

Case Study - 5

Quad AICV® installation provides superior water control and increased oil production

A remote heavy-oil field located in South America has been developed with horizontal wells (17-19 °API and 25 cP). An infinite-acting bottom aquifer provides good pressure support, but pushes the produced water cut over 90% within months of start-up. Production in the field is limited by water handling capacities, resulting in slow oil recovery and high water disposal costs.

Challenges and Objectives

Due to the presence of a strong bottom aquifer, several horizontal completions strategies (1,000-2,500 ft lateral sections) have been trialed by the operator, including: slotted liners, inflow control devices (ICD) and autonomous ICD completions. Even the ICD/AICD completions resulted in very high volumes of water production, as these devices cannot completely shut-off and provide effective water control in the sections of the well with water breakthrough.

Solutions

Due to the nature of this reservoir, the AICV® is the only technology that could provide effective and autonomous water control to allow for better oil drainage from the reservoir while limiting water production. Detailed simulation studies provided a preliminary design for a new well with AICV® mounted on wire-wrap screens. Four AICV® valves per screen joint maximized flowrates to match the Operator's oil rate expectations. The well was completed with 23 Quad AICV® joints in 12 swell packer compartments.

Results

The well began production with 4% water cut (compared to >50% with other ICD/AICD technologies) and approximately double the initial oil rate compared to initial modelling. After several weeks, the well experienced an increase in water cut due to an increase in pump frequency. Therefore, it was decided to reduce the pump frequency to avoid higher drawdowns. The well eventually reached 78-80% water cut and stabilized at a steady production rate while the bottom hole flowing pressure was dropping gradually, meaning that the AICV® devices were autonomously choking the water zones while allowing production from oil zones. Such ability cannot be provided by other ICD/AICD completions. After a year of production, the water cut is stable at 86%, showing 3 to 5 times less water and 3 to 4 times more oil compared to AICD and OH completions respectively. The performance of the AICV® technology has exceeded all expectations reducing the production decline rate and demonstrating an unparallel water control. The operator also expects an increase in the oil recovery factor due to the observed well behavior.

LOCATION

South America

NUMBER OF WELLS

1

OPERATOR

Mid-size International E&P

DEPLOYMENT

Onshore

RESERVOIR

Consolidated sandstone with faults

COMPLETION

4-1/2" AICV® with shrouded wire wrap screens and swell packers

Results



86%

Stable water cut



3-4x

Increased oil production compared to AICD/OH completions



Optimized water handling facilities utilization

