What’s hiding behind your pipe?

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(EXTENDED ABSTRACT)

Summary

The primary focus in a mature field is to arrest water cut and increase production. In the present gloomy oil price scenario it is a challenge to do so in a cost effective manner. Cairn India along with its partners faced a similar issue in Ravva field, KG Basin. This paper showcases a rig less methodology adapted by Cairn in exploiting the remaining potential behind the already drilled wells. The first task was to identify the potential zones followed by a detailed evaluation then ranking the candidates and finally to bring them under production. Three examples are cited two already implemented and third proposed. This paper brings forward a cost effective method to extract the most out of the reservoir using existing facility. In case of Ravva field this added 7% to the existing field oil production.

Introduction

Ravva (PKGM-1) is a mature field located in shallow waters of the KG basin on the east coast of India. The field is operated by Cairn India Limited, under the joint venture with Oil and Natural Gas Corporation (ONGC), Videocon Industries Limited (VIL) and Ravva Oil Singapore (ROS). Production started in early 1993 and till date 277MMbbls of oil have been produced. The field had a plateau production rate of 50,000bopd for 9 years between the years 1998 and 2007 and currently it is producing ~17,000bopd. The field has been producing under water flood for over last two decades. A detail analysis was conducted to identify opportunities in idle wells and wells which were producing with very high water cut. This helped to maximise value from such wells.

Identify Potential Zones for Intervention

The Middle Miocene (MM) sands have been the primary producing interval in Ravva field. The MM sands are deposited in shoreface / deltaic environment with excellent reservoir quality. Above the MM sands some shallow marine Late Miocene (LM) hydrocarbon bearing channel deposits are present. The LM sands are thin and not encountered in all the wells but exhibit good reservoir quality. The primary target for existing wells were the MM sands due to the large volume associated with them. The LM sands were secondary targets and mostly ignored due to comparatively lower volumes and also to simplify the completion string design. These LM sands were completed in a few wells and left behind the casing in others, mainly on the basis of pay thickness and log based properties.
Evaluation and Ranking of Potential Zones

The identified LM sands in the well logs are mapped and attribute analysis was done to de-risk the various candidates. Using Fluid Factor attribute, the extension of these hydrocarbon bearing LM sands were established. Wells penetrating those LM sands and placed in the most optimum location were selected.

Candidates shortlisted after geophysical & petro-physical evaluation were evaluated on well health and well integrity as most of the wells were old or had served as water injectors. Based on the estimated in-place volumes, well health and current well status the shortlisted candidates were prioritised on their probability of success and production impact.

Re-completion technique implemented

In all shortlisted candidate wells, the LM sand was shallower than the set production packer, which means a simple perforation job at the LM sand depth would compromise well integrity because of reservoir fluid and pressure in the annulus of the tubing and primary casing. A rig-less approach to complete these wells was adopted. A coil tubing unit was used to circulate cement into the annulus between tubing and primary casing from the holes punched in the tubing. Post a cement evaluation, wireline perforation was carried out which not only perforated the tubing, but also the casing behind annular cement allowing a flow path for the fluids into the wellbore.

Result and Production Impact

The first candidate to be re-completed in the LM sand showed a good quality cement bond with very low mechanical skin due to perforations. It came into production at 1,800bopd which at the time was a 7% increment in the field oil production. This well alone contributed 0.4MMbbl to Ravva’s production in the year 2015-16. The well was producing sand-free oil at a controlled drawdown due to absence of sand control.

This was the first time such an unconventional methodology to re-complete wells was adopted in Cairn India.

Conclusion

In a low oil price environment, oil companies look for low-cost high-impact ideas which help them produce profitable oil. This paper brings attention to one such idea that helped the Ravva field add value without spending large amount of money in developing small hydrocarbon accumulations, as well as bringing idle wells back into service. In mature fields across the globe, a large number of idle wells are waiting to be abandoned, but do we really know what's hiding behind the pipes?