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Implementation Strategy of Horizontal Short Radius Drilling in Turbidite Deposits of Pertamina Pangkalansusu Oilfield North Sumatra - Indonesia

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ABSTRACT

Turbidite reservoirs in the Pangkalansusu marginal oil field have become the most prospected area to be developed using horizontal drilling. These deposits are a part of several anticlinoria that cross the Pangkalansusu oil field and are named the Besitang River Sands Member. The Besitang River Sands (BRS) layers belong to the middle Miocene Baong Formation and form a complex sedimentary structure. This deposit is a potential oil and gas reservoir which has a maximum total thickness of 80 meter. There are currently three closures of these deposits which have 80 km^2 total distribution. The problems that influence production performance from 46 wells are mainly mechanical problems, reservoir characteristics including facies changing, low porosity, and low permeability.

The average current recovery factor of oil fields in Pertamina Pangkalansusu structures is still 11%, and total cumulative production from all structures by vertical drilling have merely recovered 7,838 MStb; on the other hand, the remaining oil in this field is still 60,876 MStb. Conventional work-over, stimulation and fracturing in several oil wells of such closures did not provide significant results. Most of those jobs just add 20% additional oil from previous production rate for each individual work.

Implementation of short/intermediate horizontal drilling in Pangkalansusu has revitalized this field and created additional recoverable reserves in this abandoned/marginal field. Until October 2001, three 6“ re-entry horizontal wells out of 7“ liner have been drilled with a successful result. The average production from these wells are 4 MMSCFD of gas and 60-70 bopd (oil and condensate) compared to the previous vertical wells drilled in this area we have an improvement of at least 8 (eight) fold.

Selection of this strategy with build up rate above 30^0/100 feet is based on cost, drilling time and to avoid drilling through troublesome formation such as reactive/swelling shale,

as this technique provides a shorter curve section (KOP to landing point). At the same time, re-entry drilling has been selected rather than drilling new wells to optimize use of the existing well bores; cost can be reduced and reduce the risk as we are drilling through known reservoirs. The choice of motor can have a significant bearing on the success of drilling operations. A non-articulated motor (4 ¾“ Titanium motor) is used on this project due to the capability to rotate in the tight curve, which improves drilling efficiency, increased lateral length, ROP and improved hole cleaning. All these wells were completed using slotted liner and drilled using water-based mud. Various problems were encountered mainly due to well-bore stability during drilling and production. Improvement needs to be made in the following areas: drilling fluid, completion by incorporating packer for zonal isolation in the curve section, milling, section mill improvement.

The above improvements will be invaluable to the success of drilling, completion and future productivity, as Pertamina Pangkalansusu is planning to drill six more horizontal wells using short/intermediate techniques from now until the end of 2002.

CONCLUSION

Application of this technology in Pangkalansusu is an excellent example of the successful strategy to drill hard to reach and thin turbidite reservoirs
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Short/intermediate radius horizontal drilling may improve production several times in an oil and gas reservoir which is shaley, has permeability barriers or condensate blocking. Application of horizontal drilling in marginal fields require special care and planning due to drilling and completion concerns associated with the use of this technology.