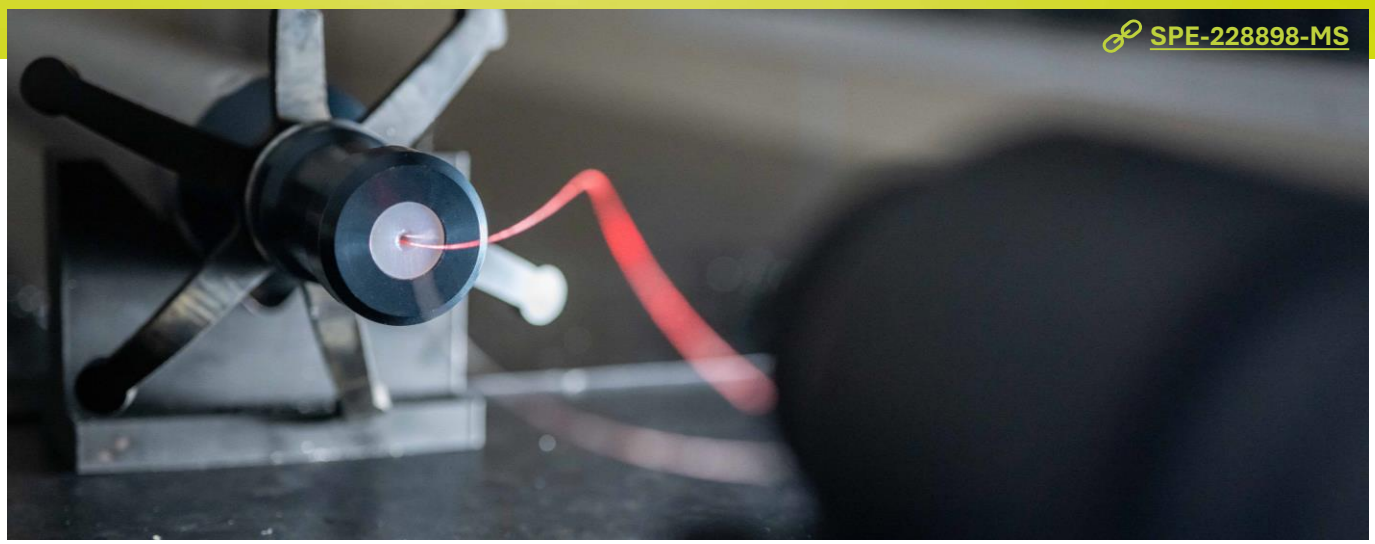
WELLSENSE

Case Study

# TRANSFORMING DIAGNOSTICS: FROM 5 DAYS TO 14 HOURS

How rapid thru-tubing Fli diagnostics can transform efficiency and avoid millions of dollars in deferred offshore production.




This survey required low-rate annulus leak detection in an offshore sour gas well with complex logistical, architectural and analytical challenges. WellSense provided the answer, with a survey time of just 14 hours compared to a conventional 5 day approach.

## The Challenge

An operator faced persistent integrity issues in a dual completion gas injector well located on an offshore island in the UAE. The well had started to exhibit sustained pressure anomalies in both the A and B annuli, with the A-annulus showing a consistent pressure increase of ~3 psi/hr. and the B-annulus building at ~1.5 psi/hr. High $H_2S$ content (~7%) and elevated injection pressures (5,500 psi.) increased safety concerns and the need for rapid diagnostic investigation.

Traditional methods would be time-consuming, require significant surface infrastructure and pose logistical challenges due to location, space and personnel constraints. Thru-tubing diagnostics also posed challenges due to the reduced acoustic coupling and signal attenuation typically associated with gas-filled annular spaces. Additionally, the well architecture included two concentric tubing strings (dual completion) and a dual production packer, each representing a potential leak path.

The objective was to determine the presence and depth of the leaks and discriminate between multiple sources to identify which tubing string was leaking, at what depth and whether any leakage was occurring across the packer.

## The Answer

To address these complex challenges, the operator deployed a single-use Fli DFOS system using WellSense's bare fibre dynamic de-spooling technique. The deployment was supported by Wellbore Integrity Solutions and involved:

- **Bare fibre deployment** via gravity descent, eliminating the need for conventional conveyance methods
- **Real-time DAS and DTS acquisition** to detect 3D acoustic and thermal anomalies.
- **Minimal surface footprint** with a compact launcher and lubricator system.
- **Rigless operation** requiring only a single engineer onsite.

