[PS]Use of Horizontal Wells in the Development of the Chachahuén Sur Field, Neuquén Basin, Argentina*

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Abstract

The Chachahuén Sur field is located on the eastern margin of the Neuquén basin. The productive unit is the Rayoso Formation, a succession of early Cretaceous fluvial cycles. These cycles are truncated by the Intersenonian unconformity, which lies between the reservoirs of the Rayoso Formation and the shaly base of the Neuquén Group and works as a regional seal. The field is compartmentalized into five blocks (I to V), limited by faults with very low to no vertical through. Oil in the Rayoso Fm lies typically between the unconformity and the oil-water contact. Block IV is the only block displaying a gas cap. It also presents the largest dip, which significantly reduces the oil halo. To keep de gas cap pressure and to produce the oil reservoir efficiently, a development with horizontal wells and a peripheral water injection was the best scenario chosen for development. In this contribution we present the methodology and lessons learnt during this experience. A static model was developed at first to identify the best zone to be navigated by the horizontal wells. The target in Block IV is the thickest sandy cycle of up to eight meters in thickness and the largest areal extent. This cycle presents the best petrophysical properties in the three basal meters, which made it the target for navigation. Well architecture was designed to satisfy the reservoir, production and drilling requirements to optimize production and costs reduction. Before the drilling campaign started, a geosteering model was prepared for each proposed well using resistivity as the input property. Wells were correlated on real time using LWD tools to position the well path in the best level of the reservoir and to avoid unwanted shaly layers. Given the results of this project, new opportunities for other cycles were visualized. Horizontal drilling in the Rayoso Fm, using resistivity geosteering models, resulted in a good development strategy to optimize production and cost reduction in oil fields located on the eastern margin of the Neuquén basin.

Use of horizontal wells in the development of the Chachahuén Sur field, Neuquén basin, Argentina

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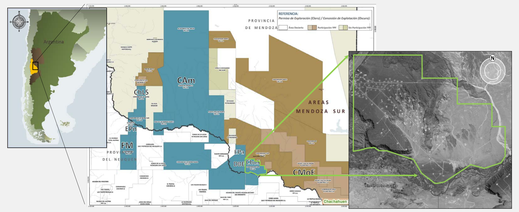
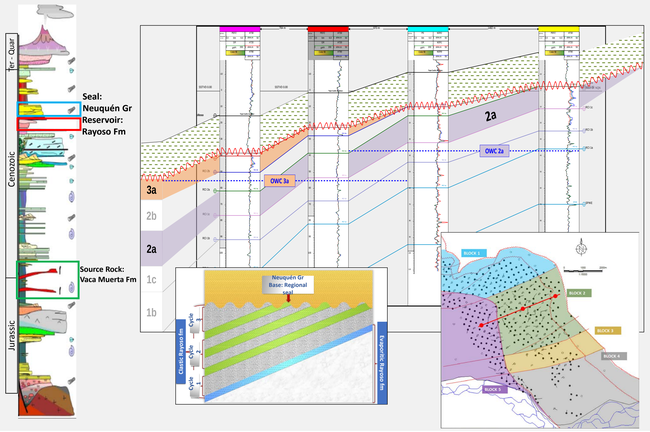
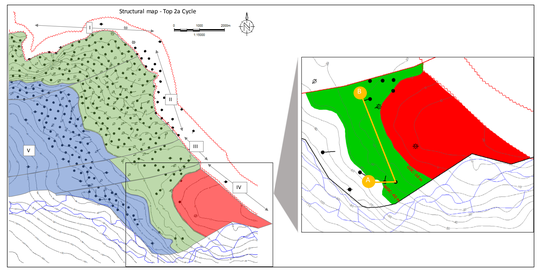
Location and geological settings



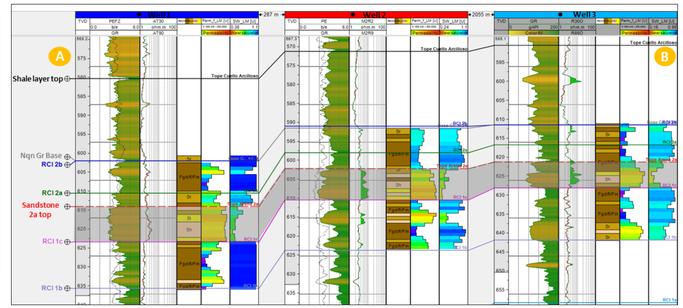
The Chachahuén Sur field is located on the eastern margin of the Neuquén basin. The productive unit is the Rayoso Formation, a succession of early Cretaceous fluvial cycles. These cycles are truncated by the Intersenonian unconformity, which lies between the reservoirs of the Rayoso Formation and the shaly base of the Neuquén Group and works as a regional seal The main production cycles correspond to cycles 2a, 3a and 1c, being the best properties and the largest areal development, the sandstone of cycle 2a



Objectives

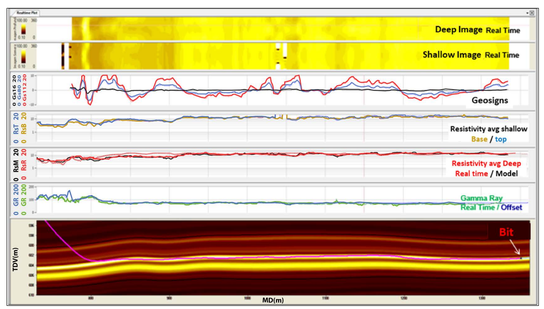


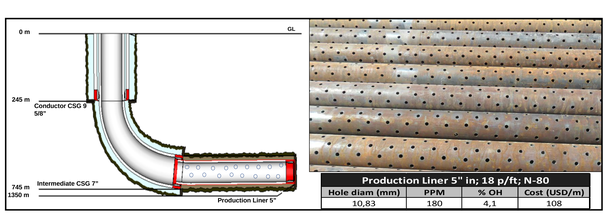
The field is compartimentalized into 5 blocks (I to V), limited by faults with very low to no vertical through. Oil in the Rayoso Fm lies typically between the unconformity and the oil-water contact. Block IV is the only block displaying a gas cap. It also presents the largest dip, which reduces significantly the oil halo. To keep de gas cap pressure and to produce the oil reservoir efficiently, a development with horizontal wells and a peripheral water injection was the best scenario chosen for development.



