The Deployment of an Azimuthal Resistivity Tool for Geosteering - A Case Study from the Foinaven Field (North Sea)

Bedrock, Martin [1]; Moody, Darren [1] (1) BP Exploration, Dyce, Aberdeen, United Kingdom.

The use of an Azimuthal Resistivity tool has been evaluated on BP's Foinaven Field with the expectation that its ability to look deeper into the rock formation would provide key information on bedding dip and fluid/structural boundaries to greatly improve geosteering capability. The key drivers were to maximise net sand and reduce the likelihood of unplanned sidetracks. This presentation explains the results of Baker Hughes AziTrak tool in three wells and how this has influenced the future deployment of the tool.

The turbidite sands of the Foinaven Field are generally drilled at low angle to bedding. Wells have been previously geosteered using azimuthal gamma and density. However, with limited depth of investigation there is the possibility of exiting sand before the need for a geosteering decision is realised. The azimuthal resistivity tool, in contrast, has a greater depth of investigation which potentially gives much better predictions of fluids and lithology above and/or below the well bore.

The Azimuthal Resistivity tool was initially evaluated in Foinaven P111 well. The Azimuthal Gamma and Density were run and used for geosteering in real-time with the Azimuthal Resistivity run in memory mode to permit later assessment as a future logging option. The results showed that the Azimuthal Resistivity tool could have been used to inform better geosteering decisions, potentially saving time and cost of additional sidetracks.

The Azimuthal Resistivity tool was subsequently run in P16Z, real-time, and resulted in (i) avoiding the premature exit of a thin sand body by identifying an underlying conductive shale bed, (ii) recognising a key channel transitions and (iii) confirming the presence of a water-wet sand below the bore thereby initiating an earlier than usual decision to steer up.

Finally, the Azimuthal Resistivity tool was run in well P43. The trajectory was planned to cross a series of turbidite channels with limited scope for geosteering. The high resolution of the Azimuthal Resistivity tool did, however, provide information on the dip and thin-bedded nature of the channel sands and influenced the decision to turn the well trajectory downwards at the toe of the well to pick up additional net sand.

Based on the above experience it is concluded that Azimuthal Resistivity data can usefully influence trajectory decisions where there is flexibility to geosteer. Where trajectories are more geometric then Azimuthal Resistivity is less useful.