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Reservoir Facies Impact on Drilling, Completion and Production in the Cardium Tight Oil Play

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Introduction

Development of the Cardium tight oil play through horizontal drilling and multistage fracturing since 2008 has established an important unconventional resource. With approximately 3,900 Cardium horizontal wells with multistage fracs drilled to--date, industry continues to push towards the depositional limits of the Cardium play fairway, where understanding the reservoir is key. The two main Cardium reservoir facies, thickly bedded sandstones and bioturbated sandstones, are described and their reservoir characteristics discussed.

Theory, Method with Examples

This presentation discusses the impact of the reservoir facies on drilling, completion and production from three distinct areas of the play, West Pembina, Garrington and Lochend. Regionally, the study area is spread over 250 kilometers from northwest to southeast within the Cardium play fairway. Beginning in the northwest at West Pembina, the Cardium reservoir is characterized by thickly bedded sandstones in a halo around the conventional Pembina Cardium oil field. Further south at Garrington, the Cardium reservoir is characterized by bioturbated sandstones with reservoir permeability too low to be economically developed by vertical wells. The most southern area is Lochend and there the Cardium play is characterized by thickly bedded sandstones overlying bioturbated sandstones with reservoir previously too thin for economic development by vertical wells.

The two main reservoir facies, thick bedded and bioturbated, are explained in terms of depositional setting, PhiH, permeability, bulk volume shale, and residual water saturations.

Drilling considerations such as well bore placement, steering (sliding percentage), number of bit runs, and time drilling the lateral section are compared in the three areas. Completion design can be optimized through understanding the influence of reservoir facies on completion break-down pressure, scour requirements, pumping rates and proppant size and concentration. Optimal completion design lessens occurrences of missed stages and screen outs.

Conclusions

More efficient drilling and completion operations tailored to each reservoir facies and area leads to reduce costs and improve well performance and economics.

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