Covering your assets

Beth Ann McCoy, Advantica, USA, presents a new solution for maintaining a healthy pipeline amidst increasingly stringent regulations and legislation.

Asset integrity and its associated data are the livelihood of gas distribution and transmission operating companies. Information surrounding safety, operability, performance, cost efficiency and regulatory compliance is vital to network survival.

In recent years, government bodies have challenged natural gas and liquid pipeline owners and operators to be more attentive to the safe operation of transmission pipelines. New US legislation requires that owners and operators develop and maintain integrity management plans (IMP) to validate pipeline safety efforts and comply with local policy and state and federal regulations.

US Department of Transportation regulations stipulate that operators must develop improved management and analysis processes that integrate all available integrity related data and information, and assess the risks associated with segments that can affect high consequence areas (HCAs). Furthermore, operators must implement additional risk control measures if needed to protect HCAs[1]. As part of those processes, owners and operators must incorporate existing data; connect relevant data from disparate systems; ensure accuracy and track and manage current integrity data; as well as changes to those data.

The legislation has spurred pipeline owners and operators to adopt plans that will not only meet regulatory guidelines, but also improve plant and pipeline safety and efficiency. As a result, technology companies across the globe have launched a flurry of development to create integrity information management solutions to meet operators' needs.

The new solution

Advantica's Uptime™ solution is among the newly developed products entering the marketplace. Uptime is a suite of integrity management products, which combine decision support tools with a data management system to address pipeline risk and integrity management issues related to regulatory compliance and system optimisation.

An ESRI® based application centered on the ArcGIS™ Pipeline Data Model (APDM), the software's level of functionality is contingent upon the level of product licensed. It can be applied as a single user desktop application or can be scaled to an enterprise implementation using an Oracle® or SQL server database management system.

The software tool operates on top of the GIS application and its related tools to identify and report on credible threats of pipeline failure and associated consequences, and to maintain network integrity and demonstrate regulatory compliance.

The solution is comprised of the core Uptime software

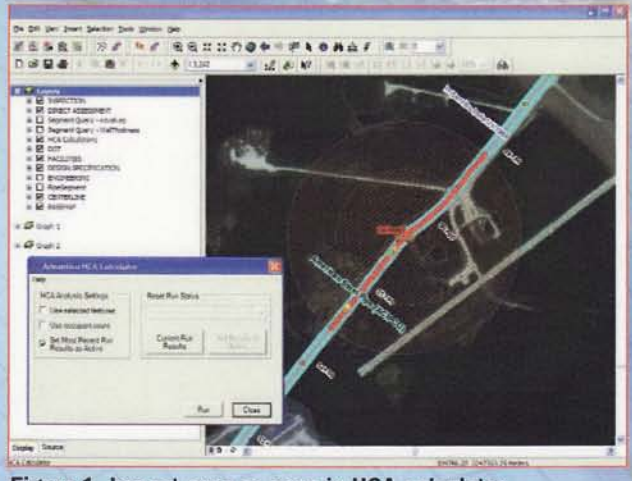

Figure 1. Impact area as seen in HCA calculator.

and a suite of optional applications. Central to the base application is a data repository and management system that stores all pipeline integrity information. The database can serve as an exclusive data warehouse or can be integrated with existing databases, GIS or CAD systems. Users can add data to the repository at any time and integrate different or disparate data sources. The centralised database facilitates decision making from the most up-to-date and comprehensive data available, increases the auditability of user decisions and reduces data input errors.

The data management system includes a data display that provides an ArcGIS map built from the pipe and facilities database and links to basemaps, aerial images and other available information. This map forms the basic template from which project or task data displays are configured. The data management system resides in the Data Manager module (one of three separate Uptime modules) along with Survey Manager and Risk Manager and their respective modules.

Uses and benefits

The Survey Manager enables users to query and analyse imported direct assessment (DA) and inline inspection survey information. Its DA Data Analyser and Excavation Manager components allow users to interact with inline inspection data and build integrity reports for any location where defects or abnormalities are reported.

