NIC Robotics

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SGN
Your gas. Our network.

Presentation Content

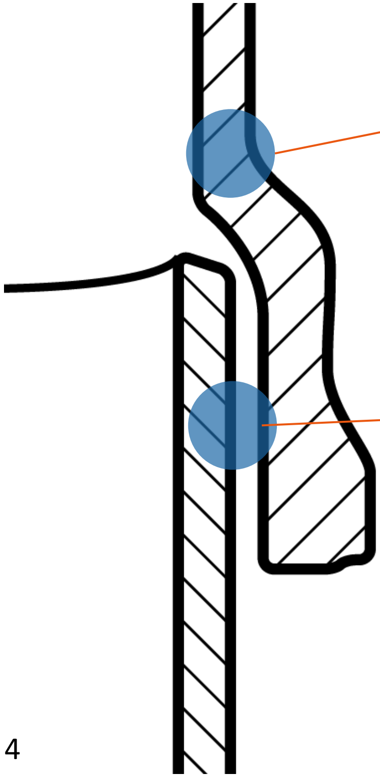
1. Background of Robotics
2. The NIC Robotics Project
3. Social Impacts

SGN

Background

- Gas networks in the UK operate over thousands of miles of metallic gas distribution pipe
- Every year, these mains require repair or replacement
- Costs of repair and/or replacement is prohibitively expensive and creates disruption to our customers
- Current repair methods include:
    - Excavation and encapsulation of individual joints
    - External anaerobic injection
    - Full mains replacment

Medium/Large Diameter Cast Iron



Medium and large diameter cast iron pipe is proven to be highly resistant to failure

Failure is most likely to occur at the joints due to heavier traffic loads, thermal expansion/contraction and loss of saturation in the jute/yarn

SGN’s Investement in Robotics

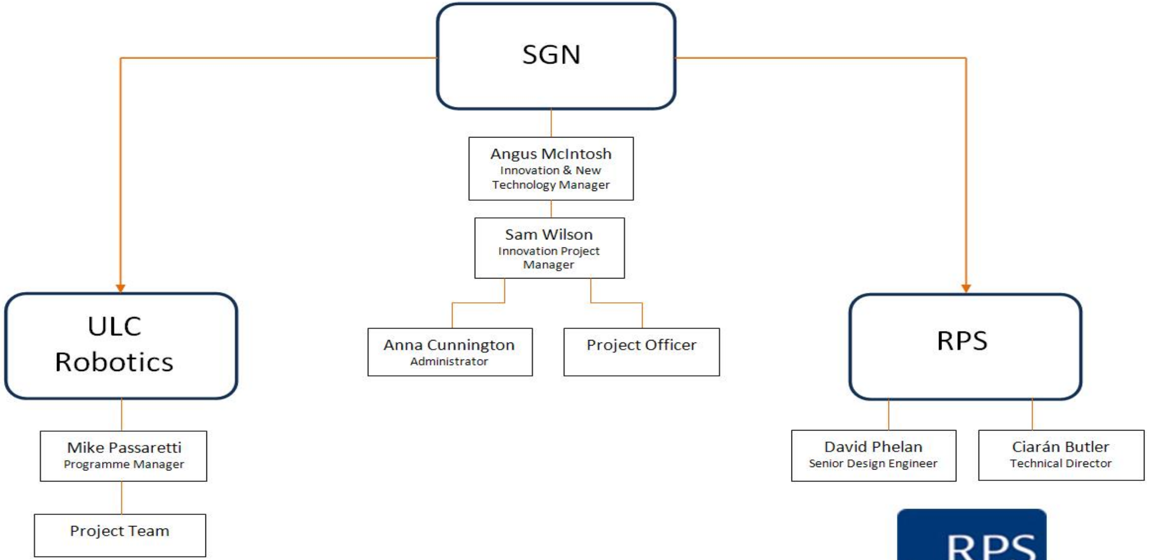
- SGN conducted a feasability study with industry experts to investigate the technologies available globally.
- ULC Robotics were identified as leaders in utility robotics
- SGN carried out the first GB trial of the Large CISBOT system in October 2013
- Following a succesful submission to the Ofgem Network Innovation Competition, SGN were awarded funding for a £7.4m project to develop robotics technology further for the GB gas industry.

