Pillar INNOVATIONS
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FIELD SERVICES MONITORING SYSTEMS

Subsidence Monitoring of Pipelines Using Resistive Strain Gauges

Problem:

A large midstream organization spent too many resources manually monitoring pipeline integrity during subsidence events and was unable to collect data at the desired frequency.

Solution:

Between June 23rd and August 3rd of 2016, Pillar Innovations installed and monitored three pipelines during a longwall passing and subsidence event near Majorsville, WV. These pipelines, a 10" ethane line; a 12" y-fluids line; and a 30" sales gas line, were each installed after 2012 at an average depth of 7' below the surface.

To gather data, the team partnered with a Professional Engineering firm specializing in pipeline stress analysis. This firm used available pipeline tallys and as-built drawings in order to recommend an excavation plan, recommend monitoring locations, and generate a stress profile of each pipeline using finite element analysis (FEA).

As shown in Figure 1, a total of 27 gauges were installed (9 on each line), overlaid on the stress profile and elevation map. Using resistive gauges, data on the pipeline was relayed via a wireless mesh network and fed through a cellular modem to Pillar Innovations' web application Field Services.

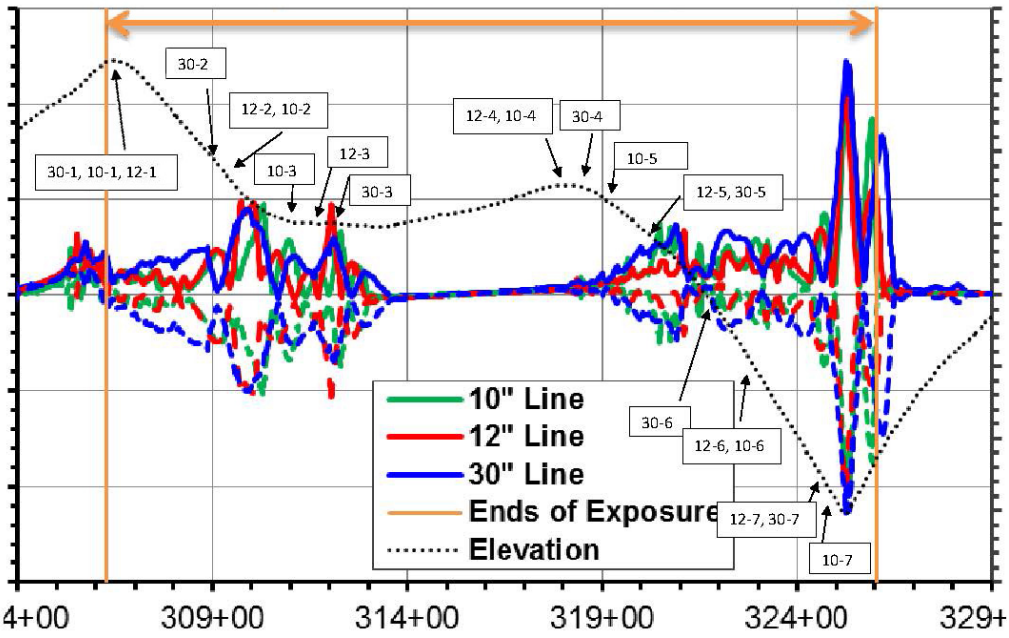

Figure 1: Gauge Locations, Stress Prediction, and Elevation Profile

The Field Services web application (seen in Figure 2) can be viewed on any browser including desktops, tablets, and mobile phones. Custom alerts were set up to email, text, and call responders if pre-determined stress levels were reached.

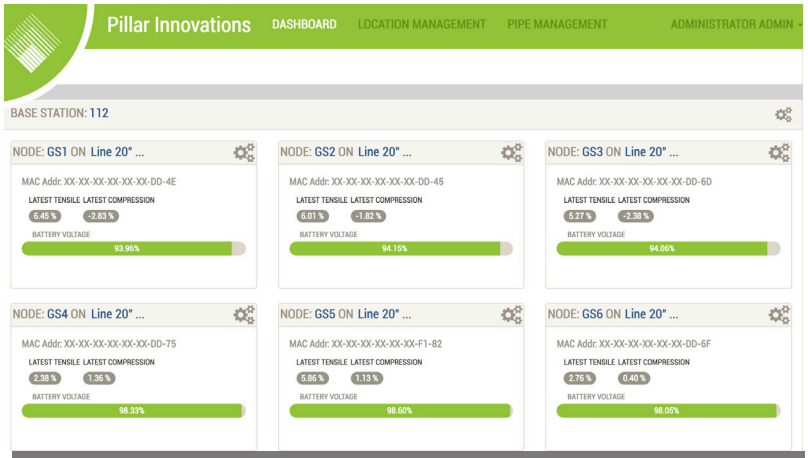

Figure 2: Screenshot of Field Services Web Application

The engineering team at Pillar Innovations managed the entire strain monitoring project for this customer, including:

- coordinating with 3rd party contributors
- installing the monitoring system onsite
- walking the pipeline to monitor system integrity
- providing a detailed final report after monitoring period

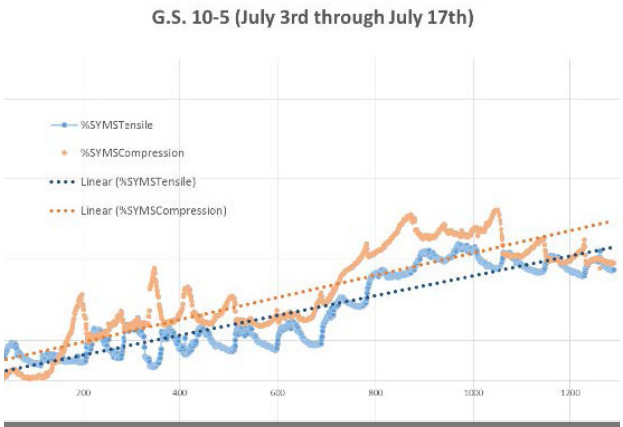

Figure 3: Trending Data of Pipeline Stress Over 2 Weeks

Figure 3 shows an increase in strain readings at location 5 on the 10" pipeline recorded during the longwall passing. Utilizing this system, the customer made safe, informed decisions regarding the manipulation of pipeline prior to backfill.

Contact:

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Pillar Innovations offers a truly turnkey solution by partnering with our parent company, Beitzel Corporation, which specializes in excavation.