Case Study – Oil Pipeline
Fort McMurray, Alberta, Canada
October 2012
## Fort McMurray Pipeline - Overview

| **Aim** | Design/install remote health monitoring system for oil pipeline employing FBG sensors. Provide real-time quantitative information on the pipeline’s response to slope creep and ground movements that cause soil fraction, inducing strain on the pipeline. |
| **Location** | Fort McMurray, Alberta, Canada |
| **System Integrator** | The Weir-Jones Group |
| **End Customer** | Confidential |
| **Date Commissioned** | Spring 2012 |
| **Instrumentation** | (2) Micron Optics si225 interrogators |
| **Sensors** | (132) Micron Optics os3110 Spot Weld Strain Gauges (22) Micron Optics os4100 Temp Compensation Gauges |
| **Software** | Customer Designed |
| **FBG Technology Benefit** | Serial installation of FBG sensors – saved time and money Simpler cabling Reduced data drift and longer sensor life |
Sensor placement:

- Three different sensor configurations were employed at eleven stations on each of two pipes.
- Sidebend configurations were used for the expansion loop to allow for the active axis to be more effectively measured.
Sensor wavelength spacing:

- 7 sensors (6 strain and 1 temperature sensor) were installed on each of the 22 channels.
- Each strain gauge was given a +/- 3.5 nm measurement window (+/-2500 με), with 5 nm between windows.
- Temperature was expected to stay between 20° and 60° C and thermal gradients among strain and temperature sensing FBGs around each circumference, once buried, was expected to be negligible.
Sensor installation:

- Surface sanded down to mirror-like surface
- Sensor is placed on pipeline and spot welded
Sensor protection:

- A poly shim was placed over the sensor, edges spot welded
- Aluminum shim was then placed over the sensor for added protection
Sensor protection:

• A urethane polymer coating was applied over the sensors with brushes and rollers
• A “top cast” of urethane polymer was applied at the splice location between trunk cable and the station of sensors
Sensor protection:

- A protective wax tape wrap was used to cover the urethane layer, then the glass wrap was applied as a final protective layer.
- The glass wrap hardened over 10 to 15 minutes, and the station was complete.
Cabling:

• Trunk cables were run into the valve house, where the interrogators are located
• Data from the interrogators are fed in real-time to remote processing unit in Vancouver, BC via satellite
We thank Dr. Iain Weir-Jones and Colin Cindrich of The Weir-Jones Group for their efforts on this project and assistance with this case study. For more information about the Weir-Jones Group, please visit www.weir-jones.com.