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Utilizing Temperature and Noise Logging Surveillance Application to Assess Vertical Conformance Issues for Low Injection Rate Waterflood Pilots in Bahrain's Field

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ABSTRACT

Bahrain's mature fields with more than 65 years of production history and over 1000 wells that is presented in this abstract is one of the world's geologically challenging onshore oil fields. The geological complex in terms of faults and fractures has major complications for existing and planned water flood (WF) or Gas injection (GI) pilots. Majority of Bahrain fields are currently being piloted for waterflood as secondary enhancement method. Hence, it is crucial that a proper surveillance program is put in place to health check WF pilot's performance before committing to any full field waterflood expansion. A success factor for any waterflood operation is the ability to understand the ariel and vertical sweep and as oil fields mature, a surveillance operation becomes crucial for proper reservoir management to enhance oil recovery. Major challenges for Bahrain fields is the ability to assess the vertical conformance issues and understand the short circuiting of injected water toward the offset oil producer wells. The low injection rate limits the surveillance technology like conventional injection/production logging tool to assess vertical conformance issues. Therefore, a key surveillance technology applicable for injectors injecting at very low rate is the application of high precision temperature combined with high precision noise logging. The high precision noise logging can qualitatively provide reservoir units contribution behind the casing for low rate wells. The high precision temperature logging has many advantages over conventional temperature logging:

- Logging radius of investigation could be deep as 3–4 m.
- The key element of the high-precision temperature logging tool is a high-sensitivity fast-response temperature sensor with a response time of less 1 s at a resolution of 0.003o C.
- Multiple reservoir barriers scanning which allows monitoring fluid flow behind casing during both production/injection.
- Ability to evaluate type of flow behind the casing using the high precision spectral noise tool (conductive fractures and matrix flow based on noise frequency and channel aperture data).
- The technology can be run for very low rate injection/prod at 30 bpd.

The abstract will cover the following key points:

- Selection criteria of the noise and temperature logging campaign for the Bahrain's WF pilots
- Operational planning and scheduling of the temperature and noise logging Campaign
- Share the results of the temperature and noise logging campaign