

TRANSFORMING THE ACCURACY AND PRECISION OF ON-SITE DATA CAPTURE AND TRANSMISSION

Wales & West Utilities has worked with AMT-SYBEX and Leica Geosystems to build a mobile solution that uses high-precision GNSS equipment to measure and map the exact coordinates of each new pipe as it is laid.

by AMT-SYBEX, part of Capita plc



Wales & West Utilities wanted to find a solution that would take the burden of locating assets away from the user, and provide a precise, unambiguous view of where each pipe is laid.

Image Courtesy: Leica Geosystems

Britain's gas network has a history dating back to the early 1800s; being the world's oldest network means that its gas mains have been upgraded over time, but many thousands of miles of pipelines are still made from cast iron and other ductile metals. These pipes degrade and may eventually fracture, leading to:

1. Gas leaks that impact the environment
2. Reduce efficiency
3. Increase costs, and

4. Can pose a danger to people and buildings.

Wales & West Utilities, an independent network since 2005, operates 35,000 kilometres of gas distribution pipelines that transport gas to 2.5 million homes and businesses throughout Wales and the southwest of England.

To keep its 7.5 million customers safe and warm with gas connections and a gas supply they can rely on, Wales & West Utilities replaces old

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metal gas mains with new, long-lasting plastic ones across Wales and the southwest of England.

As it upgrades its pipes, the company wants to be sure that those new pipes are easy to find and maintain in the future. Wales & West Utilities has worked with AMT-SYBEX and [Leica Geosystems](#) to build a new mobile solution that uses high-precision GNSS equipment to measure and map the exact coordinates of each new pipe as it is laid, as well as capturing important metadata about valves, junctions and other components. Capturing the information digitally has numerous benefits:

- Digital data capture saves time for field engineers and back-office teams
- High-precision GNSS increases the accuracy of asset data and reduces the risk of errors
- Asset data can be transmitted from the field to the office in seconds, not days
- Eliminates paper-based processes, cuts costs and reduces environmental impact
- Future maintenance work should be safer and more efficient due to better location data.

Putting Safety First

Safety is a top priority for Wales & West Utilities. The company invests £1.4 million pounds a week in replacing all old metal gas pipes within 30 metres of buildings with new plastic ones – reducing leakage and improving safety.

Replacing these metal mains with more modern plastic pipes can significantly improve the security and reliability of the network, reducing the risk of leaks and the number of repairs required. For this reason, the Health and Safety Executive has advised all the gas distribution networks to accelerate the replacement of metal main, especially those that are within 30 m of a building.

Wales & West Utilities has taken this

advice on board and is already nearly halfway through a 30-year replacement programme. On average, the company replaces more than 400 km of pipe every year.

Anna Perfect, data quality manager at Wales & West Utilities, comments: “It’s a huge programme, and it’s very important for the business and for the regulator. In addition to capturing the information in the field my team is responsible for validating the data that comes in, keeping our asset repository up to date in our SAP ERP business systems, and producing reports for the regulator about our replacement programme progress.”

Part of the effort is to ensure that when the new pipework is laid, the company updates its asset data to keep track of how the pipes, valves and joints fit together, what they are made of, and where to find them. Recording the position of a pipe accurately may seem like a simple task, but it can create complex problems.

Problems with Paper-Based Processes

Simon Barrett, records officer at Wales & West Utilities, explains: “In the past, our measurement engineers would go out on site with a paper map, a clipboard and a measuring wheel, and would draw the new pipes on the map with measurements relating to above-ground points of reference. For example, the pipe might run parallel

to a road at a distance of 75 centimetres from the kerbstone.

“But what if a few years after we’ve laid the pipe, the road is widened and the kerb moved? Then our reference point is no longer accurate, and our crews could easily end up digging in the wrong place. Or what if we’re laying a pipe somewhere that doesn’t have any convenient reference points nearby, such as the middle of a field?” After the initial data was captured, the downstream processes were also laborious. The engineers would scale up their field sketches and draw the new pipes on a larger map, which they would post to head office. Then the head office team would review the map and enter the data into the company’s central mapping system, Esri.

“We had to wait days for the latest information to arrive from the field, and processing the data was time-consuming for everyone,” adds Perfect. “We also used a lot of paper, which was wasteful and impractical. Our measurement engineers need to be able to work outdoors in any conditions, and when it’s raining or windy, dealing with paper maps can be a big problem.”

Finding A Solution

Wales & West Utilities wanted to find a solution that would take the burden of locating assets away from the user, and provide a precise, unambiguous view of where each



Figure 1. mobile solution that uses high-precision GNSS equipment to measure and map the exact coordinates of each new pipe as it is laid

pipe is laid. It also wanted to digitise the whole workflow and reduce manual effort at every stage.

"For a few years, our leakage teams have been using a mobile solution called Affinity Geofield from AMT-SYBEX, which gives them access to accurate mapping data while they're working on-site - even if they're in a remote area where they don't have a mobile data connection," says Barrett. "When we saw that Geofield could be used for drawing assets too, we saw its potential to help with some of our paperwork issues."

To solve the other half of the problem, the company decided to use Leica Zeno, high-precision GNSS equipment from Leica Geosystems, to locate each pipe's geographical coordinates to an accuracy of centimetres. However, integrating the Zeno GNSS hardware with Geofield would be a first-of-its-kind project.

"One of the biggest challenges was to ensure that the system would still work even if our measurement engineers lost their data connection," explains Barrett. "Normally, the

system works by using HxGN SmartNet Real-Time Kinematic GNSS services. The engineer holds a receiver, which takes positional data from a constellation of GNSS satellites. These readings are then compared with the readings taken by nearby base stations, whose precise locations are already known. By comparing the two, you can correct any errors in the readings and achieve incredible accuracy.

"However, if you don't have a mobile data connection to the base station, you can't compare the readings, so you can't do the correction. Since our

engineers often work in remote areas where there's little or no mobile phone signal, this was potentially a big problem."

The project team solved this challenge by building a post-processing feature - if Geofield can't find a mobile data connection, it will store all of the uncorrected readings from Zeno equipment locally until the connection is re-established. Once connectivity is restored, it can then process all of the readings in a batch, and provide accurate, corrected geo-positioned data.



Figure 2. High-Precision GNSS Equipment From Leica Geosystems.

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