Integration of Fiber Optics Distributed Acoustic and Temperature Sensing with Reservoir Petrophysical Properties

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Abstract

Fiber optic technology has made significant advancements in the area of inflow profiling, fracture monitoring and artificial lift. It has high potential to reduce costs, and risks associated with health safety and environment exposure that may be encountered when performing in well surveillance activities.
In this project, fiber optic sensing data is used to develop a real time view of wellbore conformance change overtime. This is achieved through the generation of pseudo PLT (Production Logging) profiles used to calibrate the static and dynamic model. The pseudo PLT generated from Distributed Acoustic Sensing (DAS) identifies the injection zones without the need for well intervention. This allows better understanding of the reservoir behavior, identifies zones which need stimulation, and ultimately better forecasting of recovery. Integrating Distributed Temperature Sensing (DTS) and Distributed Acoustic Sensing (DAS) data with the conventional well’s petrophysical log data allows for enhanced understanding of injection profiles and assists in determining the main factors contributing to the inflow profiles (reservoir quality, reservoir heterogeneity and completion types). The pseudo PLT inflow profiles where further verified against conventional inflow surveillance tools like Production Logging Tool (PLT) and Spectral Noise Logging (SNL). These logs are compared to the pseudo inflow profiles generated from DAS and DTS as a way to verify the fiber optic models and further calibrate the inflow profiles.
This thesis recommended that all new wells should be completed with optical fibers to allow for continuous inflow profile throughout the well-life. This will also enhance the quality of data being collected and reduce time and cost of well interventions when compared to conventional interventions.