

O&G Case Study – Seismic

Challenge

O&G industry’s first subsea DAS VSP using Distributed Fiber Optic Sensing (DFOS) and LYTT’s continuous QA/QC DAS VSP workflow

A few weeks after the subsea fiber optic installation for in-well seismic measurements and before the initial start-up, an offshore high-rate oil producer equipped with upper completion fiber optic was used to validate the overall subsea DAS system for high fidelity and SNR suitability for borehole seismic measurements used for DAS imaging on demand. It also had to address the quality of the measurements during nominal flow rate conditions and assess the well-seismic tie with near real-time waveform processing image and time-depth information.

Solution

LYTT’s near real-time DAS VSP QA/QC workflow was used to extract depth controlled and time stamped seismic shots for acquisition test shots sequence validation, SNR improvement via stacking and full waveform processing. This was used to validate reflectivity response in logged interval, time-depth relationship and evaluation of look-ahead P-wave reflections in the reservoir interval with a comprehensive well to seismic ties. The overall analysis was repeated with inclusion of production noise to fully evaluate and characterize production noise and its impact on the DAS VSP final products. LYTT’s continuous DAS VSP workflow was used to answer five fundamental questions for subsea distributed acoustic sensing for seismic, as seen below:

- Pre-production DAS seismic data SNR? – **Near real-time DAS VSP shot extraction waveform analysis**
- Length of downhole antenna with consistent DAS coupling for imaging? – **Signal processing**
- Quality of depth control and well-seismic ties? – **Seismic well tie**
- Impact and characterisation of flow noise? – **Signal processing**
- Expected frequency content in the overburden and at target? **Signal processing**

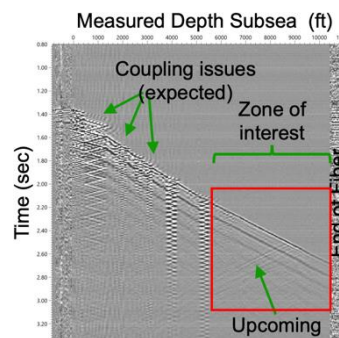
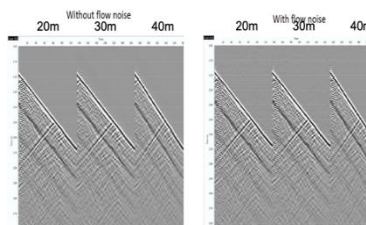


Figure showing subsea DAS ZVSP raw stack prior to signal processing

Result

LYTT’s near real-time QA/QC and waveform processing was run during offshore DAS VSP operations for overall subsea DAS system validation and borehole seismic measurements suitability for borehole seismic imaging.



DAS ZVSP raw stacks without and with flow noise

Value

The first subsea well with installed upper completion fiber optic confirmed excellent performance for DAS seismic measurements and little impact from production noise on the outcome. LYTT’s fully remote and continuous data analysis and signal processing allowed qualitative and quantitative evaluation, including well-seismic tie analysis. The well is currently producing and will be used for the first subsea 3D DAS VSP acquisition in 2022.

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