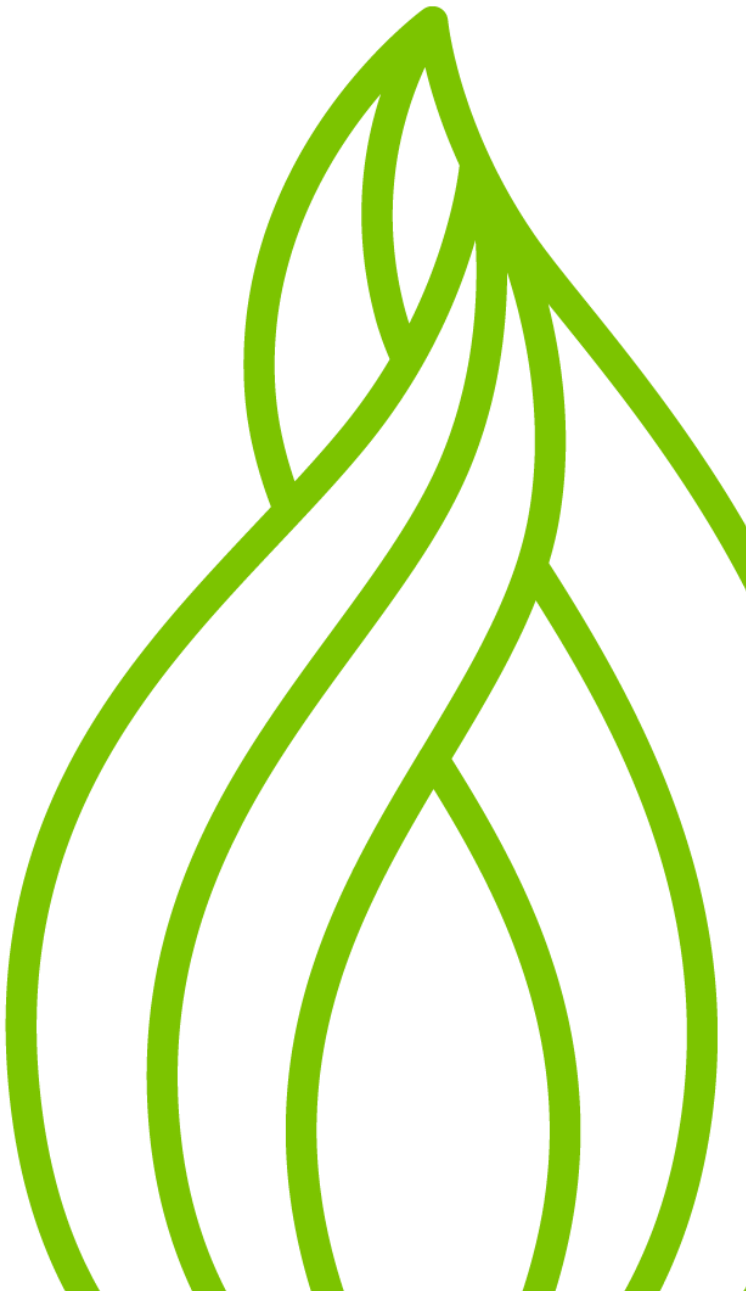
national gas transmission

BIM (Building Information Modelling)

Value Tracking Case Study



BIM (Building Information Modelling)

Background

Building Information Modelling (BIM) is the process used for pegging cost and carbon data to 3D models throughout the design, construction and maintenance of an asset. Asset owners can store the models and data for reuse on future projects. Advanced spatial survey techniques, in particular laser scanning and photogrammetry, has enhanced the work done by NGT under BIM.

These techniques provide an accurate “as-is” visual representation of the site. This type of representative survey is crucial in removing ambiguity between conflicting historical records.

What’s new?

The objectives of the BIM demonstration were to identify efficiencies and savings in cost, carbon impact, project schedule and operational expenditure. Using BIM, clash detection for both space and time can be undertaken. This is a clear advantage over traditional methods, allowing us to test various construction methods and sequences, proving the site logistics are valid and the construction timeframe is achievable.

