

 **NEW ENERGY SOLUTIONS**

OPTICAL SENSING IN CCS SURVEILLANCE

MMV TECHNOLOGY SHOWCASE

October 2024

AGENDA

- CCS Technology Solutions
- Optical Pressure Temperature System
- Distributed Fiber Optic Sensing (DFOS)
- Applications
- Real Results

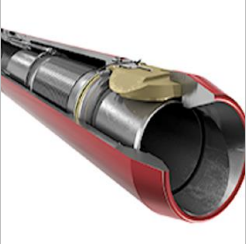
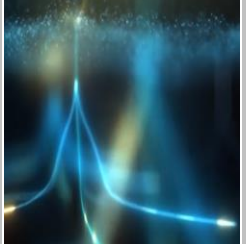




CCS TECHNOLOGY SOLUTIONS



Arsenal of award-winning tools that deliver value by addressing unique challenges of CCS project

					
EVALUATION & ENGINEERING	WELL CONSTRUCTION	FLOW CONTROL & ISOLATION	SURVEILLANCE & INSIGHTS	OPERATION OPTIMIZATION	ABANDONMENT
High-resolution data to characterize the storage & gain insight on wellbore integrity	Creating a safe and reliable pathway of CO2 injection for the life of the well	Flow control & isolation solutions with varied complexity to maintain a pre-defined back pressure	Illuminating subsurface with fit for purpose surveillance from early injection to storage monitoring.	Models & operations merged with power of AI to achieve optimized sequestration injection	Integrated & comprehensive solution to abandon well securely with high degree of integrity.
SecureView Casing & Cement Integrity Raptor 2.0 CO2 Characterization COMPACT Formation Evaluation	Magnus Rotary Steerable System	Amp eICV Interval Control Valve OptiBarrier Barrier Isolation Valve InjectionSaver Back Check Valve	ForeSite Sense Optical DTS & DAS Red Eye Water Detection	ForeSite CCS Operations CygNet SCADA Management	FIRMA Abandonment solutions Legacy Well Re-Entry
	MODUS Managed Pressure Wells				
	VERO Automated Connection				
	Optimax Safety System MaxFlo Sand Control				



FIBER OPTIC TECHNOLOGY FOR CCS MMV

- No Electronics
- Minimal Part Count
- Zero Drift on measurements
- Integrated single cable system
- Suitable for extreme environment
- Fiber as sensor

