



TORS



SYNTHOTECH
innovative engineering

An Invitation to revolutionise
the way in which gas mains
and services are replaced

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Synthotech would like to invite you to join us in delivering one of the most significant, beneficial and exciting products that will change the way in which metallic gas mains and service pipes are replaced.

Principal Benefits: 50% less excavation, less than 30 minutes time off gas for the consumer, 50% reduction in carbon footprint, reduced risk, greater working flexibility, reduced traffic management requirements, reduced logistics, improved quality control & accurate data recording.

Further Potential Benefits: 70% less excavation, less than 10 minutes off gas for the consumer, 60% reduction in carbon footprint, 24 hours working, use on 4"-12" diameter mains.





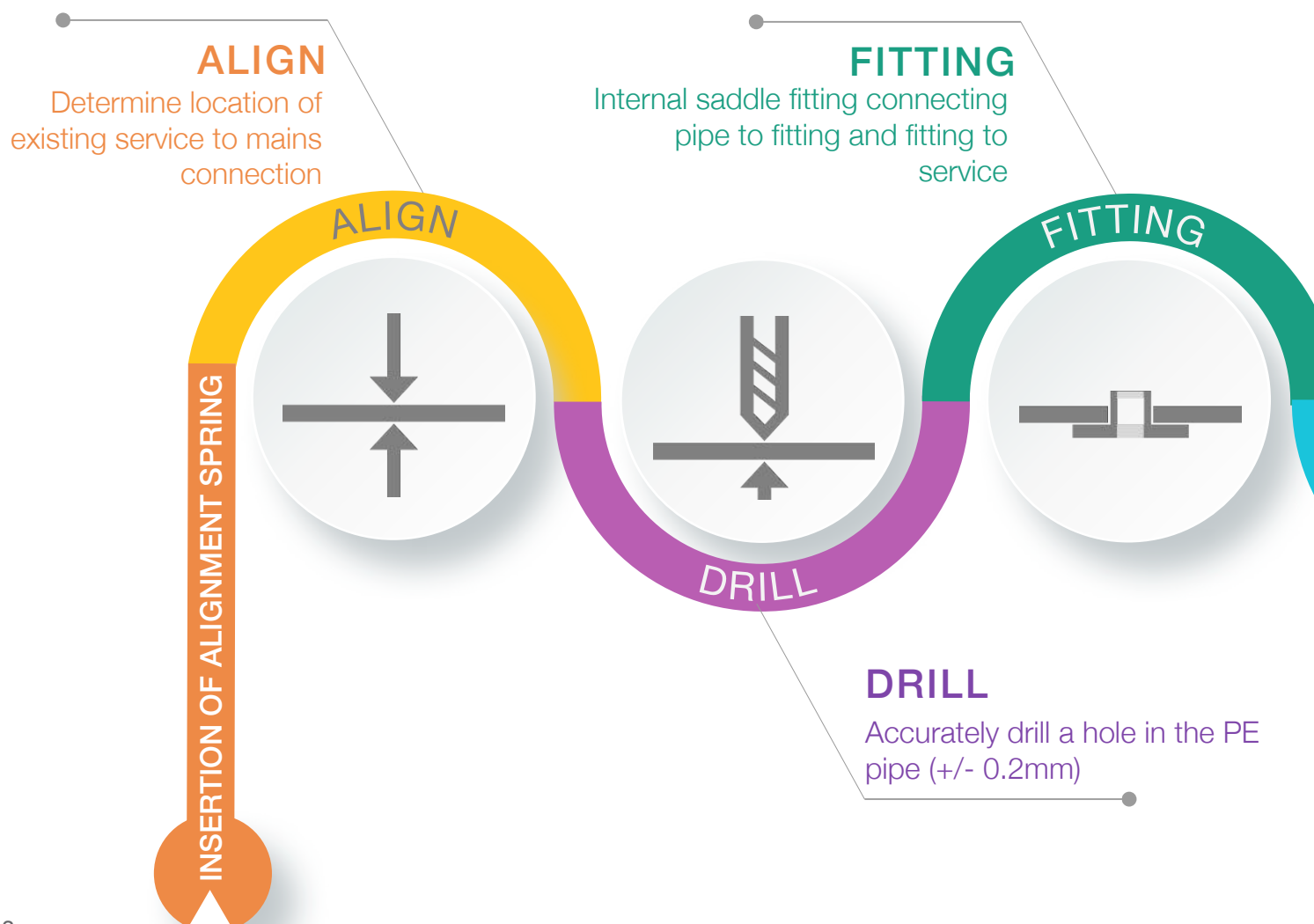
WHAT IS TORS?

TORS is a total in-pipe remote process that replaces the gas service pipe to mains connection without the need to excavate in the highway, or physically break out the old iron main.

Currently designed for replacement of 4"-6" diameter mains using either 75mm or 90mm polyethylene (PE) pipe.

HOW DOES IT WORK?

