CUSTOMER STORY

Pipeline Owners Tap GPS, GIS Technology To Help Meet Federal Regulations

CUSTOMER NAME: Tri-Global Technologies
PROJECT: Pipeline Inspection
PROJECT DATE: Ongoing

On June 10, 1999, a natural gas pipeline in northwest Washington ruptured, releasing 237,000 gallons of gasoline into a nearby creek. Ninety minutes later, the gasoline ignited, burning approximately a mile and a half along the creek. The accident killed three people, injured eight, and caused more than $45 million in property damage.

The following summer, another natural gas pipeline exploded in southern New Mexico, this time killing 12 people and leaving an 86 foot long crater in the ground. External corrosion was found on the pipelines at both accident sites.

In response to these and other pipeline accidents, the Pipeline Safety Improvement Act of 2002 was signed into law by President George W. Bush in December 2002. Designed to ensure the safety and integrity of the nation's 2.3 million miles of natural gas pipelines—most of which are buried between two and five feet below ground—the Pipeline Safety Improvement Act of 2002 requires pipeline operators to provide spatially accurate information about the location, condition and integrity of their pipelines.

In addition to recording safety information about pipelines, operators are required to identify high consequence areas (HCA)—areas where a pipe leak or explosion would have an especially adverse effect, such as in an urban area or near a body of water. Once the required information has been collected, it must be provided to the U.S. Department of Transportation's Office of Pipeline Safety (OPS), which is responsible for ensuring the safe, reliable and environmentally sound operation of the nation's pipeline transportation system.

As pipeline operators search for the most effective way to meet the requirements of the Pipeline Safety Improvement Act of 2002, more and more are turning to companies like Tri-Global Technologies, a leading provider of Global Positioning System (GPS) and Geographic Information System (GIS) field solutions for pipeline operators in North America, South America and Central America.

Tri-Global has customized end-to-end pipeline mapping solutions for more than a dozen oil and gas pipeline customers, making it easy for pipeline operators to locate, map and analyze the condition of their underground infrastructure and provide the required information to the OPS.

Prior to utilizing GPS/GIS mapping solutions, field technicians used paper maps and alignment sheets to locate company assets. These hard copy maps were often generated from as-built drawings when a pipeline was originally constructed. As pipeline routes changed or other pipeline infrastructure was added to a route, these hard copy drawings were often not updated or lacked the required spatial information to accurately place it in a GIS database.

Yet another crew would go back out into the field to test the condition of the pipeline with an electromagnetic coating evaluation device. Following each trip to the field, all of the information gathered would have to be entered into the database via the office computer.

In order for the pipeline operators' data to be as useful and manageable as possible, the OPS created the National Pipeline Mapping System (NPMS). The NPMS is a GIS that consists of geospatial and attribute data and metadata related to the interstate and intrastate underground pipeline infrastructure in the U.S.

Now, all pipeline operators with more than 500 miles of pipeline are required to provide geospatial data to the OPS, including maps detailing the GPS location of pipelines, liquefied natural gas facilities and break-out tanks, as well as attributes and metadata in a detailed format that is easily integrated into the NPMS' GIS.

The OPS and local regulation entities perform routine audits, and records must show that lines are being maintained to standards set forth by the OPS. If pipelines owners do not properly maintain their infrastructure, they are subject to fines from the OPS and regulators.

The OPS is harnessing the power of GIS by using the NPMS as a tool for decision support, emergency response, inspection planning, community access, and regulatory compliance. Through visualization, geospatial analysis, and the integration of various databases, the OPS is using the NPMS to help ensure the safe, reliable, and environmentally sound operation of the nation's pipeline infrastructure.

PROJECT HIGHLIGHTS

- Pipeline operators are required to provide geospatial data to the U.S. federal government about exact location, condition of pipes
- National GIS houses all pipeline data
- Tri-Global creates customized direct assessment field software, utilizing Trimble GeoXH handheld for subfoot accuracy

Trimble

Now, using customized direct assessment field software, technicians can automatically capture data calculated by the electromagnetic line locating and above ground coating evaluation tools, such as Radiodetection, onto a Trimble® GeoXH™ rugged GPS handheld receiver. The Trimble GeoXH handheld runs Microsoft® Windows Mobile® software and provides subfoot GPS accuracy.

Because of the use of cathodic protection—a process used to protect metal surfaces from corrosion by making that surface the cathode of an electrochemical cell—underground pipelines generally carry an electrical current. Sensors from Radiodetection, like the RD 4000 and Pipeline Current Mapper, provide the ability to trace the pipeline, calculate the soil depth of cover, measure the voltage gradient, and the current attenuation along the pipeline. Pipeline operators typically record readings every 50-200 feet, and possible external corrosion on the pipeline can be determined by variances in these measurements.

At the end of each day, field technicians return to the office to download spatially accurate details about the location and condition of the pipeline company's field assets from the Trimble GeoXH handheld into a GIS. Once in the GIS, technicians can easily manipulate the data to create maps, graphics and other visual tools to analyze the information collected.

Pipeline operators then use the information to determine exact locations of shallow pipe and where external corrosion on the pipeline may be occurring. Generally, when a pipeline operator relocates a suspected corrosion anomaly, that section of pipe is dug up for further evaluation. From this data, operators can determine the best course of action to be taken for each instance.

Having a spatially accurate record of the exact location of the pipeline infrastructure also makes it easy for operators to continually monitor any suspected defects and check those areas on a regular basis because they know the precise location.

Recent additions to OPS requirements mandate that pipeline operators examine their data every 12 months and determine if there have been any changes. In the event that geospatial, attribute or other data has changed, updated information must be submitted to the NPMS. In addition to making it easier to access and analyze information, having all of the information in a GIS also makes it easier for pipeline operators to compare recent data to a previous year's records.

The streamlined process that allows pipeline operators to store, analyze, and submit infrastructure data to the OPS and having detailed, spatially accurate underground pipeline information in a GIS has created an unexpected benefit for many companies- they are now doing much more work in less time, thus becoming much more efficient. Moreover, with the information in a GIS, pipeline operators can easily share the location of underground pipes to within a foot of accuracy to OneCall systems, so residents and developers know exactly where pipes are located before digging.

THE EQUIPMENT USED ON THIS PROJECT INCLUDES

- GeoXH handheld
- Radiodetection line locators
- Tri-Global UtiliMapper field software

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