Uptime's Risk Manager allows users to define high consequence areas (HCAs), assess threats to a pipeline and calculate a quantitative risk related to the pipeline. The quantitative risk assessment approach distinguishes the product by expanding upon the traditional qualitative ranking method. The quantitative analyses address both the probability ranking of pipe failure along with potential consequences, should failure occur. Risk Manager contains an integrated calculation tool to determine a pipeline's HCA by using the pipeline diameter to identify a potential impact radius and the location of structures or identified sites within that radius.

It also contains a Threat Assessment module that allows operators to identify credible threats for a particular pipeline as identified by the nine categories addressed in ASME B31.8S: external and internal corrosion; manufacturing; construction; equipment; third party damage; incorrect operations; weather/outside forces; and stress corrosion cracking. Results of the assessment are stored in the central pipeline integrity storage area.

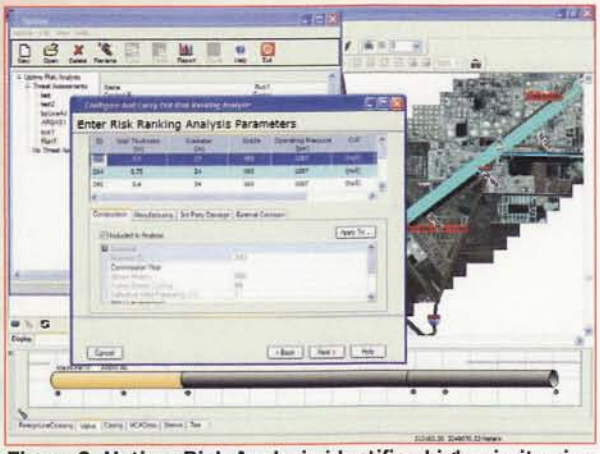

Figure 2. Uptime Risk Analysis identifies high priority pipe segments.

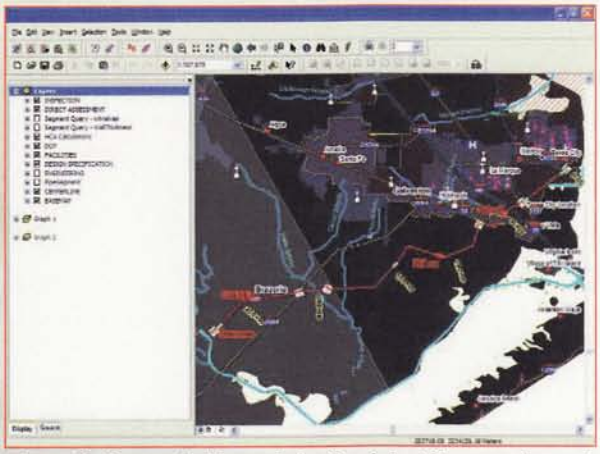

Figure 3. Geospatial based pipeline integrity management system display.

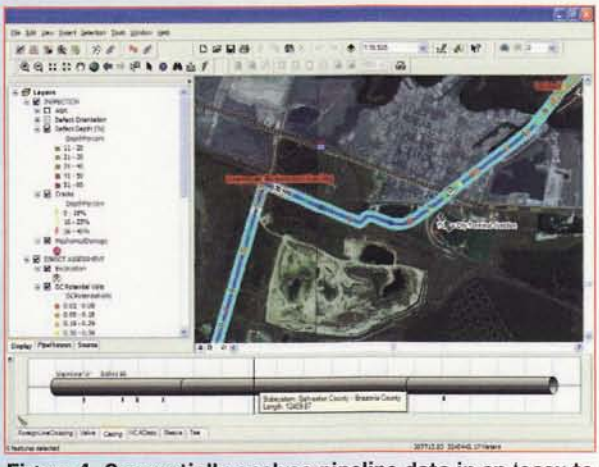

Figure 4. Geospatially analyse pipeline data in an 'easy to use' GIS interface.

