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Slickline Deployed Fibre Optic Cable Provides First Ever Production Profile For High Temperature Gas Well

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Abstract

Distributed Fiber Optic Sensing (DFOS) allowed us to continuously gather flow profile information from a high-temperature high-rate gas well. The objective of this case study is to demonstrate that Distributed Temperature and Distributed Acoustic data, thermal inversion modelling can be used to produce a Production Flow Profile in an environment where conventional production logging was not possible.

Cerberus modelling was performed, concluding there was a risk of tool lift whereby a conventional production logging tool string is deployed during flowing states. Therefore, a 0.181" diameter fiber slickline was selected to allow a continuous measurement over the accessible perforation interval at multiple rates without the risk of tool lift. A program consisting of a memory production log, run by standard slickline cable to acquire a shut-in profile looking for potential crossflow was followed by a DFOS run to gather DAS and DTS data during shut-in and flowing rates of 30 MMSCF/Day and 60MMSCF/Day. Near real-time DTS data was analyzed to aid in the evaluation of temperature stability at each rate change, and DAS data was processed at the wellsite to enable transmission to and analysis onshore.

DFOS data was successfully acquired and processed at wellsite and transmitted to town allowing for monitoring of data quality and decision making during the intervention. A complete suite of DAS/DTS data was acquired over the perforated interval at multiple flow rates, facilitated by monitoring near real-time transient behavior which aided in decision making for rate changes. Thermal inversion modelling and DAS analysis were performed, providing evidence of crossflow during shut-in and variations of flow allocation during the differing flow rates. It was observed that surveying at lower flow rates would have provided a different flow profile compared with normal operating rates.

As a result of deploying DFOS, data could be acquired at more realistic rates. Through performing thermal inversion of the DTS data and analysis of the DAS data a more accurate flow profile was achieved. This is the first profile to be acquired in the field for use in reservoir simulation and production modelling. This will result in more accurate reservoir and well optimization. This is a layered sandstone reservoir with a two-thirds production drop since start-up. Approximately 80% of production was produced from one zone and surveillance to plan remedial action was essential to maintain economic production..