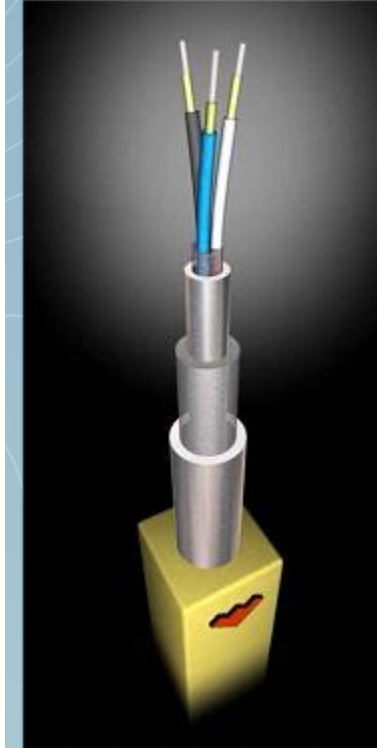
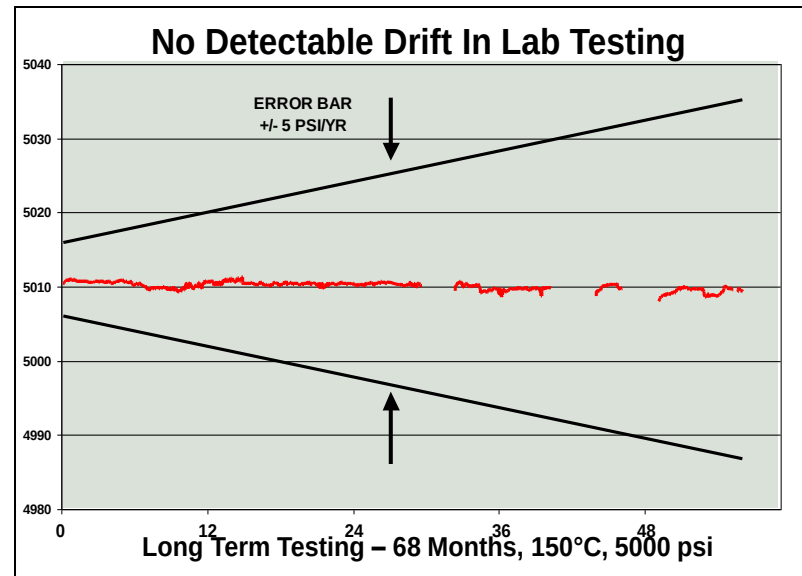
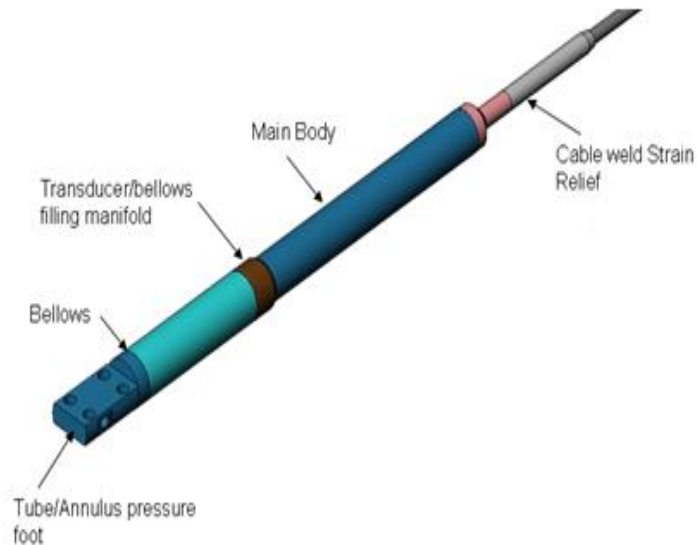
RELIABILITY

