

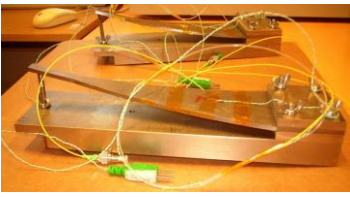
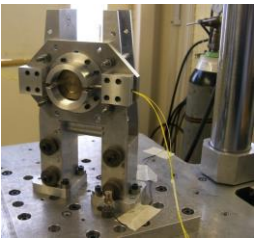




- Stable FBG P&T gauge
- No downhole electronics
- Long life at elevated temperature
- High multi-drop capability
- Low Cost

SmartCell is a fibre Bragg grating based sensor that can measure highly varying pressure and temperature excursions in production and observation wells. Numerous SmartCell sensors can be connected on a single optical fibre cable and interrogated with a topside instrument. The instrument can be located remote from the wellhead, and simultaneously monitor SmartCell chains deployed in numerous wells, providing for a highly cost effective tool for intelligent reservoir management and optimisation.

With the steer and support of Shell, Smart Fibres' FBG sensing experts have spent over 5 years optimising the design of SmartCell, qualifying its performance with extensive laboratory testing:

			
<i>Deadweight Pressure Tester</i>	<i>Sensors and pressure vessels in thermal Chamber</i>	<i>FBGs on long-term stability test fixtures</i>	<i>SmartCell sensor on shaker table</i>

## Specifications

Parameter	SmartCell Capability
Pressure Measurement	Annulus
Working Pressure Range (psi/bar)	Atmospheric to 5,000/350
Overload Pressure	150 %FS
Working Temperature Range (°F/°C)	0 to 300 / -20 to 150 (> 300/150 to follow)
Pressure Accuracy <sup>1</sup>	0.1 %FS
Pressure Resolution	0.05 %FS
Temperature Accuracy (°F/°C)	0.2/0.1
Temperature Resolution (°F/°C)	0.002/0.001
Pressure Measurement Stability <sup>2</sup>	± 0.05 %FS/year
Max number of Gauges per Cable	Typ. 15
Dimensions (in/mm) without splice housings	2.16 x 0.78 x 4.72/55 x 20 x 120
Dimensions (in/mm) with splice housings	2.16 x 0.78 x 11.81/55 x 20 x 300
Service	H <sub>2</sub> S in accordance with ISO 15156

1. As calibrated, over all pressure and temperature range, expressed as one standard deviation of the absolute errors.

2. Stability at 80% FSD pressure and 60 degC over 1 year, expressed as one standard deviation. No long-term trend visible in stability test data.

Smart Fibres maintains a policy of continuous improvement so specifications may change without notice.

SmartCell measures annulus pressure, for which the gauge carrier is a low cost, simple to install clamp, which secures the gauge to the tubing string and protects it during run-in hole.

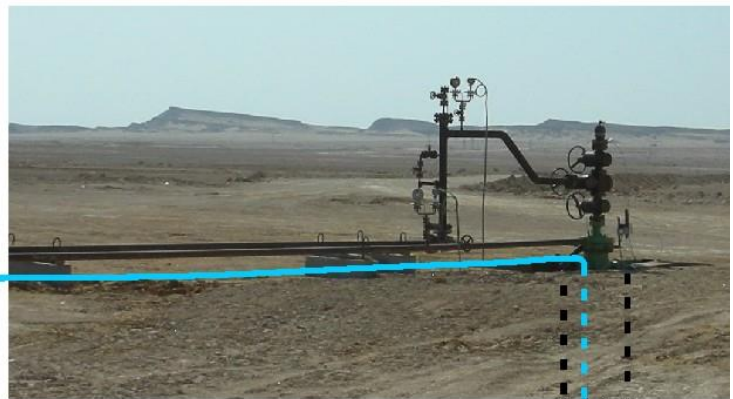
A SmartCell mandrel for tubing and dual annulus/tubing measurements will be developed in the future



The first installation of a fibreoptic distributed pressure and temperature sensing system involved a string of 9 SmartCell P/T gauges measuring annulus pressure in a vertical observation well in Oman in 2008. The image below shows how this system is configured.



Solar powered surface interrogator radios data to Muscat HQ

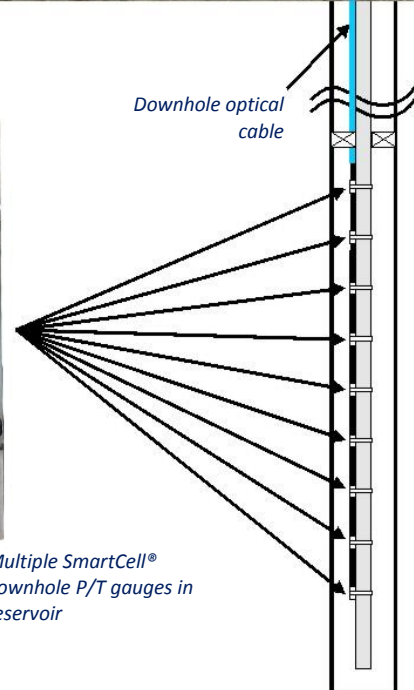


SmartCell® attachment to tubing string



Multiple SmartCell® downhole P/T gauges in reservoir

Downhole optical cable



High quality P/T data is being delivered via wireless communication to the Operator's Muscat headquarters, where PTs are monitoring the fluid levels in the wellbore.

In a further 2012 installation, 15 Downhole SmartCell gauges were successfully deployed on a single cable.