

Reservoir Units within a Multi-Layered Dolostone Formation: Grosmont Formation, Saleski Area

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Summary

The Grosmont Formation is comprised of a number of stacked depositional sequences that accumulated on a carbonate ramp during the Late Devonian. Sediments of the upper part of the formation (C, D divisions) were generally deposited within shallow subtidal to peritidal environments. Early dolomitization pervasively replaced the limestone host rock. Subsequent leaching of the dolostones by meteoric waters formed variably porous and permeable units, ultimately sealed by overlying Lower Cretaceous shales.

Eight reservoir units recognized within the Grosmont C and D divisions can be correlated over 20 kilometres across the Saleski area. Each unit is defined by log characteristics and petrophysical properties from core analysis. Reservoir units are broadly coincident with sedimentary facies but may be comprised of more than one facies.

Two lithologies are basic to understanding the reservoir:

1. Fractured and vuggy nodular dolomudstones with a pronounced triple permeability system (matrix, fracture and vug): Modal porosity of about 15% is contained mostly within vugs and enlarged fractures. Matrix permeability is generally 50-500 mDarcies, whereas as fracture and vug permeabilities are typically several Darcies. Horizontal permeability values usually exceed vertical permeability values and thus characterize a reservoir unit with extensive intraformational fractures.
2. Laminated medium and fine-crystalline dolostones in which matrix permeability predominates: Porosity is dominantly intercrystalline, commonly in excess of 30% and ranges to 45%. Permeability values range from a few tens to a few hundred mD but are difficult to characterize as high porosity samples generally disintegrate upon extraction of bitumen.

Nodular dolomudstones represent potential horizontal communications pathways throughout the reservoir. Laminated dolostones have the highest storage capacity of heavy oil within reservoir units. Cross-formational sub-vertical fractures of probable tectonic origin are present locally.

The laminated dolostones are the frequent host facies for the development of caves that formed during an early Cretaceous karsting event. Cave fill material includes angular dolomite breccia clasts, Cretaceous sediment, fine dolomite dust and significant volumes of bitumen. Caves are a product of early Cretaceous karsting. They are an important host for bitumen deposits.