SIMPLICITY

QUALITY

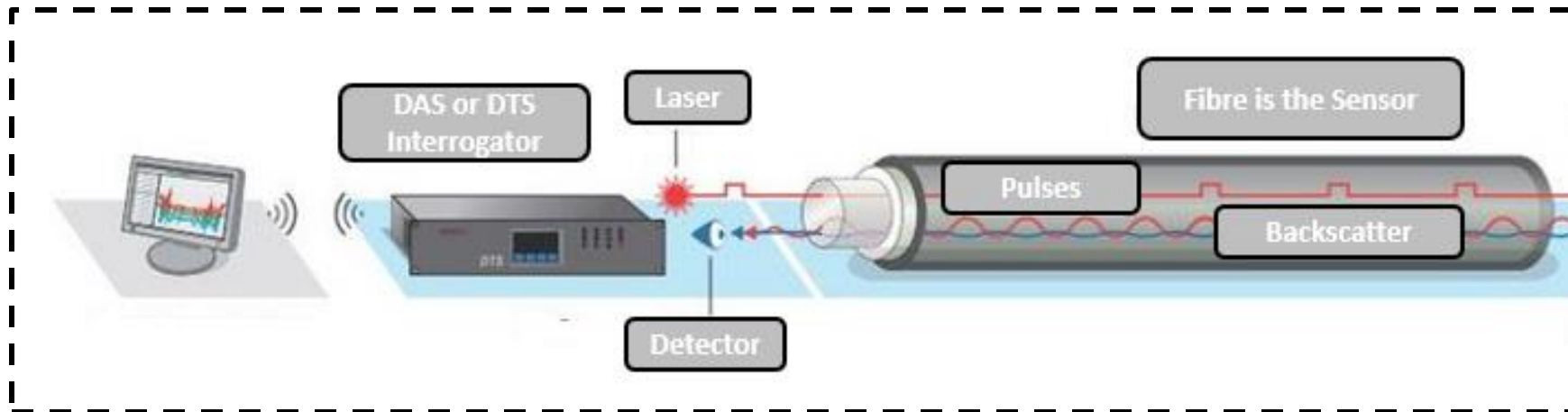
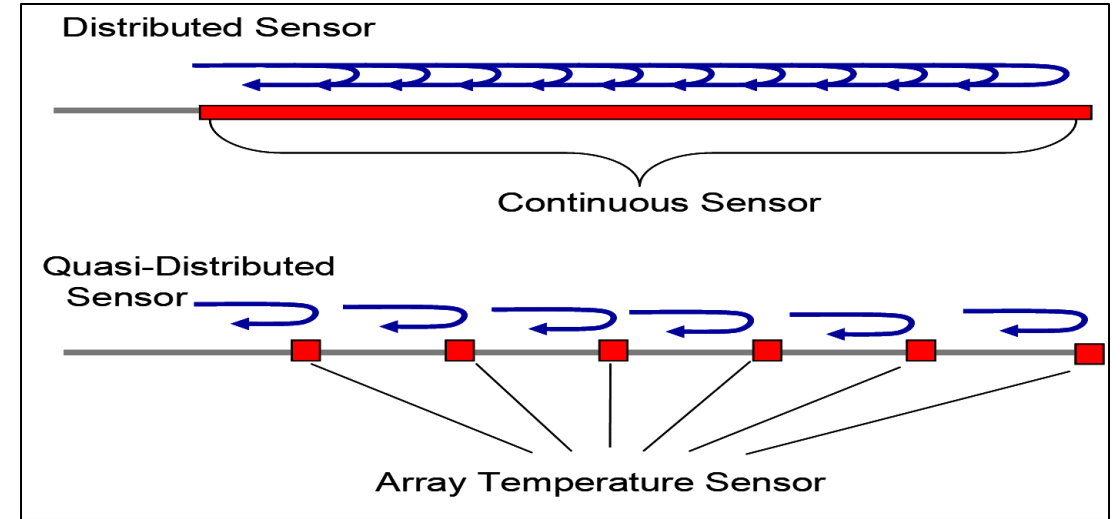
OPTICAL PRESSURE AND TEMPERATURE SENSING

