Reservoir Characterization of the Mississippian Sun River Dolomite: Reagan Field, Glacier County, Montana and southern Alberta

K. Lyn Canter, Mark D. Sonnenfeld, and Laura C. Zahm
iReservoir.com, Inc., Greenwood Village, CO, USA
canter@ireservoir.com

and

Lara Conrad, John Parkin, and Craig Siemens
PanCanadian Petroleum Limited, Calgary, Canada

Most studies of the Sun River Dolomite (SRD) emphasize the following reservoir controls: 1) a strong dolomitization overprint that is only weakly facies-selective, and 2) the importance of karst at the top-Madison unconformity. Although these processes applied at Reagan Field, primary facies distribution remains the principal control on reservoir heterogeneity, especially where enhanced thickness of the main pay (peloid-dasyclad-dolograinstone) is controlled by axes of erosion at an *intra*-SRD unconformity.

The sedimentologic-stratigraphic model was the first step in an integrated reservoir characterization workflow leading to a full-field 3-d reservoir simulation based on 38 cores from Reagan and surrounding fields coupled with observations made during a 2-day analog outcrop study in the Little Belts and Sun River Canyon. Nine depositional facies were grouped into three gross intervals: 1) an open-marine-dominated lower interval, culminated by bioclastic shoal development; 2) a middle interval characterized by aggrading cycles of restricted lagoon deposition, terminated by a significant paleokarst; and 3) an upper unit characterized by stacked sequences of high-energy transgressive shoal/channel capped by restricted lagoon deposits.

Key geologic insights that significantly impacted the reservoir model were: 1) most gamma-ray markers are hypersaline, microporous lagoonal dolomudstones that are vertical permeability baffles effective at controlling both gas- and water-coning; 2) recognition of an erosional base to the most prominent grainstone pay interval; 3) recognition of the role of paleostructure on axes of erosion; and 4) control of the field's sweet spot by intra-SRD erosion in a paleolow--*later inverted* to become the Laramide structural high.