

Airborne Natural Gas Emission LIDAR (ANGEL) Service

CASE STUDY

ITT Corp., Space Systems Division, finds new efficiencies in natural-gas leak detection and mapping service after implementing advanced photogrammetric software

Industry: Energy pipelines and storage fields

Background

ITT Space Systems Division provides innovative remote sensing and navigation solutions to commercial and government customers. Leveraging this expertise, ITT developed a new natural-gas leak detection service that provides a safe, cost-effective pipeline inspection tool for a global client base of transmission pipeline operators.

ITT's Airborne Natural Gas Emission LIDAR (ANGEL) Service pinpoints pipeline leaks and emissions that evade current industry and regulatory detection methods. The ANGEL Service provides certified findings, including unique, GIS-ready datasets and georeferenced digital imagery. ANGEL Service deliverables complement and enhance pipeline integrity management and operations and maintenance service findings while helping to meet today's tougher regulatory requirements.

The challenge

Transmission pipeline customers demand high-quality results, with few false alarms, as quickly as possible. It is essential that the customer promptly discovers pipeline leaks or ruptures and avoids risks to public and environmental safety. Natural-gas pipeline leaks can be caused by imperfect or aged pipeline welds, construction defects, corrosion, third-party ruptures, and a variety of other natural or man-made situations.

Today's prevailing method for finding pipeline leaks involves operators walking adjacent to the pipeline with handheld devices to check for leaks. Though reliable, this method is time-consuming, strenuous, provides a limited coverage of the pipeline, and can be hazardous. However, many gas companies continue to use the method, walking along thousands of miles of transmission pipeline per year to collect small quantities of data. Information retrieved from these manual surveys is recorded, with leak detection reports taking two to four weeks to complete. Other companies rely heavily on visual observations of pipeline corridor conditions, fundamentally looking for secondary indicators such as discolored or stressed vegetation.

The solution

The ANGEL Service is an advanced gas leak detection service that can survey pipeline infrastructure quickly and effectively by collecting a combination of differential absorption LIDAR (DIAL) and high-spatial-resolution imagery. From an aerial platform flying at speeds in excess of 100 mph, the ANGEL Service can survey hundreds of miles of pipeline corridors per day. The ANGEL Service geospatial data processing team then analyzes the raw DIAL data by employing operationally tested algorithms to minimize false alarms to the customer. The end product is a vector-based GIS data layer that pinpoints leak locations. To yield a complete leak detection report, leak locations are identified by an analyst, then integrated



Multi-sensor visualization of detected natural-gas emission

“We’ve been using SOCET SET® for about two years now. Our efficiency has dramatically increased, our workflow has been simplified and, our product to the customer has increased in accuracy. A part of my job just got easier and the end product improved — that is always appreciated.”

Jeff Wible,
Image Scientist
ITT Space Systems Division

with orthorectified, high-resolution imagery to provide precise leak location and contextual information that allows pipeline managers to prioritize response and assess potential threats to public or environmental safety. The ANGEL Service offers significant time savings and improved efficiency over traditional methods. It eliminates the lengthy process of walking miles of pipeline to check for leaks, delivering results in as little as 24 hours.

To build finished products to include in pipeline surveys and reports, the ITT ANGEL Service team uses BAE Systems' SOCET SET® digital photogrammetry suite — a powerful tool for triangulation, DEM extraction, and orthorectification. SOCET SET was selected based on its reputation as a reliable software package that handles large quantities of data, streamlines multiple processing steps, and can import a variety of image formats from different sources.

SOCET SET's batch processing functionality allows the ITT team to process many large image files simultaneously. These CPU-intensive projects are generally set up in the evening or during weekends, when demands on the network are low, and scheduled to finish the next morning or workday. During orthomosaic processing, the images are enhanced using SOCET SET's tools for seam smoothing and feathering, dodging and balancing, and dynamic range adjustment.

Conclusion

With its ANGEL Service, ITT has introduced the most advanced natural-gas detection, imaging, and mapping service available. The ANGEL Service provides a quick and efficient way to detect leaks and preserve pipeline integrity, reduce operational costs, increase pipeline safety, and safeguard the environment.

Moreover, the addition of BAE Systems' SOCET SET software has enabled ITT to transfer its expertise in imaging and remote sensing to an effective pipeline inspection and regulation service. The use of DIAL data is a revolutionary way of detecting gas leaks. Tools such as SOCET SET are instrumental in processing data more efficiently and fusing geospatial data sets together, allowing engineers to report quickly on potentially lethal conditions.

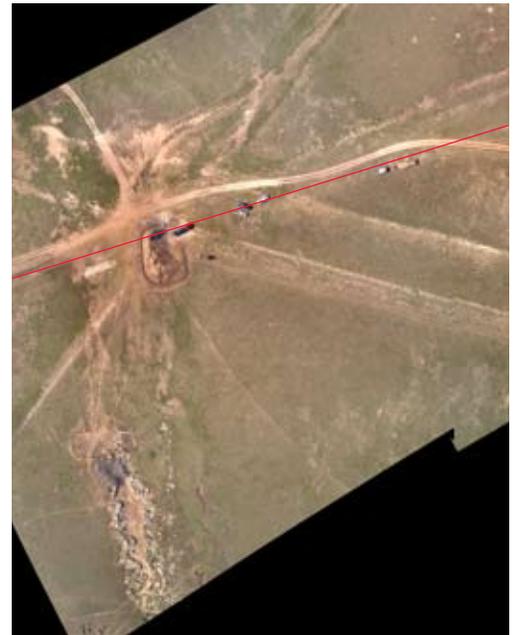
In the energy pipeline industry, where any leak can signal a potential catastrophe, every minute counts.

About ITT

ITT Corp. (www.itt.com) is a diversified high-technology engineering and manufacturing company dedicated to creating more livable environments, enabling communications and providing protection and safety. The company plays an important role in vital markets including water and fluids management, global defense and security, and motion and flow control. ITT employs approximately 40,000 people serving customers in more than 50 countries. Headquartered in White Plains, N.Y., the company generated \$9 billion in 2007 sales.



More information is available at the ANGEL Service web site:
<http://www.ssd.itt.com/angel>



Orthomosaic of pipeline corridor showing buried pipeline vector



Pipeline under repair

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