- High Reliability
- **Low Temperature** Calibration
- Vibration and Shock Tolerant
- High Data Transmission Capability
- Multiple Sensors on One Fiber
- Rigorously Qualified

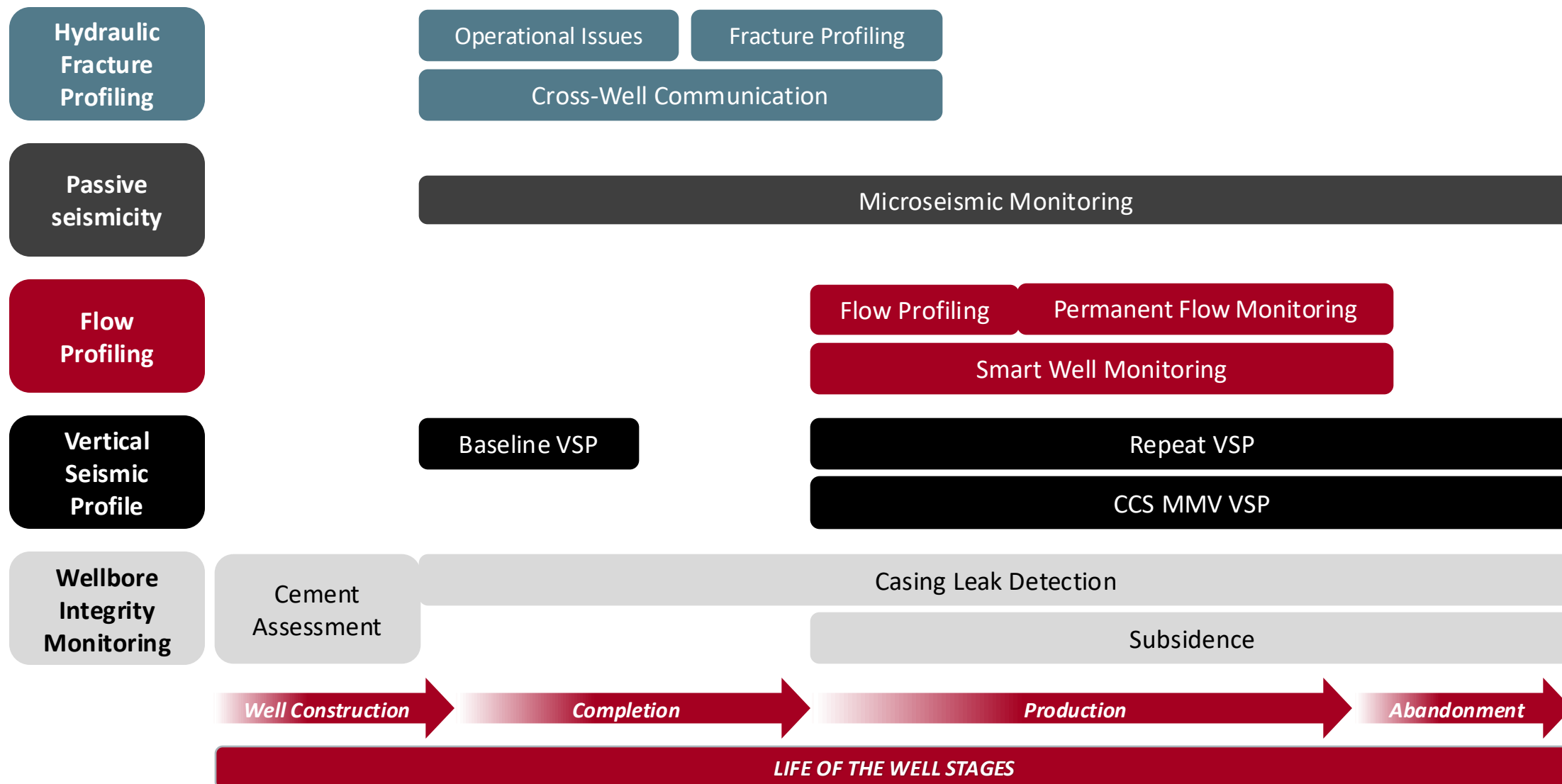


DISTRIBUTED FIBER OPTIC SENSING (DFOS)

- Fibre pathway as the sensor
- **Distributed Temperature Sensing (DTS)**
 - Thermal profile across the well
- **Distributed acoustic sensing (DAS)**
 - Acoustic profile across and surrounding the wellbore

