

## **Geosteering using Azimuthal Resistivity Imaging Tool in Carbonates Reservoirs**

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### **ABSTRACT**

Saudi Aramco has launched an ambitious program to tap into unconventional gas resources in the Kingdom, initially earmarking three areas with the goal towards meeting fast rising gas demand. The key components for an unconventional gas project are horizontal drilling coupled with geosteering and multistage fracturing. These technologies are important in the exploration and appraisal phases. This justified the deployment of the formation imaging technologies to optimize wellbore placement and to better steer the wells within the desired targets. An advanced logging while drilling technology has been introduced, combining laterolog resistivity measurements and high resolution resistivity imaging housings in one collar that enables azimuthal resistivity measurements. The imaging tool has the capability to provide high image resolution to enable detailed geological analysis, with a depth of investigation of a few inches. Two resistivity measurements can be made: focused lateral resistivity and unfocused trend resistivity at the bit which is monitored real time for geosteering applications. Deep resistivity and omni-directional measurements close to the bit allow early bed boundary detection for landing in the desired zone of interest. For formation evaluation of the lateral section, the azimuthal resistivity image sub was combined with the natural spectral gamma-ray, formation density, neutron porosity and acoustic while drilling logging tools.

This paper presents study results that demonstrate the use of the high resolution resistivity image and deep resistivity measurements in geosteering applications, to reduce uncertainty and to make decisions in real time in order to maximize exposure to the target. In addition, a comparison between wireline and LWD electrical image and conventional logs from vertical and highly deviated boreholes are discussed. Finally, recommendations are provided on job planning, effective utilization and benefits of the high definition resistivity tools in wellbore placement, wellbore integrity and geological models and fracturing efficiency to improve reservoir navigation.