1218468 Smart Field and Life of Field Monitoring: Integrated Microseismic Based Solutions

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Monitoring reservoir behavior over the Life of the Field provides operators with the opportunity to adjust injection and production schedules to optimize and maximize reservoir performance. In this context, many reservoirs include SCADA based systems that monitor multicomponent pressure, temperature, and flow at or near reservoir depth. These systems provide point measurements throughout the field that can be used to interpret dynamic reservoir behavior. However, these systems are limited by sampling and data transfer rates, and therefore do not provide the ability to record any additional data intensive measurements.

In recent years, there has been increasing interest into recording microseismic data as it provides additional information on the characteristics of reservoir behavior away from measuring points themselves. Microseismic arrays are used to map reservoir based activity such as, steam chamber development, containment of injectant within the reservoir, identification of the fluid flow front, cap rock integrity, buffer zone breachment, and activation of pre-existing faults. Continuous sampling rates range from 1 kHz for near surface sensor installations to 4 kHz for near reservoir depth well deployments, and deployments consisting of multiple arrays can be over regions extending from 100′s m2 to 100′s km2. As a result data rates can be on the order of GBytes each hour and typical SCADA systems have not been designed or implemented to allow for the recording of such data.

In this presentation, using current installations in the Middle East as examples, we focus on the technical instrumentation aspects of Life of Field monitoring from design, to configuration, instrumentation, data storage, communications, and analysis requirements to allow for the inclusion of microseismic data along with traditional field measurements. Along with data acquisition, we show how these systems may potentially be used to assess field operations in near real-time, how the data can be incorporated into operations in the field, and how different configurations can be established to allow for both near real time response advanced integrated analyses using full event data sets and signals. Additionally, we identify new developments in data acquisition to increase robustness under harsh field conditions and allow for the extension of monitoring encompassing larger field monitoring programs.

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