



DIGITAL WELL INTEGRITY OPTIMISES PRODUCTION AT PETROCHINA'S LIAOHE OILFIELD

Ensuring well integrity demands continuous real-time well performance information. The Sentinel DTS™ system provides precise real-time data across production intervals and prevents costly, time-consuming and high-risk interventions. Sensornet's Digital Well Integrity solution used in PetroChina's Liaohe thermal wells provided a simple and effective method of identifying the reservoir layer and understanding the growth of the steam front over time. The trending data recorded was critical to establishing the effectiveness of the steam placement and the ensuing heating of the reservoir.

CLIENT REQUIREMENTS

The Liaohe oilfield is the third largest oil field in China and is the largest Chinese heavy oil production base. Determining the integrity of these wells was vital in providing an early indication of steam breakthrough, and with a typical depth of 1500m and maximum downhole temperature of 270°C there was an immediate need to provide increased and improved production data to the reservoir engineering team, allowing them to better justify interventions during limited opportunities.

THE MONITORING GAP

Demand for increased production coupled with increasing costs meant that intervention operations were difficult to justify. Production Engineers were often left for months without any means of analysing underperforming wells.

THE SENSORNET SOLUTION

DTS was deployed in multiple heavy oil thermal wells (injection, production and observation) and using the Sentinel DTS-SR (0-5km range) fibre optic distributed temperature sensor, a high resolution temperature reading of at least 0.01°C was obtained every metre along the well bore from the surface to the toe. In the thermal production wells the high temperature sensing cable was deployed on the outside of the casing string. For the observation wells, the cable was installed inside the casing giving maximum exposure to thermal events as they occurred to allow the operator to monitor in real time. Robust fibre and cable designs were employed to ensure years of operation without degradation or loss of signal performance. As well as the tubing and casing, every inwell component was monitored continuously to provide a complete thermal profile of the well.

The Sensornet DTS acquisition unit provided the ideal solution. The wide operating temperature range, fine temperature and sampling resolution provided the client with a powerful analysis device. The client is now using steam injection to exploit the wells using Sensornet DTS measurements to close their monitoring gap.



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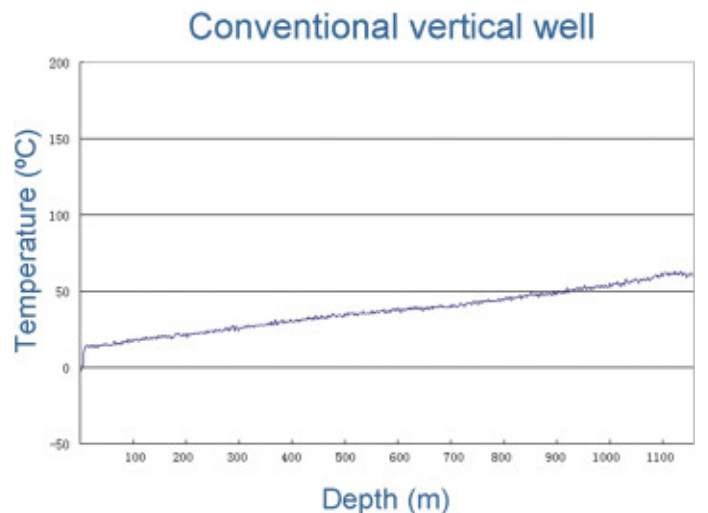
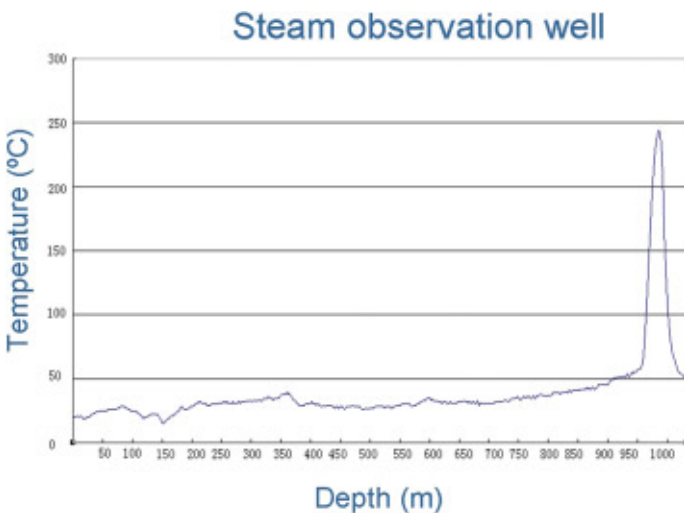
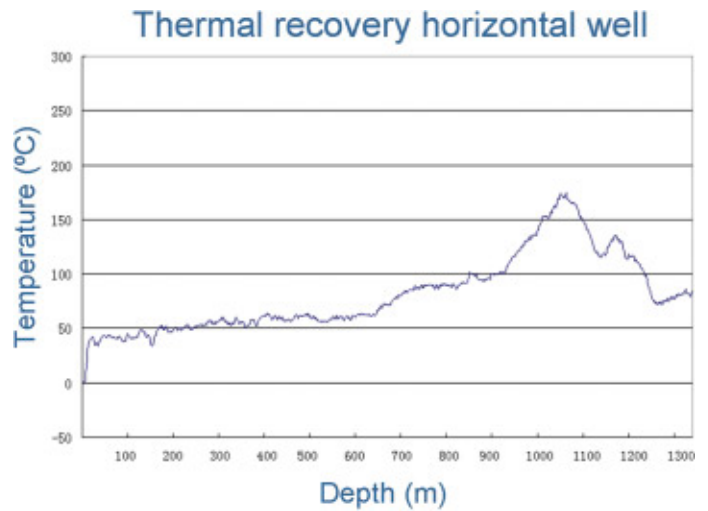
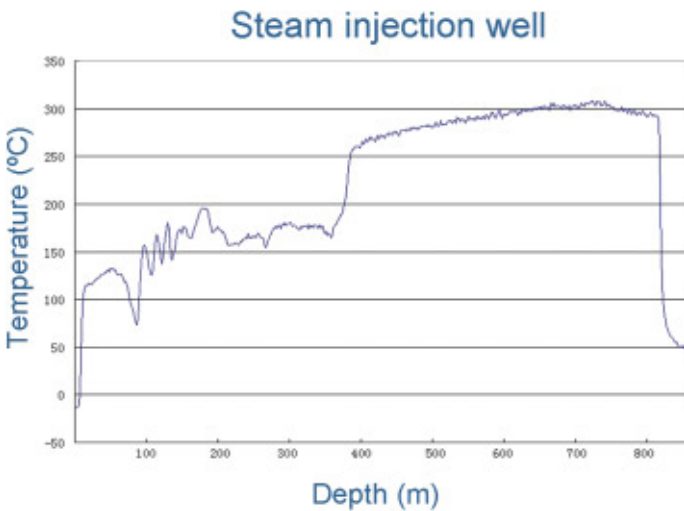


SUBSTANTIAL BENEFITS

The Sensornet Digital Monitoring solution is versatile and easily deployable without the costs, risks, and deferred production associated with conventional monitoring technology. The benefits include understanding the steam front growth over time, understanding trends, monitoring for any steam breakthrough in unknown channels, to ultimately improve the Steam Oil ratio.

Combining DTS information with geological data, a detailed reservoir layer can be determined. By analyzing the well using the Digital Well Integrity solution followed by an evaluation on the effect of steam injection, engineers can accurately determine production layer intake ability. These techniques can increase exploitation efficiency, heat energy, and cost reduction.

The data shown below displays different wells' performance in the Liaohe oilfield.



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