Companies with multiple and diverse assets have greater cause for caution when selecting a pipeline integrity information management system. Without the right solution, an operator can overspend its needs or overlook integral issues that need to be addressed.

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Consolidated Edison Co. of New York, Inc. (Con Edison) recently contracted Advantica to design and implement a pipeline integrity information management system (PIIMS) using Uptime. The PIIMS will encompass 50 miles of transmission pipeline and 30 miles of distribution mains operating at or above 125 psig in Con Edison's service territory in New York City and Westchester County. All pipelines to be addressed by the PIIMS are considered to be in HCAs. Advantica proposed the Uptime solution together with custom applications to meet the integrity program and regulatory compliance needs.

The problem solved

The Con Edison solution is designed to provide a comprehensive information management system that complies with the Pipeline Safety Improvement Act of 2002. Specifically, the company required a solution that would enable it to:

- Evaluate pipeline condition and threats.
- Protect against pipeline failure.
- Address transmission assets.

The plan calls for close collaboration with Con Edison staff to ensure proper data configuration and customisation and model development. Through information gathered during initial discovery phases, Advantica will design and implement the core PIIMS system, including infrastructure design and development; underlying data model development; legacy and existing pipeline integrity data collection; and Uptime data and integrity management product installation and training.

Firstly, the conversion of basemap and pipeline

integrity data into the PIIMS format is carried out. Con Edison plans to use licensed New York City and Westchester County basemaps containing street centreline; tax parcels; buildings; and addresses. Its pipeline integrity data will be captured from GPS field surveys; mains and service (M&S) plates; corrosion survey maps; and 'as constructed' maps. The converted data form the basis of Uptime's ArcGIS mapping system, which provides a template from which modelling projects and tasks will be configured. After the data have been converted and quality tested, they will be loaded into the Con Edison production environment. Uptime will also interface with existing Con Edison programs to continually update pipeline integrity data in the PIIMS, including:

- Flow Model Analysis to identify critical angles where internal corrosion may exist.
- Gas Information System to provide valve and corrosion inspection results.
- One Call to help identify potential third party encroachments.
- Field data collection of direct assessment survey results.
- Document Management to attach and display reports and images with specific assets and events.
- Pipeline Patrol to incorporate findings from periodic pipeline patrols.
- Risk Ranking to perform risk analysis using the most current data set and store historical and 'what if' results.

When the data interfaces have been established, Advantica's solution can support Con Edison's integrity process. All data will be maintained in a single repository to provide access to up-to-date data for modelling. The solution will allow Con Edison to build routes that display individual attributes or a combination of attributes contained in the database and import, align and store survey results.

The company will also be able to identify locations to assess the condition of selected pipes, generate excavation priorities and schedule integrity inspections based upon its findings. Using specific variables, it can execute risk ranking procedures and perform and record the results of pipeline patrols. It can also collect and access data from the field and generate regulatory reports.

With all data collected, stored and maintained in a central location, Con Edison can meet and exceed the required elements of government pipeline integrity information management programs. The tools offered through a comprehensive PIIMS solution provide a data management system that also connects to relevant external systems and exploits that data to help analyse and assess pipeline condition.

Conclusion

Well designed integrity management programs can offer pipeline owners and operators the tools and knowledge to maintain compliance, reduce pipeline failures and minimise costs. PIIMS not only provides the data management that incorporates all existing useful data, but also links relevant systems and tracks and manages data. Through implementation of the Uptime PIIMS, Con Edison can enhance its integrity management program and fully satisfy regulations.

References

1. United States Dept. of Transportation. Research and Special Programs Administration 49 CFR Part 192 Pipeline Safety: Pipeline Integrity Management in High Consequence Areas (Gas Transmission Pipelines); Proposed Rule. Washington: Federal Register, Vol. 68 No. 18, 2003.