

Review of Upper Devonian Saskatchewan Group: its hydrocarbon potential of the Birdbear and Duperow formations in Saskatchewan

Chao Yang*

Saskatchewan Geological Survey, Saskatchewan Ministry of Energy and Resources,
201 Dewdney Ave. E., Regina, SK, S4N 4G3, Chao.Yang@gov.sk.ca

Abstract

This paper presents a broad overview of hydrocarbon drilling activity, production, petroleum system, and trap mechanisms of the Upper Devonian Birdbear and Duperow plays in Saskatchewan in order to highlight their hydrocarbon potential.

Two petroleum systems define two widely separated production areas for upper Devonian hydrocarbons plays in Saskatchewan: the Williston Basin petroleum system in southeastern Saskatchewan and the Alberta Basin (eastern edge) petroleum system in west central area of the province.

In the southeast, the Upper Devonian Saskatchewan Group plays are controlled by the Williston Basin petroleum system. The Birdbear Formation hosts initial oil in place of 6.9 million m³ and has yielded in total of 1.1 million m³ of light to medium oil from a total of 59 production wells out of 155 perforated wells, of which 13 are horizontal wells. Among the total production, 51% are produced from Hummingbird pool that is a structural trap associated with collapse structure caused by multiple-stage salt solution and 40% are produced from Kisbey pool, Tatagwa and the Walpole areas where up-dipping closures of non-permeable rock are the primary trapping mechanism. The Duperow play has produced a total of 158 x 10³ m³ of oil from 9 wells, with only 35 wells perforated and 3 horizontal wells drilled.

In west-central Saskatchewan, the Upper Devonian oil is associated with the Devonian “Nisku” petroleum system of the Alberta Basin. Heavy oil has been intermittently produced from the Birdbear since 1968. The recent application of horizontal technology in west-central Saskatchewan resulted in a sharp increase of production from 2 m³/day in January 2007 to 283 m³/day in September 2010. The success has sparked drilling in the Birdbear subcrop where part of the Birdbear is truncated by the sub-Cretaceous unconformity. No commercial oil has been produced from the Duperow Formation in west-central Saskatchewan, which may be attributed to immature exploration and therefore a lack of knowledge of the system.

The number of drilled wells in the Upper Devonian Birdbear and Duperow plays in Saskatchewan is substantially lower than those in other producing horizons. There are a total of only 410 perforated wells (including 51 horizontal wells), 119 of which are production wells. A total of 1.4 x 10⁶ m³ of oil has currently been produced from the two formations. These data highlight the potential for the future discoveries of oil in the Upper Devonian Birdbear and Duperow formations.