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Application of New Technologies Leads to Discovery of Prolific Reservoirs in the Geneva Dolomite (Middle Devonian), West-Central Illinois Basin

The Geneva Dolomite, the basal member of the Middle Devonian Grand Tower Formation in much of the Illinois Basin, is an exploration target that has recently generated much interest. A combination of 3-D seismic and under-balanced horizontal drilling techniques was used to establish a new Geneva discovery. The initial well was completed for up to 3,000 barrels of oil per day at a depth of 4,000 feet in the Illinois Basin. A study of older reservoirs in the vicinity of the new discovery shows that pronounced structural closure of approximately 100 feet over Silurian reefs, fracturing, and formation of secondary porosity through dolomitization and dissolution of fossil material are associated with reservoir development and entrapment of petroleum. Examination of core from Geneva Dolomite reservoirs shows the rock to be a brown, vuggy, sucrosic dolomite. Mapping suggests that Devonian-age structures, commonly associated with underlying Silurian reefs, are a major element that enhances reservoir porosity and more recent structural movement has created the pronounced closure needed for petroleum entrapment.

Three-dimensional (3-D) seismic technology was used at nearby Tonti Field to accurately delineate the subtleties of reef structures in the field, establishing the presence of multiple Geneva high areas that likely mimic an undulatory surface of the underlying Silurian pinnacle reef. Details of the topography of a pinnacle reef show clustered high areas that are key to exploration and development of Geneva Dolomite reservoirs. Implementation of 3-D seismic and horizontal drilling technology should significantly improve the drilling success rate and recoverable reserve figures for these reservoirs.