



Comparison of horizontal wells performance in different exploiting degree area in East Pembina, Alberta, Canada

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Summary

Pembina Field, which is one of the Canada's largest oil fields, has received plenty of attention since its discovery in 1953 (Nielsen, 1984). The original oil-in-place (OOIP) was estimated to be 1.68 E9m³, which accounts for one fifth of the volume among Alberta, Saskatchewan and northeast British Columbia (ERCB, 1981). The field has approximately 4,000 km² area containing over one thousand pools and twelve thousands wells (Krause, 1982), where Cardium pool is the principal reservoir which has cumulatively produced 213 E⁶m³ oil and 40 E⁹m³ gas as of April 2015 (Geoscout).

After over 60 years of development, the oil production rate of most wells, except for some recently drilled wells, has declined to very low level, while the current oil recovery factor has been still as low as 14.94% OOIP. The current oil recovery factor of the east part is even lower. Horizontal drilling plays a unique role since the breakthrough of multi-stage fracturing, the oil production rises to a new level. Then a question is followed: where is the best place to drill? Based on the production data of 487 horizontal wells and 1140 vertical wells in East Pembina, we divided the study area into four different parts which are Inside Waterflood area, Besides Waterflood area, Inside Non-waterflood area and Outside Non-waterflood area. By comparing the performance of different areas' wells, the outside non-waterflood area is the winner.

For horizontal wells, the overall average ultimate oil recovery per well is 6.4 E³m³. Because they were all drilled after 2008 when reservoir pressure has significantly dropped and part of the recoverable reserves has been produced inside the existing vertical wells area, the new drills outside non-waterflood area contribute the best probability of above-average ultimate oil recovery per well. Inside and besides waterflood area, because the water saturation has been increased due to waterflood, only 25% new drills' well ultimate oil recoveries are above the average. Inside non-waterflood area, because the oil recovery has been as low as only 4.3% but there is no water injection to maintain reservoir pressure, the average well ultimate oil recovery is relatively low. Therefore, the proposed new drilling area had better focus on the Outside Non-waterflood region.

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