

## **High Resolution Sedimentological Interpretation of the Lower Paleozoic Clastic Reservoirs in Ghadames Basin, Libya**

**Seraj Bosnina<sup>1</sup>, Ali Najem<sup>2</sup>, and Adel Marimi<sup>3</sup>**

<sup>1</sup>Senior Geologist, Schlumberger, Libya

<sup>2</sup>Senior Exploration Geologist, Schlumberger, Kuwait

<sup>3</sup>Senior Geologist & Exploration Manager, AGOCO, Libya

### **ABSTRACT**

During the last decade, exploration activities in Ghadames basin have been intensified by the national oil corporation (NOC), national and international companies. Arabian Gulf Oil Company (AGOCO) was the leader in most of the discovered fields in the basin by drilling numerous wildcat wells targeting siliciclastic Paleozoic reservoirs, mainly of Silurian age. The Silurian rock units are known to contribute for both source rock (Tanezzuft) and hydrocarbon reservoir (Acacus) successions in the area. Acacus Formation is subdivided informally into three main units known as lower, middle and upper, with the lower unit containing the main reservoir potential. These units have been mapped using the basic well log data, nevertheless their sedimentological criteria remained untapped due to operational issues such as cutting cores. It has been observed from the appraisal wells that there is a high uncertainty of the reservoir lateral continuity even within a few kilometers distance. Therefore, there was a demand to understand the stratigraphic depositional architecture and its lateral continuity and distribution of the sandstone reservoir units in the area. By using the basic well log data alone, it was a challenge for the geoscientists to identify the main lateral variations especially in cases where the core is not available. Accordingly, AGOCO has started a new acquisition plan to come up with high resolution sedimentological understanding of the main reservoir in the area. The exploration team decided to acquire both two main wireline tools; those are; borehole images (FMI) which gives a resolution down to 5 mm as well as element capture spectroscopy (ECS) which gives quantitative results of the elements for optimum geological interpretation in a detailed scale. The advantage is having more than 900 ft of core-like description data of the Lower Acacus units as well as a quantitative elements computation. This has in return resulted a high resolution of sedimentological and stratigraphic interpretation throughout the Lower Acacus clastic reservoir in Ghadames basin. Imaging the wellbore and measuring the dip of the features have retained vast knowledge for AGOCO about the vertical succession of the main reservoir and understanding the reservoir geometries. In this poster, a case study from one of AGOCO wells has illustrated the value of the comprehensive wellbore integration and interpretation. As a result and based on the detailed interpretation; it was concluded that the Lower Acacus unit was deposited under the conditions of tidal flat/channels (fining up cycles) over the bottom parts, overlaid by tide-dominated deltas (coarsening up cycles). Once more, repetition of cycles has been clearly observed. The contact between the Lower and Middle Acacus Members looks like a gradational conformable contact.