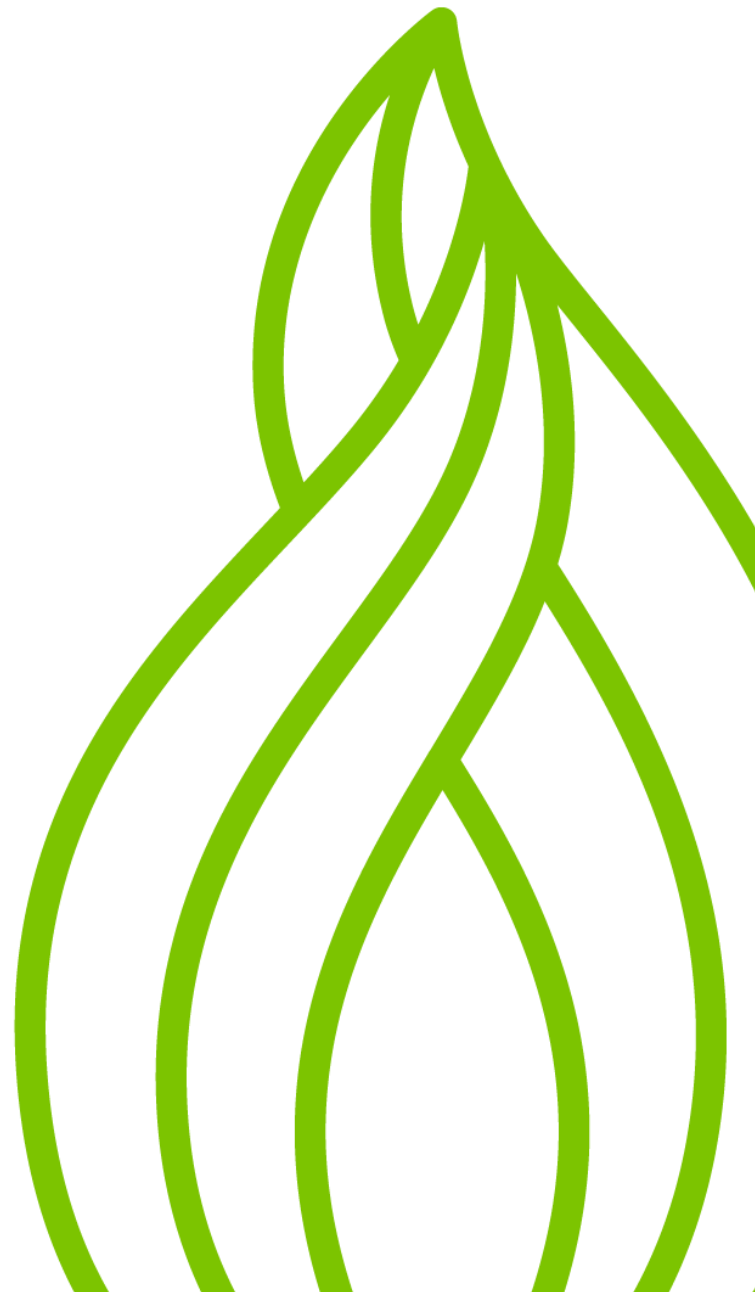




Over Mesh Pipeline Protection

Value Tracking Case Study



Over Mesh Pipeline Protection

Background

National Gas Transmission (NGT) wished to investigate the use of geo-grid installed above a pipeline to protect against intervention, as third party damage is the highest risk to the National Transmission gas pipelines. The costs of repairs and disruption are always significant, typically in the range of £30k to millions especially if the pipeline has to be shut down whilst the damage is repaired.

Reduced depth of cover and shallow ditch crossing are increasingly being identified e.g. from pipeline walking surveys. Several innovation projects have been progressed to mitigate against third party damage, e.g. the use of PE slabs and in-line depth of cover assessments (NIA_NGGT0085). PE slabs have been successfully implemented as an impact protection measure for NTS pipelines that cross ditches at a shallow depth. The curved PE (NIA_NGGT0097) will protect the shallow pipelines in fields against damage caused by agricultural activity.

Following the success of PE slabs, it has been identified that in the case of new installation and diversions, there is currently no protection routinely placed above pipelines to deter damage.

Arising from research for these innovation projects, the 'overpipe' net solution, already in use in parts of Europe, was identified. The technology comprises of a high strength yellow geo-fibre net grid that is very visible to excavator operators whilst restricting the dig capabilities of the excavator bucket if snared and hence minimising the likelihood of deeper excavation.

A study carried out by Gaz de France determined that earth moving construction machinery represents the majority of risks to which a pipeline is subjected. Protection placed above the pipeline, in addition to the modest load distribution role during the passage of construction machinery, can reduce this type of risk by informing the earthmoving construction machinery operator. The difference in resistance between the ground and the mechanical protection alerts the construction machinery operator of the presences of an underground construction and encourages prudence.

What's new?

To understand the effectiveness of the geo-grid a series of tests using an excavator was performed on a grid installed above a pipeline.

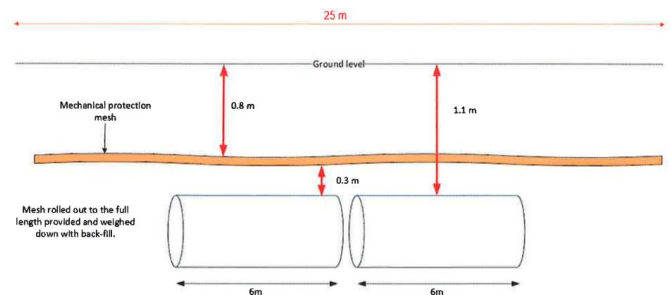


Figure 4: Installation diagram for mechanical protection mesh

Testing was carried out on two samples of the protection mesh, one intended as a warning in the event of third-party interference, and a second was to provide mechanical protection from an excavator with a capacity up to 18 tonnes. Both meshes were installed; the warning mesh was installed under 0.5m of backfill and the mechanical mesh installed 0.3m above a 12m section of pipework and 0.8 m below ground level. The initial test was carried out using a 15-tonne excavator and then repeated with a 22-tonne excavator. When the excavators encountered both the warning and mechanical protection mesh it provided an indication to the excavator driver.



An attempt was made to pull the warning mesh out; this could not be achieved although the mesh did start to shred but did not snap. The mechanical protection mesh resisted attack with both the 15 and 22 tonne excavators and the pipe was undamaged following the tests.

The study has successfully demonstrated that the use of two different types of protection meshes provide an appropriate protection method against third party interference from large site excavators typical on many large construction sites. Smaller and much more frequently used 'JCB' sized excavators would certainly be resisted by the mesh. The availability of the two types of mesh, as a warning or the heavy-duty protection mesh provides options for different circumstances

The benefits

Fixed pipeline protection systems are designed and implemented to minimise the accidental damage. Applying the over pipe geo-grid solution will offer another technique to mitigate potential pipeline damage. The system will ensure cost avoidance in not having to repair/ replace damaged pipeline in the network. This will also avoid outages to complete any necessary repairs and improve safety by mitigating the risk.

Financial savings

It has been identified that an installation of the Over Mesh system will cost £18,750 and the repair of a damaged section of pipeline (including labour, materials, etc) will cost approx. £96,500. This provides a saving of approx. £77,750 per incident.

Implementation

Equipment has been rolled out across NGT and benefits to be tracked with recorded benefits. Further lessons learnt to be logged from these

instances and any further opportunities to explore with Subject Matter Experts.

