Silurian "Clinton" Sandstone Reservoir Characterization for Evaluation of CO_2-EOR Potential in the East Canton Oil Field, Ohio

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The Ohio Division of Geological Survey conducted a detailed reservoir characterization of the Silurian "Clinton" sandstone in the East Canton oil field to evaluate the potential for CO_2-EOR (enhanced oil recovery). This investigation, in cooperation with private industry, included an 80 ton CO_2 cyclic test ("huff n puff") in Stark County. The East Canton oil field has produced approximately 95 million barrels of oil through primary recovery since 1947 from approximately 3,100 wells within 175,000 acres. With an estimated 1.5 billion barrels of original oil-in-place, there remains significant "stranded" oil in this nearly depleted but economically promising oil field. There have been no secondary recovery efforts in this mature field because of the tight, heterogeneous nature of this reservoir.

Regional stratigraphic cross sections were generated across and surrounding the East Canton oil field and correlated to full-diameter cores and published reports to establish the regional "Clinton" sequence stratigraphy and depositional setting. The stratigraphic framework developed by these cross sections established regionally consistent formation/interval boundaries that were used for construction of regional structure and isopach maps. Detailed reservoir maps of up to five sandstone units and surrounding impermeable shale units within the "Clinton" interval were mapped and related to production in a 16 square mile area around the CO_2 cyclic test. The geologic model was used as input into a reservoir simulation to estimate behavior of reservoir fluids from CO_2 injection.

Heterogeneity in the "Clinton" sandstone is largely controlled by deposition and geometry of tidal/fluvial-dominated deltaic deposits. Regionally, the "Clinton" interval has an average gross thickness of 110 feet, and net sandstone thickness ranges from less than 10 feet in the offshore marine environment and interchannel areas to over 60 feet in the thicker, tidal/fluvial channel sands. Detailed mapping of these depositional units and fracture systems is necessary to better understand reservoir compartmentalization, fluid flow, unswept oil and for planning any future EOR development.