A TORS remote connection is achieved using an intelligent robotic 'train' type system that travels through the newly inserted PE main and sequentially replaces each connection by: locating with precision accuracy the location of the old service connection, drilling out the new connection hole in the PE main, inserting the unique micro-fusion connection fitting, pulling-in the new PE service pipe, fusion welding the complete assembly, and finally pressure testing the complete installation to 350mbar – each connection is completed in approximately 1 hour.



Fitting developed with



Fitting developed with



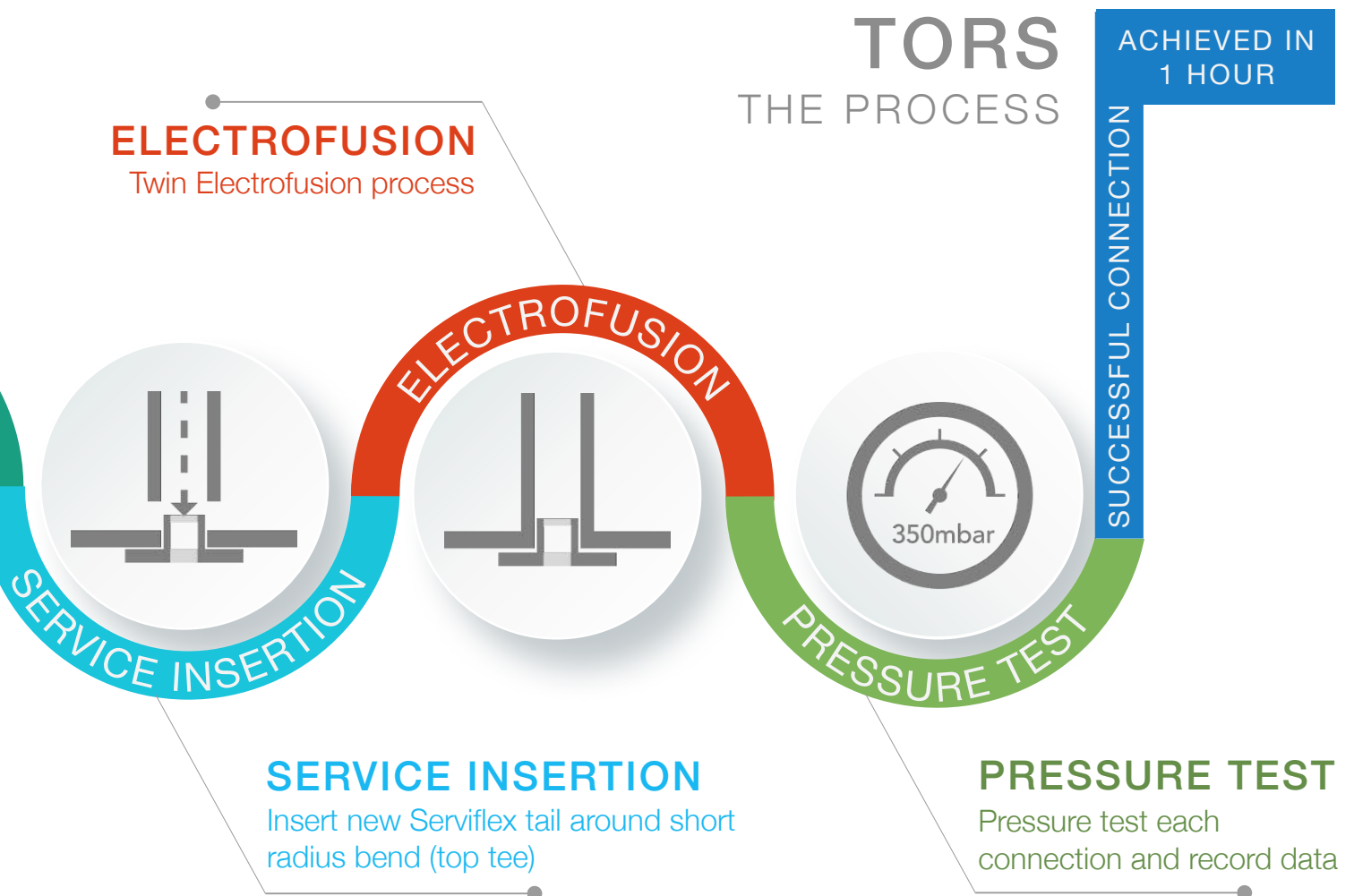
Critical to TORS success has been the development of unique micro-electrofusion fittings (shown above), installed remotely from within the newly-laid PE main.

The entire process is controlled by a mobile vehicle incorporating a 'state of the art' operations console providing: intuitive decision-by-decision, step-by-step navigation, multi-screen footage of the 'live' process, dashboard of controls & outputs and accurate data recording.

The system has been developed for replacement of 4" mains however, a 6" system has also been designed.

