

Carina® 100XLog, fibre optic sensing-based well logging service highlights anomalies related to crossflow between water and oil producing zones

Client: Enquest, Malaysia

Challenge

Identify the communication path between water and oil producing zones, i.e. cross flow behind casing or across the packer.

Solution

Deploy Silixa's retrievable distributed fibre optic sensing-based system, Carina 100Xlog, for in-well diagnostics. With advanced analytics, data acquired would highlight anomalies related to crossflow.

Results

Water entries due to a leaking SSD linked to the water producing zone were identified. Anomalies related to the corroded gas-life orifice were also detected.

Background Information

Well X is an oil producer completed in 1997 but has been shut in since 2001 due to high water cut. It is a single oil producer connected to three reservoir zones: A, B and C.

Two out of three zones are active; A and B, and produce through individual Sliding Sleeve Doors (SSDs). Zone C was previously plugged off at the No-Go Nipple.

Historical and recent data from offset wells suggest that Zone B is a water-bearing reservoir while Zone A is oil-bearing. However, water production was observed at the surface during production of Zone A with SSD A open and SSD B closed. This was an indication of possible inter-zonal communication.

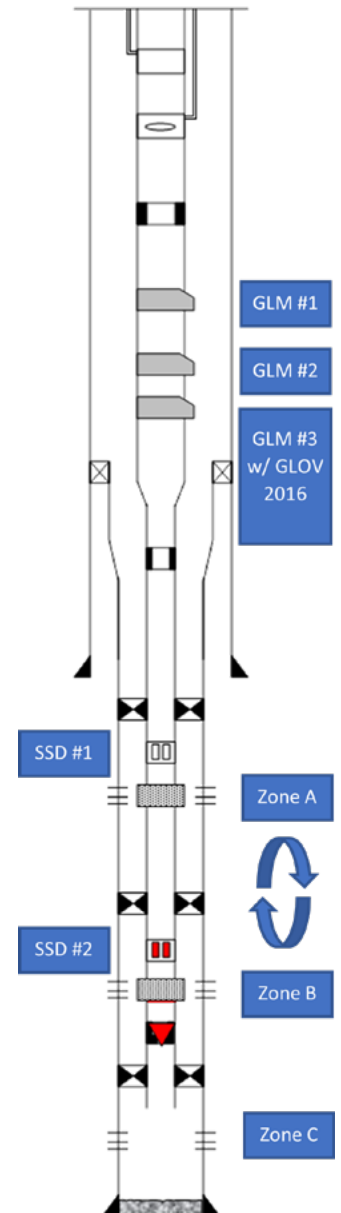
Surveillance Program

Silixa Ltd, in partnership with Neural Oilfield Services Sdn. Bhd. (NOSSB), proposed a unique data solution using a distributed temperature and acoustic measurements. Data was acquired with Carina 100XLog, the retrievable, high-fidelity fibre-optic sensing-based service. Silixa's Constellation™ fibre optic cable was deployed via Geowell's dedicated slickline unit and two runs were made:

- » Run 1: depth correlation GR-CCL
- » Run 2: main Carina 100XLog run to acquire high-fidelity acoustic and temperature data under different well conditions.

With a distributed array of sensors a wider well coverage was achieved under significantly reduced logging times. Twelve hours of data was recorded, under a baseline shut in condition, a flowing condition, and a hard shut-in before pulling-out-of-hole.

Well X diagram



Value creation to client

Well X was successfully logged on 12 April 2021 without LTI or HSE issues. High-level findings and results were presented to EnQuest's project supervisors five days after the data was remotely processed and interpreted by Silixa's in-house data analysts stationed in London, England.

A summary of key findings

Liquid movements inside tubing from zone B past zone A and up to the liner hanger during shut-in conditions were observed. These fluid movements were detected on the low-frequency DAS signal (LF-DAS) and were related to fluid entries from Zone B due to a leaking SSD and consequently dominating the flow rather than Zone A.

- » There were clear indications that the orifice was continuously active during shut in. This was possibly due to corrosion of the valve which could potentially aid the backflow of reservoir fluids into the annulus under certain pressure conditions.
- » It was established that there was cross flow between Zones A and B but even more significant was the backward flow of fluid in the tubing to the annulus through the corroded orifice valve.

Benefits of high-quality distributed measurement demonstrated

- » The continuous acquisition of data along the entire well's depth during different conditions allows for a better understanding of a well's dynamic or transient behaviour.
- » Real-time data acquisition and displays using fibre-optic enabled retrievable intervention methods can ensure the data is correctly recorded as expected and allows for immediate remediation.

Why Carina 100XLog?

- » **Smaller footprint:** The system operates on a slickline unit hence it has a reduced footprint.
- » **Real-time data:** Unlike conventional methods that use point measurement memory tools where data is only downloadable after the job, Carina 100XLog delivers real-time data offering a more complete image of the well.
- » **Distributed data ensures wider coverage:** Unlike memory tools that cover a single point in the well at one time, possibly missing the complex well dynamics of inter-zonal communication, Carina 100XLog captures every point in the wellbore simultaneously, replacing guesswork with high fidelity data.

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