



DIGITAL FLOW PROFILING ENHANCES PRODUCTION DISTRIBUTION AND FACILITATES EARLY DETECTION OF WATER PRODUCING ZONE IN OIL PRODUCTION WELL

Sensornet installed a high resolution temperature sensing system to enhance a Middle East operator's understanding of flow distribution in an offshore oil well application. The resulting data not only provided critical production flow profiling data, but also revealed a water producing fracture behind the casing enabling the operator to pinpoint the problem interval and perform water shut-off treatment.

CLIENT REQUIREMENTS

The operator had a clear objective to gain a better understanding of their production profiles in the open hole section of this long horizontal oil producing well. After careful consideration the client decided that installation of the Distributed Temperature Sensing (DTS) system provided the best option in terms of robust, reliable thermal profiling technology coupled with ease of deployment in this application.

THE MONITORING GAP

The high resolution distributed temperature sensing system provided the client with thermal profiling information across a well section that is otherwise largely misunderstood due to lack of data sets and insufficient interpretation capabilities. Due to the open hole well trajectory a temperature measurement of 0.01°C or less was required to provide flow distribution. By monitoring the well with Sensornet's industry leading Sentinel DTS acquisition unit, the desired accurate flow distribution analysis in the open hole sections of the well were successfully determined.

THE SENSORNET SOLUTION

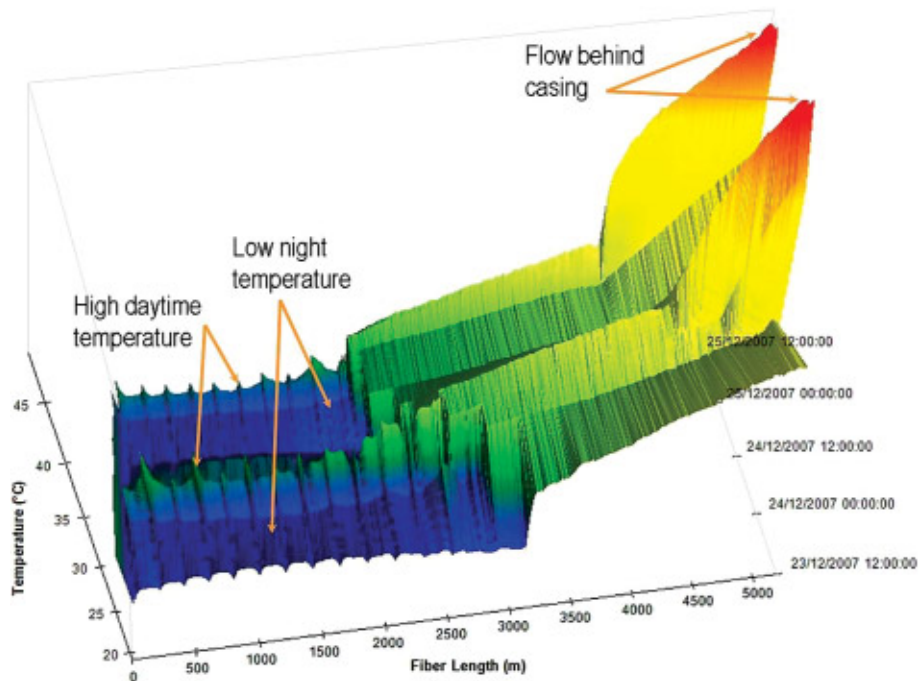
The extended reach open hole horizontal oil production well was completed with a distributed temperature sensing system installed on the production tubing string across a 7" shrouded ESP to the casing shoe depth and then subsequently crossed over to a 3 ½" stinger string to facilitate the DTS system deployment to the toe of the well. Initial torque and drag sensitivity analysis provided data to determine the stinger string size and the low friction "open hole" cross coupling protector design required to reduce frictional factors whilst running in hole. The DTS system was constantly monitored during the completion deployment operations which provided data on the functionality of the system until the point of setting the production packer which was also monitored by the DTS system.

SUBSTANTIAL BENEFITS

The data recovered from the DTS system facilitated early detection of a water producing fracture during an injection phase and after the water shut-off treatment was performed has significantly increased well productivity and saved the operator additional costs and risk associated with the workover operations.

MEASURABLE PERFORMANCE

Digital Flow Profiling captured by the distributed temperature sensing system, which has a standard update rate of 10 seconds has furnished the operator with high quality DTS data providing significantly improved interpretation of the production distribution along the entire 3000m open hole section. The high resolution temperature measurement of 0.01°C is crucial given some of the small temperature changes expected in this horizontal oil production well.



Flow behind casing observed in FloQuest during injection intervals

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