ROBOTICS

Reducing cost through innovation

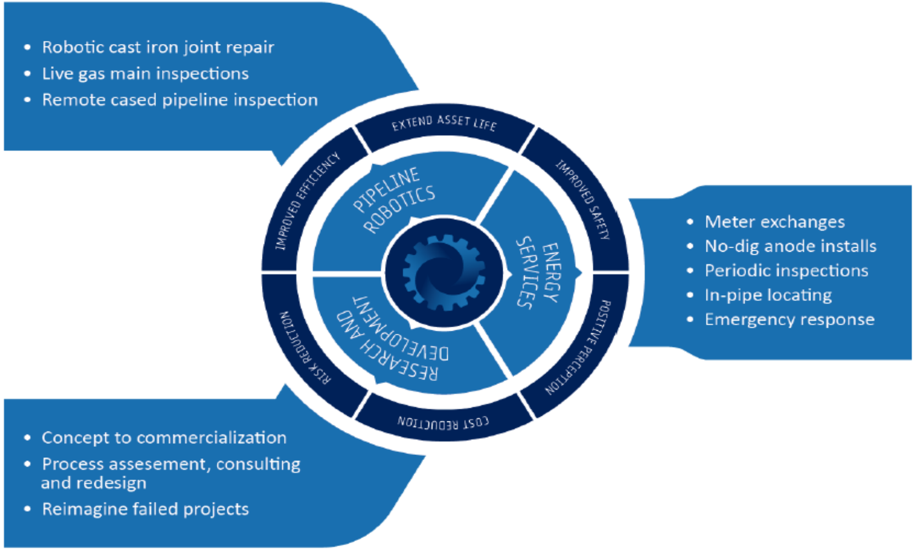
The objective is to develop new robotic technologies which operate inside the live gas main which can not only remotely repair leaking joints, but also support our pipe fracture risk management process through enhanced inspection in our larger diameter pipes.

Project Team



ULC Robotics

ULC Robotics are a specialist robotics company focused on developing robotic solutions for utility industries based in Bay Shore, New York.



Project Breakdown

Element 1

Development of a robotic 'platform' and launch system to enable deployment of modular repair and inspection devices for tier 2 and 3 pipes

Element 2

Development of an internal mechanical joint installation module and Weco seal repair method for tier 2 and 3 pipe

Element 3

Robotic visual and non-visual inspection

Element 4

Automated live asset replacement for distribution services and mains for tier 1 mains.

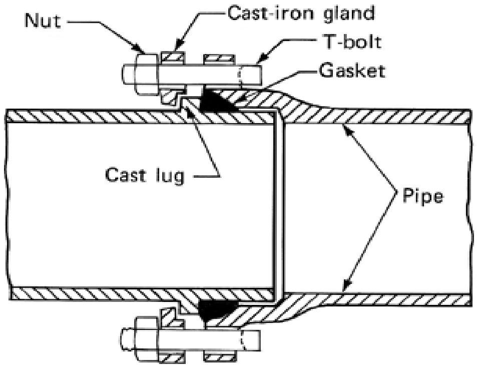
Elements 1 and 2 have been grouped together since they will be performed as a single development by one team of engineers

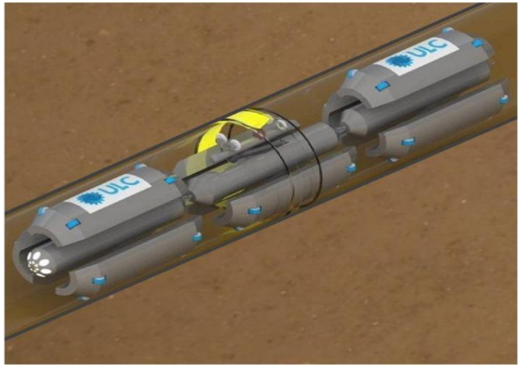
Elements 1 & 2

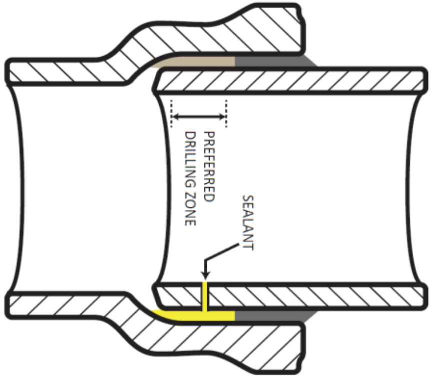
- Development of an internal sealing method will alleviate considerable costs whilst providing environmental and customer benefits.

- Multiple joints will be repaired internally from one excavation point with a target distance of 150m in each direction (300m).

- Practical field trial preparation will start on 07/09/2015.