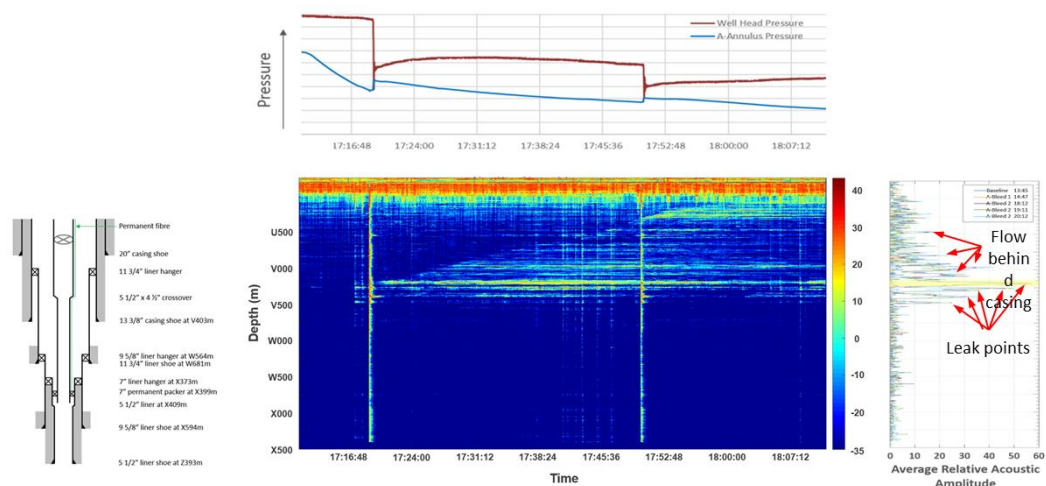


DFOS APPLICATION IN CCS



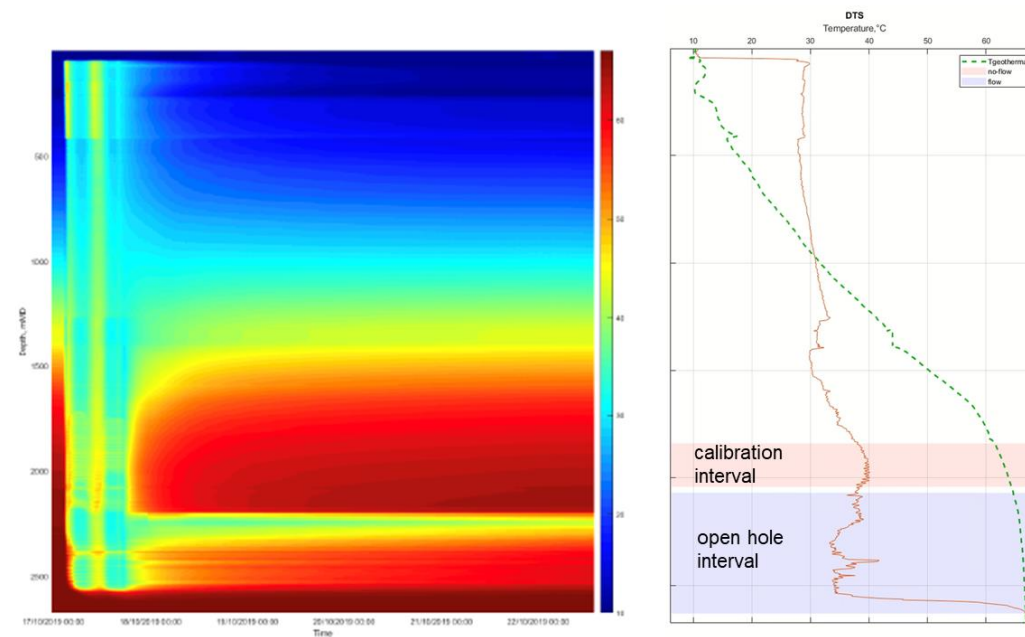
APPLICATION SCENARIO

Well Integrity



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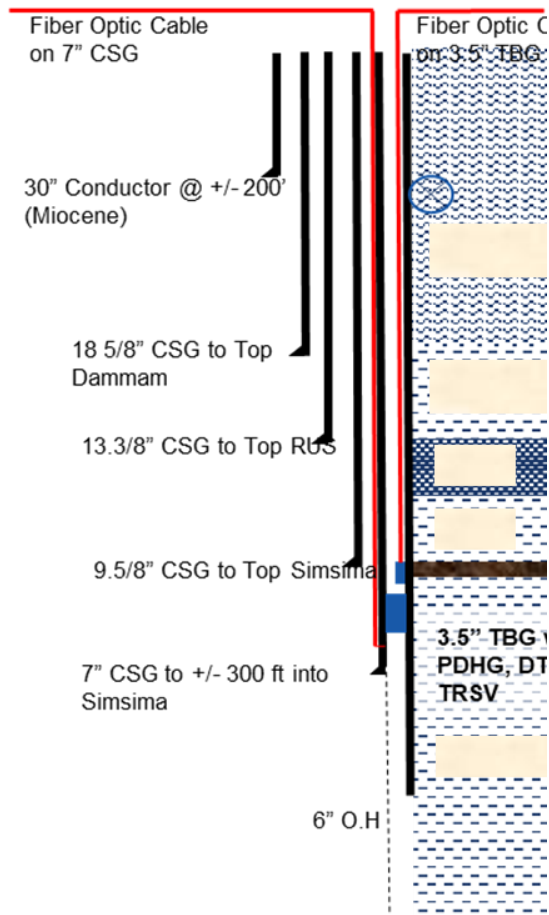
Injection Profiling



REAL RESULTS

OPTICAL CABLE BEHIND CASING (MIDDLE EAST)

- Cemented behind 7" casing
- Monitoring Deliverable
 - Vertical Seismic Profiling (VSP)
 - Micro-Seismic Monitoring
 - Injection Profiling



OPTICAL PT & DFOS (UK SNS)

- Multiple optical PT gauge c/w DFOS measurement to injection depth
- Monitoring Deliverable (injection commencing Dec '24)
 - Phase Verification
 - Plume Migration (VSP)
 - Injection Profiling





THE ENERGY OF
INNOVATION™