

## A New Approach of Utilizing Real Time Resistivity Image Measurements in North Kuwait Carbonate Formation Evaluation for Completion Optimization: Case Study

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### Abstract

Mauddud formation in Sabriyah field of North Kuwait is a heterogeneous carbonate reservoir produced since 1950s. The Mauddud reservoir has been divided into ten sub units based on the rock properties. Its thickness reaches about 400ft dominated by carbonates deposition in a ramp environment. Due to the lack of aquifer support, after years of oil production there has been severe reservoir pressure decline in Mauddud formation which affected the field productivity and the plan of field development. Highly deviated wells and horizontal wells were drilled by Kuwait Oil Company targeting the upper section of Mauddud reservoir to sustain oil production in this field since 2012. Simultaneously water injection was start to support reservoir pressure and increase sweep efficiency.

As expected, an increase water cut happened in some areas of this field, which became another challenge for water management. To address these issues, Kuwait Oil Company has initiated installing in-flow devices (ICD) in horizontal wells to control the water production in Mauddud reservoir and optimize the oil rate. One of the key factors for this operation is to place ICD at the most permeable zones where the dominated production is coming from. As complex as other carbonate reservoirs, it is very difficult to define the permeability in Mauddud reservoir because of the presence of vugs, cracks and fractures (secondary porosity). The connected vugs or factures could improve the permeability of reservoir rock significantly and become dominated factors for production. Evaluation for such performance is hard with wireline logs and triple combo LWD data. Petrophysicists often define the secondary porosity from the difference between sonic porosity and neutron-density porosity. In the Sabriyah field of north Kuwait, real time resistivity image measurement from LWD in the horizontal wells has been deployed to help qualitatively picking the sweet permeable zones for optimization of ICD completion.

In this case study, SineWave Micro Imager data was utilized for ICD completion in a horizontal Mauddud single producer. Vuggy zones and composite conductive fractures are identified from the real time data analysis. Since possible faults were picked up as well, operation team were able to set an integrated completion plan accordingly.

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## References

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