

Optimising Pipeline Surveying Technology



Specialist engineering input, combined with customised software development, has resulted in a pipeline surveying solution that emphasises why partnerships can be so effective. The starting point for this application-specific solution from Capita's property and infrastructure business was a Bluetooth link between an RD8000 cable and pipe locator and KOREC's data collection software.

Capita's property and infrastructure business is one of the UK's leading multidisciplinary consultancies providing a range of design, project delivery, infrastructure, real-estate and business transformation services. Its utilities and industrial division specialises in engineering, design and project management services for a wide range of clients including major UK energy suppliers.

With a strong track record in producing innovative solutions to meet client requirements, Capita has previously worked with precision measurement and software development specialists, KOREC, on a number of utilities based data collection solutions. These have included the introduction of a paperless surveying system for a national utilities risk assessment and replacement programme.

John Hall, Capita business centre manager, quickly identified that the productivity gains achieved in the above contract could be successfully achieved in other application areas if the hardware and software could deliver the specific survey requirements of Capita's utilities clients.

Capita had been contacted by a major UK energy supplier to undertake a survey of a cross-country pipeline in order to assess its integrity. Habitually these surveys are undertaken using manual measurement methods and paper maps, a time-consuming process that not only lacks efficiency and accuracy in the field but also results in extensive back office input to prepare the field information for useable reports.

"This process has numerous drawbacks from the frustrations of working with paper maps in inclement weather conditions to the possibility of typographic errors," explains John Hall. "We are always looking for better ways to get better results and we knew immediately that a different approach to this work would provide our client with a faster, more accurate and more detailed survey. However, whilst we knew that a digital data capture system would be relatively easy to implement, our past experience meant that we were equally sure that it would be the customisations that we could make to existing technology that would really increase our field efficiencies."

Specific Requirements

Line walking surveys require an existing pipeline to be walked regularly in order to record the position and attribute information of any changes in its immediate surroundings. These changes might include subsidence, flooding or construction infringement within a prescribed buffer zone or even insufficient ground coverage of the actual pipe.

An electro-magnetic underground utility tracing device (in this case an RD8000) is used to detect the location and depth to the centre of the pipe. The depth of ground cover above the pipe is then calculated. During the same line walk, additional information is collected to generate condition reports on the pipeline's marker posts, special crossings and other attributes.

"Our initial challenge was finding mapping hardware that could handle the type of map data we use," continues John. "We favour strip maps which incorporate detailed information on only the immediate territory of the pipeline routes in a long narrow strip. They require huge processing power if they are to be handled efficiently in the field and this had already proved problematic in other hand-held devices that we had looked at. We also required a system that could provide consistent decimetre accuracy in the field and a wireless link with the RD8000. This ruled out all smartphone/app type solutions."

Hardware First

Capita looked at several manufacturers' systems but elected to use Trimble's latest hand-held GPS, the Geo7. This is their most advanced hand-held device and the key to its suitability was its huge 1Gb processing power, a pre-requisite for handling the strip maps. It also offered a number of other relevant features including excellent GNSS performance in challenging conditions; the Flightwave remote positioning technology for asset data capture with remote measurement; consistent decimetre accuracy; and a fast, 5 Megapixel camera for recording marker post condition, encroachments etc. The Geo7 was also the perfect platform for KOREC's customisable K-Mobile data collection software.

Customising the System

With the hardware in place, John Hall worked closely with KOREC on the customisations required for the software. “For us the key to this project was always going to lie in a partnership between Capita and KOREC that would see our engineering requirements developed into a user-friendly, application specific, data capture system,” he explains.

Key customisations undertaken by KOREC included:

- Bluetooth link to RD8000 – automatic recording of the pipe location coordinates and depth to the centre of the pipe via the Bluetooth link between the Trimble Geo7 and RD8000. K-Mobile then automatically calculates the depth of ground cover to the top of the pipe.
- Handling of detailed as-built strip maps - whilst the Geo7’s huge 1Gb processing power ensures that it is capable of handling high resolution raster strip maps, K-Mobile was further developed to optimise the display of this mapping data for fast viewing on the Geo’s large, sunlight readable, screen. With paper maps, the surveyor was often reduced to guessing his location in relation to landmarks on the paper map. K-Mobile ensures that the surveyor can now always view an exact position in relation to the pipeline making it almost impossible to stray from the route, hence increasing efficiency.
- Automatic easement buffer creation – Capita surveyors now have a fail-safe method for immediately assessing whether an encroachment is within the pre-programmed easement width simply by walking to it and checking its position with the Geo’s decimetre accuracy. In the past, this was a time-consuming process based on each surveyor’s estimate as to how far the encroachment was from the perceived pipeline location, often resulting in the recording of features that could safely be ignored.

John Hall reports that time savings in the field are already at more than 25%. In the office, data processing and report generation times have been cut by a half. Additionally, the intuitive nature of K-Mobile means that the Capita field team required very little training in the use of the software. There are also significant health and safety benefits to be gained from use of the system due to a function that enables the surveyor’s progress to be tracked at any time during the survey. John also reports that the built-in ‘point and shoot’ laser range finder on the Geo7 is an exceptional addition that ensures that surveyors can accurately record infringements without having to stray from the route of the pipeline, allowing river banks to be avoided along with excavations and flooded areas.

“Our aim was to replace time-consuming manual methods with an automated ‘field – office – client’ paperless and wireless solution,” explains John. “We’ve found KOREC to be flexible, accommodating and responsive in its approach to translating our engineering expertise into a tailor-made solution that can achieve these aims. Our two areas of expertise have come together and the end result is a system capable of producing an accurate, detailed and complete survey that will provide our client with an excellent basis for future projects in a format that can be easily incorporated into their GIS.”

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