



Smart coiled tubing, SCT, is an integrated solution for potential and existing through-tubing applications in horizontal completion and production technologies. The integrated line allows for normal CT operation with the option of controlling through-tubing electric tools, as well as monitoring pressures and temperatures with Distributed Temperature Sensing (DTS) and Distributed Acoustic Sensing (DAS). With our coiled service, the line can be installed inside various coiled tubing strings dependant on wellbore requirements. More conventional deployment methods for fibre and e-line in horizontal wells can require traction conveyance, which can be expensive, limited, and risky.

Smart & Permanent Completion

- DAS/DTS Fibres can be installed on producing or observation wells in permanent fashion.
- Smart completed wells normally need monitoring in order to secure the benefits of the ICDC/VC combination used.
- DTS/DAS fibres provide required monitoring along well length at any time.

Smart Coiled Tubing, SCT

Using optical E-line inside CT would enable:

- Monitoring CT operation and provide operational support
 - WOB
 - CT sticking
 - Fluid level & loss

- Real Time CT-deployed frac and acid jobs
 - Fracture Location and propagation
 - Flow or injection zonal contributions
 - Acid placement



Fibre Technology Applications

- **Production Optimization**
 - Log fluid flow contributions along skinned liner, perfor, or bare foot
 - Identify and characterize failed start-ups, slugging, flow restrictions, and gas lift

Well Integrity and Production Risk

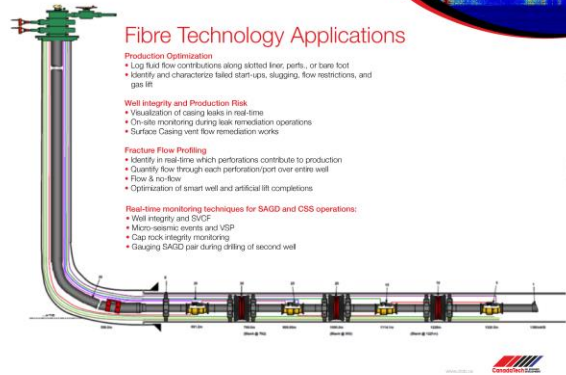
- Visualization of casing leaks in real-time
- Dynamic monitoring during leak remediation operations
- Surface Casing vent flow remediation works

Fracture Flow Profiling

- Identify in real-time which perforators contribute to production
- Quantify flow through each perforation port over entire well
- Flow & no-flow
- Optimization of smart well and artificial lift completions

Real-time monitoring techniques for SAGD and CSS operations:

- Well integrity and SVCF
- Micro-seismic events and VSP
- Cap rock integrity monitoring
- Gauging SAGD pair during drilling of second well



CanadaTech Fibre Services

- Supply armored fibre e-cable and necessary technology and materials to equip logging trucks.
- Provide fibre-equipped Coiled Tubing drums adapted to requested applications.
- Provide interrogation boxes for DTS and DAS together with fibre handling equipment.
- Provide Software and field engineers for installations to monitor CT job and support operational decisions.
- Provide fibre-equipped e-line and CT trucks and services for onshore well interventions and workovers.

"If unconventional natural gas is a revolution in the making, so are the services required to make it happen."



Emerging Fibre Technology

Over the last 3 years, CanadaTech has been involved in extensive pilot program to introduce DAS/DTS technology into different applications of well monitoring. The outcome of this program has set new grounds for well logging techniques and well interventions via coiled tubing. The continuous fibre signals along the well bore provide a clear understanding of well and reservoir flow characteristics and provide guidance to the intervention process itself.

Why Fibre Optics?

- Highly sensitive to acoustics, temperature, strain & pressure
- Proven in extreme environments (Temperatures up to 300°C)
- Simple, no moving parts, robust
- Infinite bandwidth
- 1000's of sensor points on single line ("fibre is the sensor")
- Very high fidelity and sampling ability
- Low noise floor, immune to EM noise
- High Signal to Noise ratio - ability to sense acoustic events from sub Hz to ultrasonic



DTS

Distributive Temperature Sensing

- Quick temperature snapshot of entire well
- Stabilize test for long periods of time
- Transient analysis
- Temperature Resolutions up to 0.018°C
- Spatial Resolutions as small as 25 cm

DAS

Distributive Acoustic Sensing

Stress Pulse Caused by Acoustic Wave

