

Mississippian Carbonate-Hosted Heavy Oil and Associated Gas in Southwest Saskatchewan

Erik Nickel, Saskatchewan Geological Survey, Regina, Saskatchewan

erik.nickel@gov.sk.ca

and

Dr. D.M. Kent, Consultant, Regina, Saskatchewan

Abstract

The Mississippian Madison Group in southwest Saskatchewan is the primary reservoir unit for carbonate heavy oil pools in the area. Heavy oil production has been from two main areas, Battle Creek and Rangeview. Battle Creek was originally discovered in the late 1960's, but grew steadily from the early 1990's to the mid 2000's when it peaked at over 30 producing wells. The field has cumulated over 1 million m³ crude oil and over 40 million m³ in associated gas. Rangeview was active throughout the 1990's from 15-20 wells and has produced over 271,000 m³ oil and 5 million m³ associated gas. To date, these are the only two Paleozoic carbonate hosted heavy oil and gas fields in the region

The Madison group in southwest Saskatchewan is characterized by interbedded crinoidal packstones and grainstones deposited in an outer shelf setting, and inner shelf deposited skeletal wackestones. The hydrocarbons are trapped within two types of porosity: moldic/vuggy porosity related to the dissolution of skeletal packstones and grainstones, and; intergranular porosity in dolomitized zones. It is thought that both of these diagenetic events are related to the sub-Mesozoic unconformity as the majority of oil shows and production occurs subjacent to this contact.

Mixed siliciclastic/carbonate rocks of the Jurassic Gravelbourg Formation overlie the Madison Group above the sub-Mesozoic unconformity throughout the region. Both trapping and reservoir development are related to the unconformity as this interface has allowed for the conduction of fluids that have created porosity through dissolution and dolomitization. Structure on the unconformity has played a role in trapping as the Rangeview and Battle Creek fields both occur on positive features that are possibly related to deep-seated (Precambrian) structures. Mapping indicates that more of these features may be present in the area.

This core display will show select examples of the various facies within the Madison Group, the relationship to the overlying Jurassic Gravelbourg Formation, and the nature of reservoir porosity types. These locations will be placed in context to recently updated structure mapping of the pertinent surfaces, potentially leading to new Mississippian heavy oil target areas.

References

Kent, D.M. and MacEachern, J.A., 1990, Heavy Oil potential of the Mississippian Madison Formation in Southwestern Saskatchewan: University of Regina, Energy Research Unit Contribution No. **199**, 70p.

Kent, D.M. and Kreis, L.K., 1995, Trapping mechanisms for Mississippian heavy oil reservoirs in Southwestern Saskatchewan: Saskatchewan Geological Survey, Sask. Energy and Mines, Misc. Rep. **95-4**, 129-134.