A static model was developed at first to identify the best zone to be navigated by the horizontal wells. The target in Block IV is the thickest sandy cycle of up to eight meters in thickness and the largest areal extent (cycle 2a). This cycle presents the best petrophysical properties in the three basal meters, which made it the target for navigation

Development and results

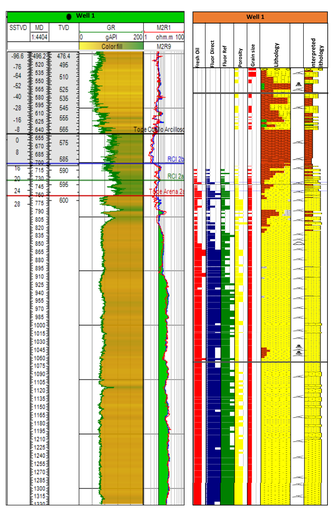


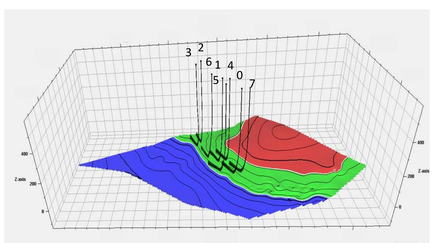


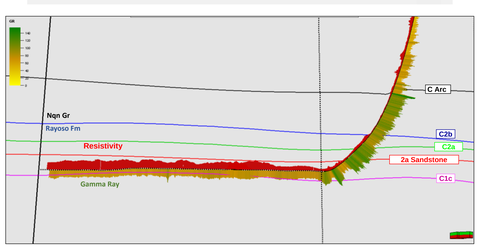
Production Liner 5" in; 18 p/ft; N-80			
Hole diam (mm)	PPM	% OH	Cost (USD/m)
10,83	180	4,1	108

Well architecture was designed to satisfy the reservoir, production and drilling requirements in order to optimize production and costs reduction.
Before the drilling campaign started, a geosteering model was prepared for each proposed well using resistivity as the input property.

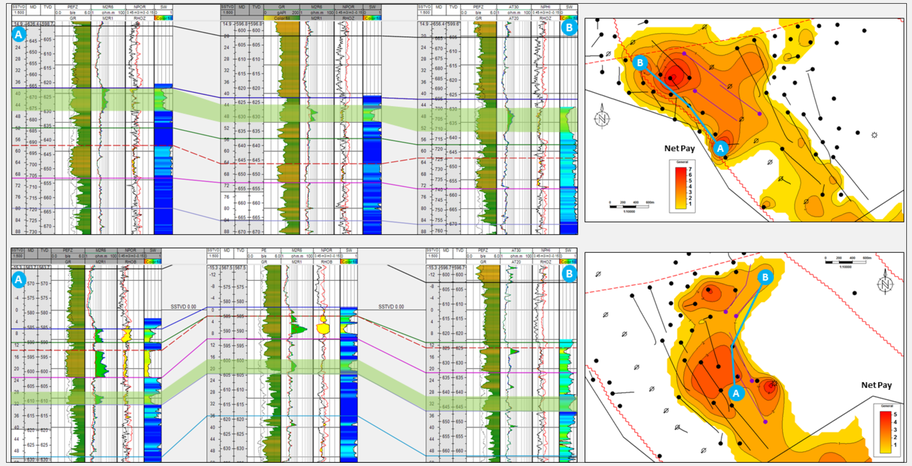
Eight horizontal wells were drilled and navigated the cycle 2a sandstone. Wells path were designed parallel to the structure strike, with an average horizontal branch length of 500 m. Wells were correlated on real time using LWD tools (Azimuthal Resistivity and Gamma Ray) to position the well path in the best level of the reservoir and to avoid unwanted shaly layers. The use of mud logging was very important too.







New Targets



Given the results of the project, new opportunities for cycle 2b and 1c were visualized.
it worth to highlight that both cycle have a higher geological risk due to the petrophysical properties and to the thickness decrease. The project add 5 horizontal wells with target cycle 1c and 4 wells with target cycle 2b.

Conclusions

- Use of horizontal wells resulted a good development strategy because of the reservoir areal extent, the good petrophysical properties of Cycle 2a and the reduced oil halo due to the gas cap.
- The Block IV oil remainder could be drained with eight horizontal wells.
- The geosteering allowed to:
  - Optimize the landing point in the 8 ½ "section.
  - Position the well path in the best level of the reservoir and make corrections in real time.
  - Maximize the reservoir exposure at the best petrophysical levels.
  - Underground better knowledge .
- Add new horizontal wells for the development of cycles 2b and 1c within block IV

Acknowledgments

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Production team of Chachahuen field
Geosteering Halliburton team
Orion Excel SA

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