

Implementing New Well Placement Technique in Deepwaters Channel-Levee Complexes

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In Niger Delta tertiary sedimentary basin, maximizing production by optimizing well placement is one of the key significant challenges in channel-levee complexes of deepwater geological setting. This challenge becomes eminent where reservoirs are thin with lateral facies variations and highly laminated and intercalated sand and shale sequence as observed in Oyo field.

The Oyo field is located in western offshore Nigeria with approximate water depth of four hundred meters, signifying that it falls within the continental slope region of deep marine setting according to the bio-facies profile. The complex lamination and compartmentalization of the field requires detailed study of the subsurface structure and stratigraphy as well as enhanced drilling campaign. However, the geo-steering technique was chosen in order to expose the well to a larger drainage surface area and therefore improving the well's productivity.

A 3D integrated Petrel model and Real Time Geosteering Software was generated based on seismic interpretation, well logs and correlation, dip analysis and reservoir thickness as well as seismic attribute using the modeling processes to understand the reservoir geometry and the internal architecture of the reservoir to minimize or eliminate drilling surprises. The value of using distance-of-boundaries measurement concept combined with Density Imaging tool transmitted in real-time contributed to determining the change in dip and reservoir features during the drilling of the lateral section. The main benefit of combining these two measurement concepts is the ability to determine uncertainty of formation dip inside the hydrocarbon bed thereby making it possible to drill the well through the narrow sand thickness.

The challenge in the drilling of this well therefore is keeping the lateral section while drilling in the sand zone and getting out of the shale within a short horizontal channel length by using very smooth Zigzag type of the lateral hole. The combination of the vertical positioning from distance measurement concept and the density images made it possible to drill the well through the narrow sand thickness and gave the help for the geo-steering team to take decisions that contributed to keep the well longer in sand bodies. These helped the Asset team take make fast enabled to keeping the well longer in sand area and less in the shale hence increase in Net to Gross ratio along the horizontal leg.