The system was configured with a BiFli roller probe to overcome high deviation angles (>66°), enabling full deployment of DAS and DTS fibres to 12,165 ft in just 20 minutes.

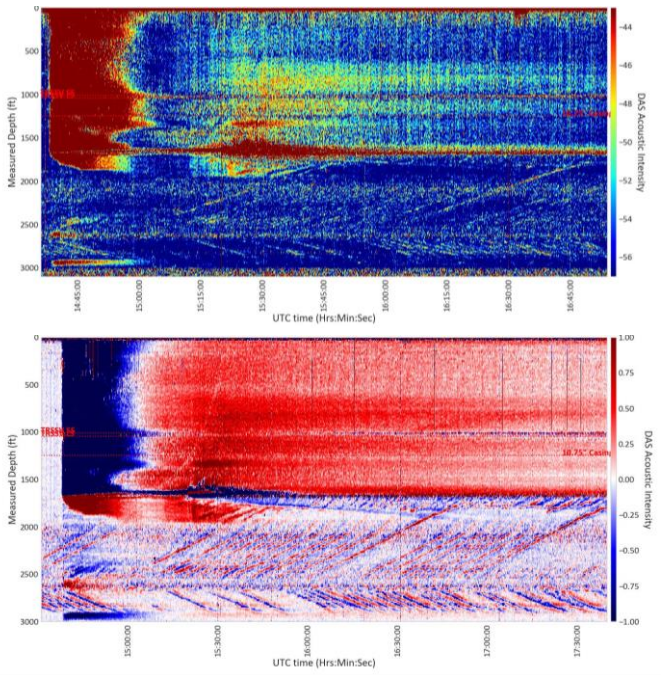
Upon reaching total depth, a 60 minute survey was conducted to establish the baseline acoustic signature of the well. A series of coordinated pressure manipulations then stimulated the leak sources and the survey was completed within 14 hours.

## The Results

Using the Fli DFOS data, the WellSense analytics team successfully identified multiple leak sources and flow paths:

- **Primary A-annulus leak origin pinpointed** at 2,910 - 2,920 ft in the short string
- **Multiple acoustic events** detected during pressure manipulations, with dynamic flow behaviour and crossflow between tubing and A and B annuli, indicating multiple secondary leak points in the short string.
- **Gas-liquid interface** in the A-annulus was located at 1,655 ft using DAS strain rate and DTS anomalies.
- **Hydrostatic modelling** validated leak depths and pressure differentials, supporting the diagnosis.

**A post-survey diesel displacement confirmed the short string as the main leak source, halting pressure build-up in the A-annulus.**




## The Value

The single-use, bare fibre Fli system demonstrated capability to distinguish between multiple leak sources and establish their leak rates in the short string, long string, behind casing and in different annuli, enhancing diagnostic confidence and enabling faster, more targeted remediation. It delivered significant operational and strategic advantages:

**Reduced diagnostic time**: Full survey completed in <14 hours vs. estimated 5 days using conventional methods.

**Offshore efficiency:** The system's compact surface area and reduced personnel requirements effectively mitigate the challenges associated with platform access, deck space and personnel onboard (POB) limitations.

**Minimised deferred production**: Up to 80% reduction due to faster rig-up and survey.

**Lower emissions**: This operator identified that use of the Fli system could provide it with an estimated saving of 500 tons of $CO_2$ annually through reduced energy use and rigless operation.

**Enhanced risk assessment**: Accurate leak rate estimation and fluid level identification in this sour gas well enabled the operator to classify it as medium risk, avoiding unnecessary shut-ins.

**Cost savings**: Through greater efficiency and time savings and eliminating the need for separate Leak Rate Measurement (LRM) jobs and reduced intervention frequency.

**Improved reliability and operational safety**: Passive fibre system reduces mechanical failure risks in high-pressure, sour gas environments.

**Personnel Safety:** Less personnel in the red zone.

**This operator's wider experience of the Fli DFOS system, across various wells on both minor satellite and major offshore platforms, has demonstrated its effectiveness in uncovering complex integrity issues and enabling the formulation of targeted remediation strategies. The data yielded provides valuable insights, facilitating proactive maintenance and enhancing overall well integrity management.**

**Read the SPE technical paper: https://onepetro.org/SPEADIP/proceedings-abstract/25ADIP/25ADIP/D031S108R009/793382**
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