



GIS - THE PERFECT TOOL FOR PIPELINE MANAGEMENT

PIPELINE NETWORKS ARE EVER MORE COMPLEX, OIL AND WATER GROW SCARCER AND MORE VALUABLE - C&C PIPELINE MANAGEMENT SYSTEM DEPENDS UPON GIS

A consequence of the rising prices of oil & gas, which started their march northwards at the end of 2003, is that the integrity of the pipeline network that carries these increasingly rare and precious commodities becomes more and more important. Pipeline managers must be able to locate every feature of their network quickly and accurately to ensure that they can not only remedy problems when they happen but plan maintenance effectively to stop these events happening at all. Many pipeline networks are ageing and failures will not only have economic consequences but, as recent spills have shown, bring further censure and regulation to an industry that has historically been left to its own devices.

In addition to economic arguments for the need for better management of pipeline networks, other considerations, including political (pipelines cross international borders), environmental ("What-if" modelling) and practical (how to get to the pipeline) mean that a customised software is a vital tool.

A GIS is the perfect application to manage a pipeline network and offers so many benefits over a relational database or CAD program, just the simple act of adding an aerial photograph to the map view of a pipeline can provide a vast range of new information to the field crews. That said, design, implementation and management of transmission pipelines presents companies with a unique set of challenges and the GIS used must be specifically designed to overcome these (see Box 1 regarding Stationing).

Coler & Colantonio Inc, based just south of Boston, Massachusetts has been providing just such GIS based pipeline facility management



tools for twenty years and their software is now used by oil and gas companies across the United States and throughout Canada. With over 200 people dedicated to supporting their customers, Coler & Colantonio Inc. is now expanding its horizons by opening a UK office. Through their partnership with the London based geospatial sales and marketing agency Quarry One Eleven, Coler & Colantonio will now be bringing their expertise to pipeline managers throughout the rest of the World.

Coler & Colantonio Inc.'s core pipeline management system is called Intrepid™ and is a perfect example of how GIS is being used by Oil & Gas companies to monitor the complete life cycle of their pipeline networks. Based on ESRI technology, Intrepid™ can bring information together from within the company, from third party data suppliers (road networks, aerial photographs etc.) and from within the pipe itself (in-line-inspection data are provided by remote controlled 'pigs' that travel inside the pipeline).

Pipeline management tends to break into three areas;

Field Acquisition: Where field workers used to use notebooks and pencils to record information about the planning and installation of new pipelines, now all users can input data on handheld PDAs and laptops. Integration with GPS instruments means that the collection of the location information is so much simpler as well. This information is then uploaded to a central data repository and field workers can receive back all other updates from the length of the pipeline. Collecting 'As-Built' survey data accurately is vital to the final usefulness of a pipeline database and hence these field tools must be simple to use, robust and integrate seamlessly with the rest of the tools that manage and analyse the network.

Facility Management: With the pipeline network in place, day-to-day management and maintenance schedules can be driven from the central database and integrated with



NEXT STATION PLEASE

When a pipeline is created the relationship between the ditch within which the pipe lies, the ground surface and the pipeline itself poses a number of problems when it comes to defining how a feature is located. The World, unlike a map, is not flat! Pipeline mapstations are used as a way to create addresses along a pipeline that record points of interest and to uninitiated their nomenclature can be confusing. From a fixed starting point (0+00) stations are measured along the top of the pipeline (Slope Stationing) and recorded in units of 100 feet from the starting point: 3+00 denotes a feature 300 feet from the starting point (metric units can just as easily be used). This method is used because in a mile of horizontal map distance and due to variations underground terrain, it could be that there is a mile and half of pipeline

TWO TO BECOME ONE?

As is often the way with many industries, the pipeline database model has been described by a number of 'standards' throughout the years – these include the Pipeline Open Data System (PODS), the Integrated Spatial Analysis Technology, the Industry Standard Pipeline Management and the ArcGIS Pipeline Data Model (APDM). Of these, PODS and APDM are the most widely used and in a recent move, that will hopefully reduce the number of acronyms used in this industry, these two organisations have signed a Memorandum of Understanding to form a close working relationship.

other corporate applications, such as ERP systems which are used to order replacement parts. Additionally, the custom workflows can be used to manage other tasks such as re-routing of pipelines as well as generating Alignment Sheets (detailed maps of the pipelines) and associated documents. The layers of information displayed on the Alignment Sheets will not only be accurate geographical data but numerous datasets of interest to the pipeline engineers such as; pipe construction material, the pipe coating, pipe wall thickness etc.

Data Analysis: A number of recent events have had the effect of increasing the regulations attached to planning new, and managing existing, pipeline networks. These regulations mean that network managers will have to be able to communicate information clearly and quickly with not only regulators, but also the public at large. So in addition to the database model holding geographic information about where the pipeline features actually are, the

network database must also contain additional data layers such as conurbation locations, tax and country boundaries, river basin networks, right of way information etc.

By providing tools that meet the challenges of each of these three areas, Intrepid™ shows how a GIS can be at the heart of the daily business tools used by pipeline managers. Of course each company will have their own workflows and hence customisation and integration with other corporate software is as important as the functionality that is provided out of the box. Coler & Colantonio Inc. works in partnership with each of their clients to ensure that Intrepid™ works in exactly the way they need it to and hence provides a vital tool to manage their pipeline networks around the World.

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