

Smooth Dataflow Assures Smooth Oil Flow

Highlights

- o Incident tracking system database in SQL is linked to permit mapping via a Web browser.
- o Oracle's Enterprise Asset Management software manages storage tank data and makes it accessible through GIS.
- o The GIS-based front end is integrated with the back-office ERP.

Houston, Texas-based Plains All American Pipeline, L.P., handles more than 3 million barrels per day of crude oil, refined products, and liquefied petroleum gas—through 20,000 miles of pipeline and gathering systems in North America.

Strictly enforced federal regulations regarding the storage and transportation of crude oil require sophisticated IT systems that manage and monitor every barrel of crude oil in the possession of oil transportation companies, such as Plains. During the long process from extraction to refining, crude oil is pumped through the company's intricate system of closely monitored storage tanks and distribution pipes that help maintain an uninterrupted flow of petroleum products to both industry and individual consumers.

Through a series of acquisitions and mergers during the past seven years, Plains has increased its storage capacity from 10 million to approximately 61 million barrels and expanded its pipeline network from 2,800 to 20,000 miles, making it one of the largest independent oil transportation and storage companies in North America.

When John Waldeck, GIS manager at Plains, joined the company in August 2003, it was still using hard-copy maps for managing and monitoring its pipelines.



Plains' St. James Tank Terminal is adjacent to the Mississippi River near St. James, Louisiana.



View of Plains' pipelines and tank terminal in Martinez, California.

Comments Waldeck, "Rapid expansion has provided Plains with many opportunities but also the challenge of integrating various disparate work methods, data sources, and standards."

Waldeck quickly recognized the need to automate these processes, and after much review, Plains standardized its enterprise system on a full suite of ArcGIS software products. This allows Plains to collect and manage the linear asset data regarding the location and condition of its pipelines.

"Our GIS is currently driven toward satisfying regulatory compliance requirements," says Waldeck. "We are using it as a resource for day-to-day operations, pipeline integrity, pipeline mileage reporting, business development and marketing, risk analysis, and automated one call."

The company developed a link to its incident tracking system database in SQL to permit mapping, via an ArcGIS intranet Web browser, of any incident that occurs and to aid in the evaluation of what impact it may have on any potential high-consequence areas. In addition, Plains uses Oracle's Enterprise Asset Management (eAM) software to manage its storage tank attribute data, and that data is accessible through the GIS mapping system.



A liquid distribution manifold system at the James Terminal.

"A key challenge to this IT strategy was integrating the two systems," explains Doug Salvatore, GIS project coordinator at Plains. "All the various records for the tanks were compiled into a single database that is accessed by Oracle's asset management system. The database maintains more than 100 attributes of the tanks, including such things as the size, type, diameter, height, ownership, and inspection details. It tells us the required frequency of inspections and generates work orders for the Operations Group to go out and perform the inspections when required. However, the database had no geospatial attributes, which necessitated its integration with ArcGIS."

"By georeferencing our tanks using aerial survey data and plot plans, we were able to apply a latitude-longitude measurement to each tank. Including this measurement with our unique tank asset identification number in the data table provided access to the Oracle data through ArcGIS by utilizing an attributed link into our geodatabase. Using existing APIs from Oracle helped create and maintain the link between the GIS and eAM. This gives us a GIS-based front end and its

viewing and analytical capabilities integrated with our back-office ERP [enterprise resource planning] maintenance management system."

For its next stage, Plains is continuing the development of its GIS applications and developing greater links between the ArcGIS and eAM software. The pipeline assets are being loaded with links to the GIS pipeline segments. This is important because the pipeline industry is carefully monitored by the U.S. Department of Transportation (DOT).

"This will allow us to track work orders for inspections and repairs against specific segments of the pipe in eAM with a spatial view using an ArcGIS link," explains Salvatore.

The U.S. DOT oversees oil transportation companies through its Pipeline and Hazardous Materials Safety Administration (PHMSA) (see related article "[U.S. DOT Provides Secure Access to the Nation's Pipeline Data with GIS](#)").

PHMSA is the federal agency charged with the safe and secure movement of almost one million daily shipments of hazardous materials

by all modes of transportation. It also supervises the nation's pipeline infrastructure. DOT lines are pipelines directly regulated by the agency that are normally 8 5/8 inches or greater in diameter or routed through an urban area. (State agencies regulate those pipelines that remain within their borders. Their regulations are similar to those of DOT.) Since pipelines often stretch for hundreds of miles and across state lines, the monitoring process is fairly complex. Operators are required to submit geospatial data to PHMSA's National Pipeline Mapping System regarding the location of these lines to meet requirements.

Pipeline monitoring is an ongoing and complicated activity with between 15 and 20 different regulatory requirements specified for every part of the entire system to satisfy both environmental and security concerns. For example, the vast majority of the pipelines that Plains operates are inspected from the air with weekly overflights.

Waldeck indicates that he would like to tie Plains' right-of-way ownership database, which provides easement information for the company's pipeline network, into the GIS at some point in the near future. Comments Waldeck, "This is particularly important for the DOT lines because of the public awareness program required by the Department of Transportation."



This pump at the St. James Terminal has a 27,000 barrel-per-hour capacity.

Regarding the future, Waldeck explains that Plains plans to continue expanding the use of GIS pipeline monitoring by including its integrity management data currently maintained by the company's Pipeline Integrity Group.

More Information

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