

Long Range Seismic Acquisition with DAS: Challenges in Production and Subsea Environments

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September 2020



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 - Reservoir and production monitoring with DAS
- New Developments in IU technology for Subsea and long tieback wells
 - Ocean Bottom survey
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- Conclusions



Offshore Applications of Fiber Optic Distributed Sensing

Reservoir monitoring

- 4D Seismic Timeshifts (Total's North Sea Work: Merry et al Seismic2020 EAGE2020)
- 4D VSP from producing wells
- 4D Seismic Waterflood Mapping
- Carbon Capture and Storage
- Production Monitoring
 - On-demand Optical DAS PLT
 - Sand control
 - Screen analysis
- Smart Well monitoring
 - Artificial Lift control
 - ICV Control



CO2 Plume Tracking with TimeLapse DAS VSP

50%

Repeatable DAS Surveys capture subtle amplitude anomalies from CO2 storage facilities

- Validation of first time lapse DAS CO2 plume tracking in 2016
- DAS technology is able to detect the progression of CO2 in storage facilities
- Third generation IU provided repeatability
 - Two new IU's have been released since then
- Four vintages of DAS VSP have shown progression of plume
- Fiber Optic data provides a cost saving repeatable technology to monitor increasingly critical carbon storage and EOR facilities



TimeLapse from DAS \rightarrow Repeatable and Cost Effective

Multiwell VSP Acquisition from Active Producers and Injectors



Mateeva et al, SEG 2017

DAS Survey for Gas Lift Assessment Production and Seismic Monitoring from DAS

Multiwell 3DVSP acquired during dual production string activity







AbdulRahim et al, 2017



Noise in Seismic Data is the Signal for Production and Completions Engineers



Seismic2020

Subsea Wells and Ocean Bottom Fibers

The Need for Long range DAS: Ability to use long fibers with optical losses from subsea infrastructure



DAS – Seismic

Rapid Changes in IU for seismic measurements



First Interstage 4DVSP; Byerley et al. 2018 First Commercial Microseismic with Tensors, Cole et al. 2018

50km Long Standard Fiber

Airgun Source – Ocean Bottom Cable 50000 channels



Challenge in Subsea Wells \rightarrow Optical Losses

25km Long Fiber with Attenuators from Wetmate connects and Subsea Template



Long Range DAS 25km Umbilical – Interrogating 5km Single Mode Fiber

Minivibe single sweep source

Reflections observed in borehole data without any processing



20000 channel - Only 5000 channels at 1m spacing are shown

Seismic

Autonomous Systems → DAS Data Streaming Solutions Remote Operations: IU(s) to Remote Processing Centers at Full DS Bandwidth





Conclusions

- New IU technology can acquire seismic data from fiber optic at long range
- Subsea monitoring
 - Long Tie-ins to Subsea Templates with SM fiber (15-25km validated)
 - Flow profiling monitoring validated with 15-40km tie ins (Summer 2020)
- Surface Seismic and OceanBottom-FiberOptic monitoring
 - Long offset DAS can be deployed for long fiber optic spreads on the surface or ocean bottom
 - Deployed with 30-50km standard fibers
 - Commercial Seismic Survey with 50km standard fiber
 - Radiation patterns for surface seismic are addressed with omnidirectional fibers
- Data streaming (raw or processed) makes Distributed Sensing products available in personal devices



Questions Andres.Chavarria@OptaSense.com