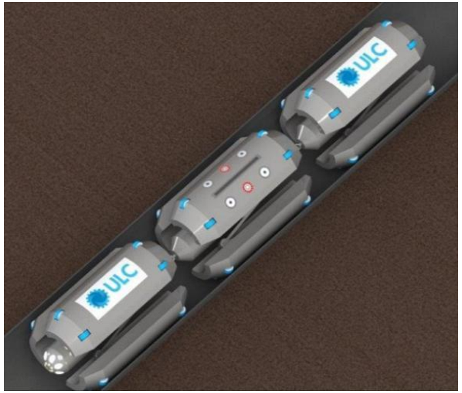


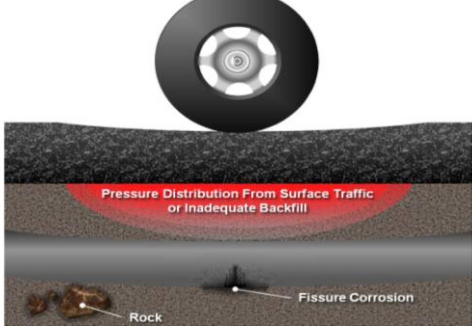


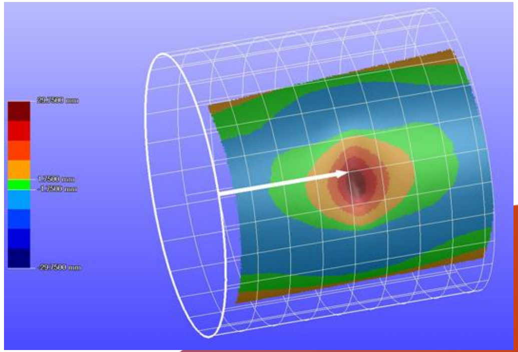


Element 3

- Metallic pipelines are more susceptible to corrosion and stress cracking. This leads to failure of the pipeline.
- In order to quantify the integrity of pipes without significant excavations or taking the main offline, a means of live ‘in-pipe’ assessment is needed.
- Element 3 focuses on research and development of a suite of sensors which can be transported into live gas mains via the robotic transport platform.

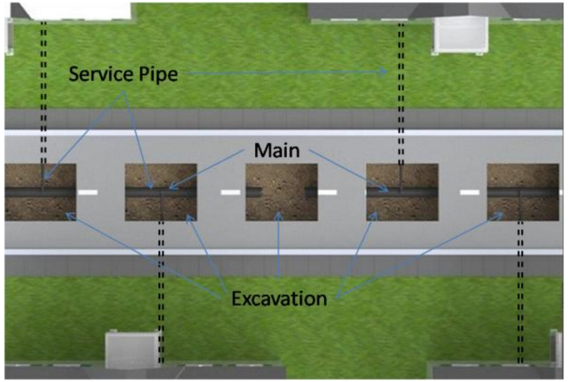


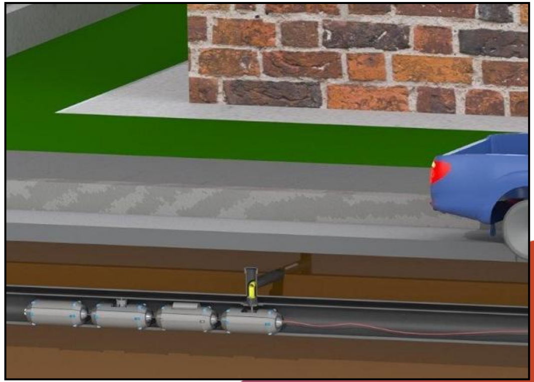




Element 4 – 06/07/2015

- Service pipe insertion allows for the installation of distribution piping with reduced excavation, resources, permitry and restoration costs.
- In order to reconnect the customers service, currently excavations are created at the point where each customers service meets the existing main.
- This project proposes to develop a system capable of remotely reconnecting service lines to inserted pipe without the need to perform excavation over each service connection.





Social Cost Calculator

- The social cost calculations used are based on "A web-based social cost calculator for utility construction projects" by John C. Matthews and Erez N. Allouche of Louisiana Tech University.

$$T_D = \frac{\frac{c}{2}\left(1-\frac{g}{c}\right)^2}{1-\left(\min(1,X)\frac{g}{c}\right)} + 900H\left[(X-1)+\sqrt{(X-1)^2+\frac{4X}{uH}}\right]$$

Conventional Excavations -192 days	
Cost Due to Traffic Delays	£120,771.84
Cost Due to Pedestrian Delays	£13,776.00
Cost Due to Increased CO2	£1,547.00
Total Increased Social Cost	**£136,094.84**

Robotic Deployment – 153 days	
Cost Due to Traffic Delays	£96,240.06
Robotic Deployment – 30 days	
Cost Due to Traffic Delays	£18,870.60

RPS Animation

Please insert animation here

Robotics Technology

This innovative and world-leading project has the potential to revolutionise customer impact as a result of gas works

Thank you

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