

PaperID **AU132**

Author **Sanjeev Kumar , ONGC , India**

Co-Authors **Ramesh Chander Pareek, Dinesh Mukati, Anupam Saxena, N S Rao, A
K Chadha, R L Singh**

Integration of Geo steering the well with modified In-Situ Combustion technology for production enhancement in brown field of Mehsana Asset

Recent developments and innovations in Logging While Drilling (LWD) technologies have proven to be indispensable for facilitating precise borehole placement as well as enhancing complex reservoir evaluation. The uses of real-time azimuthal images and directional deep resistivity for Geo-steering and boundary avoidance have direct and obvious impact. Equally important is compact tool design which facilitate close to bit measurement and advanced real time measurement that provides more comprehensive petrophysical analysis.

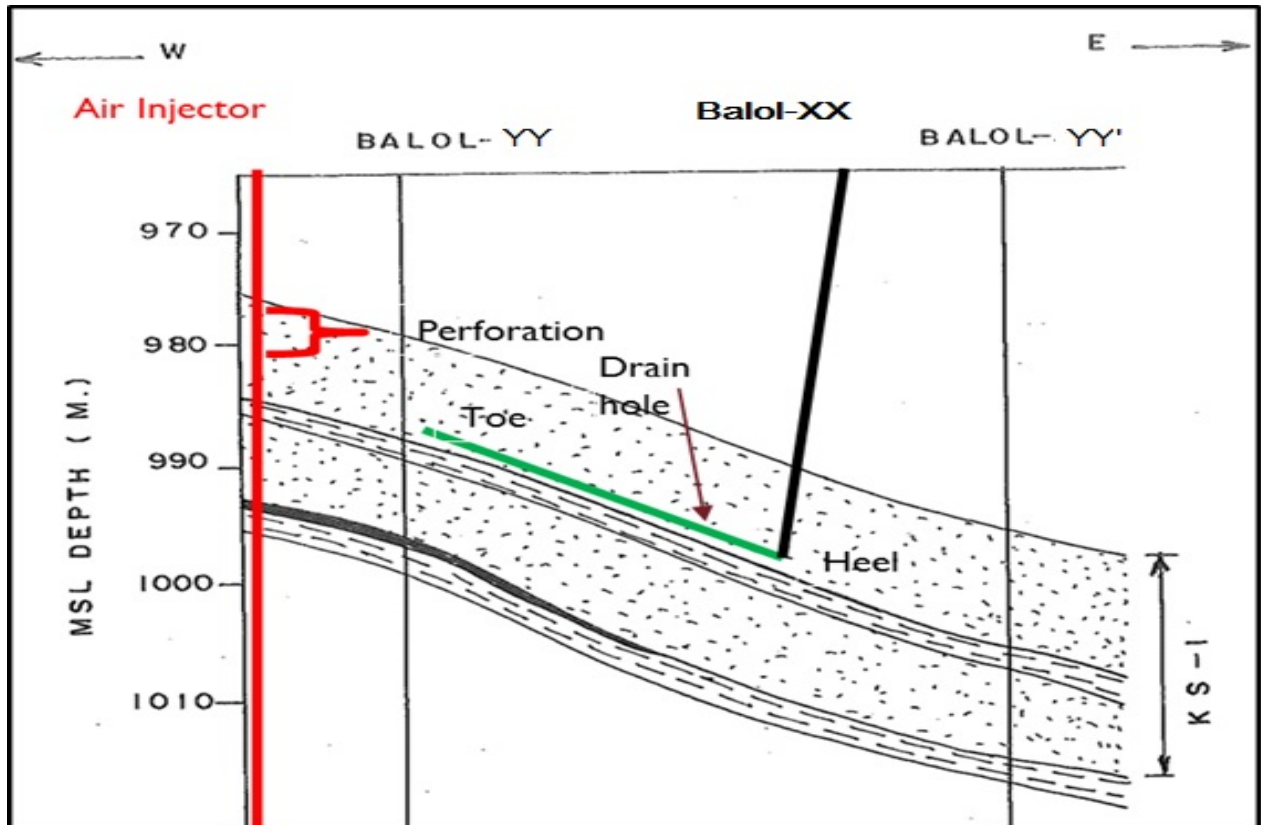
Lanwa, Balol & Santhal is a heavy oil belt in the northern part of cambay basin. The viscosity of these fields are ranging from 60 to 2000 cP. The primary recovery envisaged from these field are in the range of 5 to 17 %. Looking into the poor primary recovery, In-Situ Combustion (ISC) process is implemented in these fields. The performance of the process is very encouraging in the moderate pay thickness & viscosity area (Santhal & Southern Balol) whereas in the high pay thickness area the performance was moderate (Northern Balol & Lanwa).

In these areas to enhance the production & recovery, Toe to Heel Air Injection (THAI), a modified version of in-situ combustion (ISC) process was implemented. It is a short-distance oil displacement process that achieves high recovery efficiency because of its stable operation and ability to produce mobilized oil directly into an active section of the horizontal producer well just ahead of the combustion front. The combination of advanced horizontal well concepts and EOR processes results in a fluid flow mechanism radically different from conventional EOR processes. THAI process implemented in this area is consist of a horizontal producer & two Air Injectors (AI). The injectors are drilled in the up dip part of the structure. The drain hole of the horizontal well is drilled against the dip & toe of the well is placed closed to the injectors.

