

## IR29

### **Optimization Water Flood, Water Management and Plan for EOR Stage using Rantau Structure in North Sumatera Indonesia as an Example**

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#### **Main objectives**

Rantau was Mature fields that had been produced since 1929 and have potential 580.25 MMbbl remaining oil in place. Primary peak oil production 31,711 bopd in 1969, and then production decline until 2550 bopd in 1984, because reservoir pressure decline rapidly. in 1984 secondary recovery began and get secondary peak 5,500 bopd in 1988 in several layers n blocks. To increase or optimization oil production from potential layers or blocks, that some of them was not impact by secondary recovery in 1984. EOR division Pertamina EP planned for pilot water flood on 3 potential layers (600, 400, 770 & 800), upgrading injection & production facility (water for injection comes from water produce and treated before inject into the reservoir) and EOR stage on layers and blocks that in 1984 already impact by water injection. from kick off pilot waterflood in January 2010 successfully increase oil production from 400-500 bopd from 2 producer with previous condition 20 bopd.

#### **New aspects covered**

Successfully pilot waterfood (increasing oil production & reservoir pressure), water management (problem of water production), plan for EOR implementations with chemical flood

#### **Summary**

Rantau structure is located in north Sumatra basin of Indonesia, with the main hydrocarbon producing layer from Keutapang, has 33 productive layer and divided into 11 compartment (A1, A2, B, C1, C2, D1, D2, D3, D4, E1 dan E2) and has 580.25 MMbbl remaining oil in place. Rantau structure start produced in 1929, total number of wells already drilled 558. Peak primary oil production occurred in 1969 with 31,711 bopd. The oil was produced from primary stage to secondary stage on several layers and blocks. The secondary stage has been started with injecting water since 1984 with peripheral pattern and successful increasing oil production from secondary recovery until 5,500 bopd in 1988 from the previous condition 2,550 bopd in 1984 with source of water injection from sea water that has water salinity 26000-33000 ppm, this poor water injection quality directly impact problems for injection wells (plugging) and declining oil production until 2300 bopd in 1997. To increase or optimization oil production from potential layers or blocks, that some of them was not impact by secondary recovery in 1984. Water production is the main issue that can impact directly to oil production, manage water production and get more additional production from potential layer that some of them was not impact by secondary recovery from 1984. EOR division Pertamina EP planned for pilot water flood on 3 potential layers (600, 400, 770 & 800), upgrading injection & production facility (water for injection comes from water produce and treated before inject into the reservoir) and EOR stage on layers and blocks that in 1984 already impact by water injection. Kick off pilot water flood had been done in January 2010 with irregular 5-spot pattern in layer 600 and successful increase reservoir pressure and oil production until 400-500 bopd (after 3-4 months injected) from 2 producer wells form the previous condition 20 bopd. From the prediction with reservoir simulation additional reserve form full-scale water flood in 3 potential layers (600, 400, 770 & 800) can get maximum 11.65 MMbbl and additional reserve from chemical flood 6.83 MMbbl (layer 600), but for the long term EOR division Pertamina EP will be screening and restudy all production layer, because remaining oil in place still potential to optimize with secondary and EOR stage.