dynamic processes that vary in time and space at nearly all scales, from the pore network to the regional sequence stratigraphic architecture. Evaluation of the complex internal heterogeneities is accomplished by tying reservoir quality to primary facies and the application of geometrical data from modern and ancient depositional analogs. The South Buckeye field is a complex combination trap, both stratigraphic and structurally compartmentalized, where patch reefs preferentially grew on paleotopographic highs.

The fundamental goals of this study are to define vertical stacking patterns of facies from detailed core descriptions within the constraints of relative sea level change, and to create a three-dimensional geostatistical model of the reservoir ground truthed by comparing initial production data at ten acre spacing. This is accomplished through the utilization of petrophysical and petrographic analyses from high density subsurface core data, to capture the complex internal architecture of the South Buckeye field. Integrating multiple types of data into a three-dimensional geostatistical reservoir model is critical for efficient hydrocarbon extraction, natural gas storage, and CO₂ sequestration in the Michigan Basin Dundee and other similar carbonates around the world.