

DIGITAL FLOW PROFILING PROVIDES FLOW CONTRIBUTION OF A HORIZONTAL WATER INJECTOR WELL

To help a major operator in the Middle East to understand the flow distribution in their water injection well our unique Digital Flow Profiling solution was used to provide the information at lower cost and risk than traditional production logging technology. The result was a more detailed understanding of the permeable zones and a dramatic reduction in crucial injection interruption.

CLIENT REQUIREMENTS

A water flood was being used to maintain reservoir pressure, enhance field production and improve recovery. A long open-hole horizontal well was used for injection into multiple flow units. Knowing the flow distribution was critical for managing pressure support, understanding treatment efficiency and the development of future injection and production wells. To fully understand the flow profile a high performance instrument was critical as the injection period exceeded three years. The well warmback response was therefore only expected to provide very small temperature deviations along the open hole section. As result the client specified a measurement resolution exceeding 0.01°C.

APPLICATION

A fibre optic cable had been installed on a 2 3/8" stinger in the long open hole section during a well workover some months prior to the DTS survey. Low friction cross coupling clamps helped ensure the stinger could be easily deployed along a 1,500m open hole section. During the shut in temperature survey no well interventions were required. Sensornet field personnel arrived on the wellsite, hooked the monitoring unit up to the existing wellbay junction box and observed the wellbore temperature response during the shut in period and subsequent injection.

THE MONITORING GAP

Insufficient measurement sensitivity, update times and poor interpretation capabilities had previously left the client with insufficient understanding of the flow distribution. By monitoring the well using the industry-leading Sentinel acquisition unit Sensornet were able to provide an accurate flow distribution across the open hole section. Highly permeable regions, as well as treated zones, were quickly identified. The warm back interpretation was verified by tracking the movement of thermal features at a high rate during the start of re-injection. Without the Sentinel's high update performance this verification would not have been possible.

THE SENSORNET SOLUTION

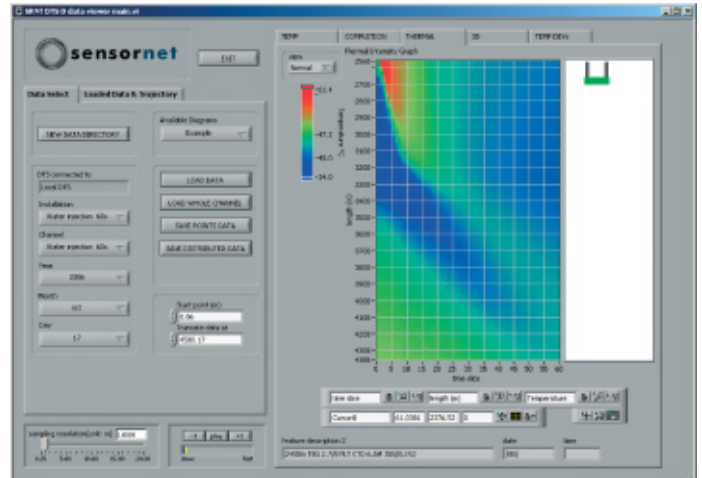
Working with the Drilling and Completion Engineers we designed the system to achieve total coverage of the well with no further impact on installation and operation. All equipment underwent comprehensive quality checks before delivery to the wellsite. Working closely with the offshore rig personnel the onsite installation crew conducted further downhole sensor tests before, during and after installation. Within minutes of running the completion complete temperature profiles were being captured, validated and delivered to the client.

SUBSTANTIAL BENEFITS

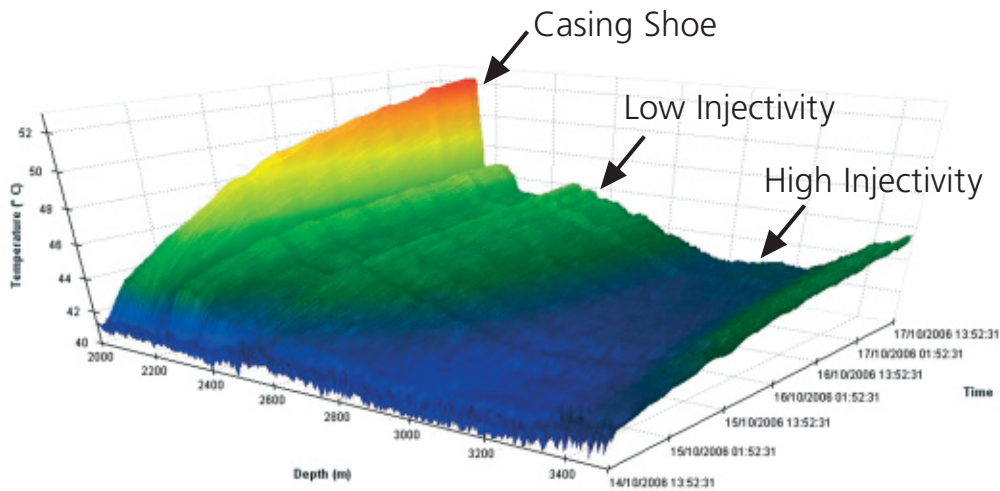
The quantification of the injectivity profile led to a far more detailed understanding of the permeability, treatment efficiencies and layer pressures. Compared to the alternative of an open hole well intervention on coiled tubing the operator saved in excess of \$300,000 on service company charges and at substantially lower risk. This has allowed them to perform flow distribution surveys every six months, enabling a much improved understanding of the sweep efficiency in the field.

MEASURABLE PERFORMANCE

Digital Flow Profiling provided real time data gathering and interpretation. High resolution updates every 10 seconds provided a new dimension to the transient behaviour while a resolution of 0.01°C along the entire 4km well length allowed more accurate interpretation of the warmback response.



User interface for data playback and visualisation



High resolution temperature data captured during the warm back of a mature, open hole, water injection well

To close your monitoring gap, call +44 20 8236 2550 or visit www.sensornet.co.uk