As, in the process, it is required to drill a horizontal well against the dip & placed at the bottom, it is very challenging for the drilling due to possibility of change in dip while moving against the dip which may lead to enter into bottom. To place the well as per design & prediction for the structural uncertainty, detailed geological correlations & maps were prepared for the different markers & formation based upon the nearby well data. A predrill geological model is also prepared for the planned trajectory. The drain hole section is Geo-Steered with state of art bed boundary mapping tool with resistivity inversion modelling, leads to the successful operational execution of the extremely challenging drain hole section.

Case-1 is a successful completion of Horizontal producer well Balol-XX under THAI scheme. Well Balol-YY was already existing AI well & Balol-ZZ was drilled as another AI well. Well Balol-XX was having drain hole length of 215 m and maximum angle of 94.8 degree. The inclination is build up to align trajectory with the formation dip appropriately. The horizontal production well Balol-XX was put on production with simultaneous air injection in two air injectors. The well initially produced 48 m³/d of oil with 10% of water cut. Case-II & III are the example of success story of same technology in the Balol field.

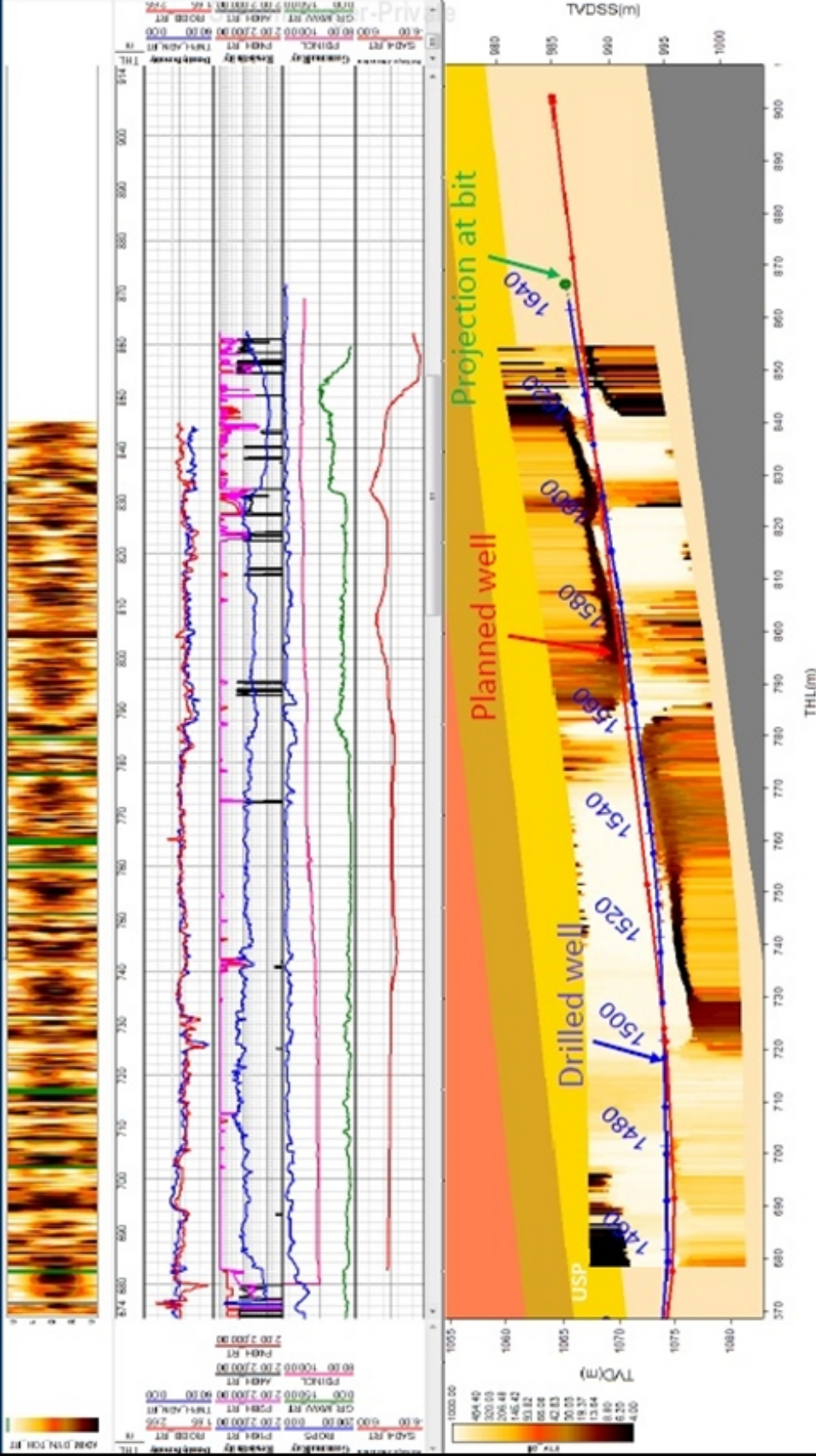
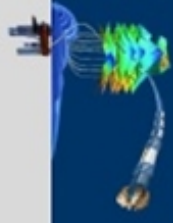
The placement of these well as per the requirement of the process was only possible due to the integration of the latest Geo-Steering technologies. Due to accomplishment of the designed parameters in placement, the process is implemented efficaciously & further extended into the suitable blocks.



Schematic diagram of THAI in Balol-XX

Balol-XX- ST1 6" Drainhole Section

Curtain section @ 1645m MD



Real time monitoring of Drain hole for trajectory manoeuvring for Balol-XX