Laser scanning was identified as an immediate solution to improve visualisation because of the high accuracy of the returned information, and the reasonable costs and fast generation of the site models. The development of a standard for laser scanning has allowed the technique to be quickly adopted for business-as-usual asset health works such as Feeder 9, Bacton and the Emissions Reduction Programme (ERP), as well as on new innovation projects.

Key advantages in using the BIM technique come through in the early stages of generating and assessing design options, which are often very different from the conventional solutions.

The benefits

BIM at Peterborough & Huntingdon

Upgrade works at Peterborough and Huntingdon compressor stations are underway as part of our ERP. To complete the work safely without lengthy station outages, it is necessary to extend the boundary of both sites onto adjacent land to fit new vent stacks. This land would need to be secured, with an extension to the existing Integrated Site Security (ISS). ISS is a costly enhanced security measure that consists of electrified fencing and monitoring capabilities including high resolution cameras and lighting which feeds back to a central control system in our control room. The cost to extend the existing ISS measures on each site would have been £2.7m for Peterborough and £2.2m for Huntingdon.

To identify potential alternatives to the conventional option, we held a challenge and review session using 3D laser scans of the sites fed into the BIM tool, Navisworks. This allowed our engineers to review the site from different angles and perspectives using 3D models in real-time to identify opportunities that may not have been clear using traditional 2D alternatives. A second option was identified, which removed the need to extend the ISS measures onto the adjacent land. Instead, standard security fencing would be installed and a contingency plan put in place to ensure full operation of the vent stack within 28 days. This alternative option greatly reduced the cost for both sites (£1.85m at Peterborough and £1.25m at Huntingdon).

Financial savings

Following further analysis by our team of experts to evaluate this new approach, approval was granted and work is now underway to complete the detailed design at both sites. BIM unlocked the opportunity associated with alternative options and as a result avoided the need to extend existing costly ISS measures. In total this has saved £3.1m (Peterborough: £1.85m; Huntingdon: £1.25m).

The benefits

BIM at Bacton

Bacton is a large gas terminal on the NTS which had been identified as one of three sites suitable for a trial run of an inline inspection robot. The robot is being developed as part of Project GRAID, and will be used to inspect buried pipework on large NTS sites. Laser scanning and 3D modelling of the Bacton site was undertaken as part of the works to ready the site for inline inspection with the GRAID robot. The extent of the benefits of having a 3D model of Bacton became clear once asset health works got under way.

These works included the isolation of two incoming pipes from the ENI sub-terminal into the Bacton site ring main and modifications to the pipe manifold. The pipes had been out of service for some time and were beyond their design life. The isolation of the ENI pipes from the other incoming sub-terminals required significant engineering works. Using the Bacton BIM model, the manifold for disconnecting the ENI terminal pipes was designed, built offsite in Leeds and then transported to site to be connected.

Financial savings

The use of the Bacton site 3D model on just this one occasion has realised savings of £647k compared to the conventional alternative. A traditional approach would have involved extensive manual work using engineering line drawings with a greater degree of uncertainty. Laser scanning and building an accurate model enabled off-site construction, which as well as saving costs, increased the safety and lowered the risk of the work, with less time spent on construction activities on a high-pressure gas site.

Implementation

To date BIM has delivered £4.6m in cost efficiencies and has been rolled out across the business. The new techniques have improved the overall process with use of 3D models and has been recognised by our team:

"The use of 3D models on some of the more complex aspects of the design ensured we provided accurate cost estimates in the short time frame we had available"
Martin Gould, Managing Estimator, NGT

"BIM is fundamentally changing our project management and delivery practices and we are now evaluating the impact on our asset management techniques"
Paul Lee, Investment Scheme Manager, NGT

Next steps are to build on the work to date and explore further opportunities to develop techniques and utilise new technologies.