TORS can replace up to 10 gas service pipe to main connections on a 100m section of metallic pipe in one continuous process. Currently, this can be achieved in a three-day period in conjunction with Live Mains Insertion. A traditional launch and receive pit is required at each end.

TORS was successfully field tested on an operational site in Leigh, near Manchester in May 2017.



WHY TORS?

Gas Distribution Networks are relentlessly challenged by OFGEM to continually reduce: costs, consumer time off gas, consumer & road user inconvenience, carbon emissions and risk.

The largest contributor to these is the replacement of aged iron gas mains and services - one of the costliest and labour intensive parts of this process is the replacement of the service pipes.

This is due to the significant works required to physically excavate at each connection, break out the old iron main, and connect the newly inserted PE service pipe onto the newly inserted PE main.



HOW HAS TORS BEEN FUNDED?

TORS was originally developed as a result of a Network Innovation Allowance (NIA) funded collaboration between Cadent Gas Limited and Synthotech Limited.

This collaboration concluded in May 2017 with a field trial evaluation that proved the system was operationally viable, however, Cadent decided not to progress due to their GD1 cost benefit analysis.

Given the operational viability, successful lifetime performance testing (independently verified), and potential for application in GD2 across a wider range of pipe diameters Synthotech decided to continue development on a self-funding basis.

TORS has successfully progressed from Technology Readiness Level (TRL) 2 to 7 during 2012-2017.

Over the past 12-months Synthotech has made significant progress and is seeking collaborative partners to help complete and commercialise TORS to meet operational requirements in GD2.

Such is the belief in its potential that associated projects to complement the TORS process have already started, including:

- Micro-coring for difficult connection transfers.
- A system that will reduce consumer time off gas to less than 10mins.
- Concepts for larger diameter applications up to 12" diameter mains & 2" diameter service connections.
- Capability for 24hrs working – due to its quiet process.
- Live gas main & service replacement.

WHERE CAN TORS OFFER THE MOST BENEFIT?

TORS offers significant benefits when used in areas of high operational difficulty or restricted access.

These include: major roads, traffic sensitive roads, major bus routes, roads of decorative or modular construction, major pedestrian thoroughfares, outside places of large public congregation, commercial/ city streets, inhibited access to gas mains due to obstructions or multiple utility apparatus, replacement of difficult materials like ductile iron and steel, etc.















WHAT NOW?

Synthotech simply does not have the financial resource to continue development alone in a timely manner, we require gas network partner(s) who believe, as we do, that TORS provides the basis to revolutionise the way in which gas mains and services are replaced.



TORS Timeline

2017	2018	2019	2020	2021
 <p>Successful field trial to TRL7</p>	 <p>TORS practicability assessment and field trials</p>	 <p>Complete a service replacement in 45mins</p>	 <p>Increase size range for 6" to 12"</p>	<p>TORS business as usual for 4" to 8" mains</p> <p>50% less excavations</p> <p>30mins consumer time off gas</p> <p>50% reduction in carbon footprint</p>
 <p>In service fittings pass 1000 hour test</p>	 <p>MicroCore technology for service transfers</p>	 <p>MicroCore to reduce transfer excavations by 50%</p>	 <p>Solution for increased service pipe diameter</p>	
 <p>Stakeholder engagement</p>	 <p>TORS possible from road to garden</p>	 <p>TORS becomes fully operational</p>	 <p>Increased replacement rate using LMI and LSI</p>	



TORS is a robotic platform that is designed to operate in 53mm and above space envelopes

If you are interested in undertaking a practicability study to determine the operational value TORS can offer you please contact us.



RIIO GD2 Targets

2029

Upscaling technology for Tier 2 to 3 (12"+) and up to 2" services.

Compatible with other complimentary techniques e.g. SealBack II.

Significant reductions in as laid cost per metre - Target up to £100 per metre cheaper compared to current base costs.

Evolution of robotics to allow network extension.

Robotic repair techniques for PE pipes.

TARGET - Reduce excavations by up to 90%



'The system is ground breaking in terms of the fact that it allows us to replace mains and services through minimal excavation; removing risk, removing impact on customers and actually moving things a significant step forward.'

Richard Hynes-Cooper |
Northern Gas Networks |
Head of Innovation



"This technology has got the ability to be developed into something that could be useful in the future."

Lucy Mason | Wales and
West Utilities | Innovation
Manager

WHO IS SYNTHOTECH?

Leading the way in providing innovative turnkey engineering products to the gas industry, we are an innovative British engineering business, focused on the development of pioneering products and services for utility and infrastructure markets around the world.

Innovation is at the heart of everything we do from design concepts to implementation in our customer's business.

We are a highly successful multi award winning company, including 4 major awards for innovation in 2017 and we were also awarded the Gas Industry 'Company of the year'.

Our innovation partners include UK Gas Distribution Networks, Water Companies and Network Rail.

144,000



Research and Development man-hours since **2013**

STaRS

Synthotech Test and Research Site (**STaRS**) opened in **2015**, providing **65,000ft²** of testing facilities

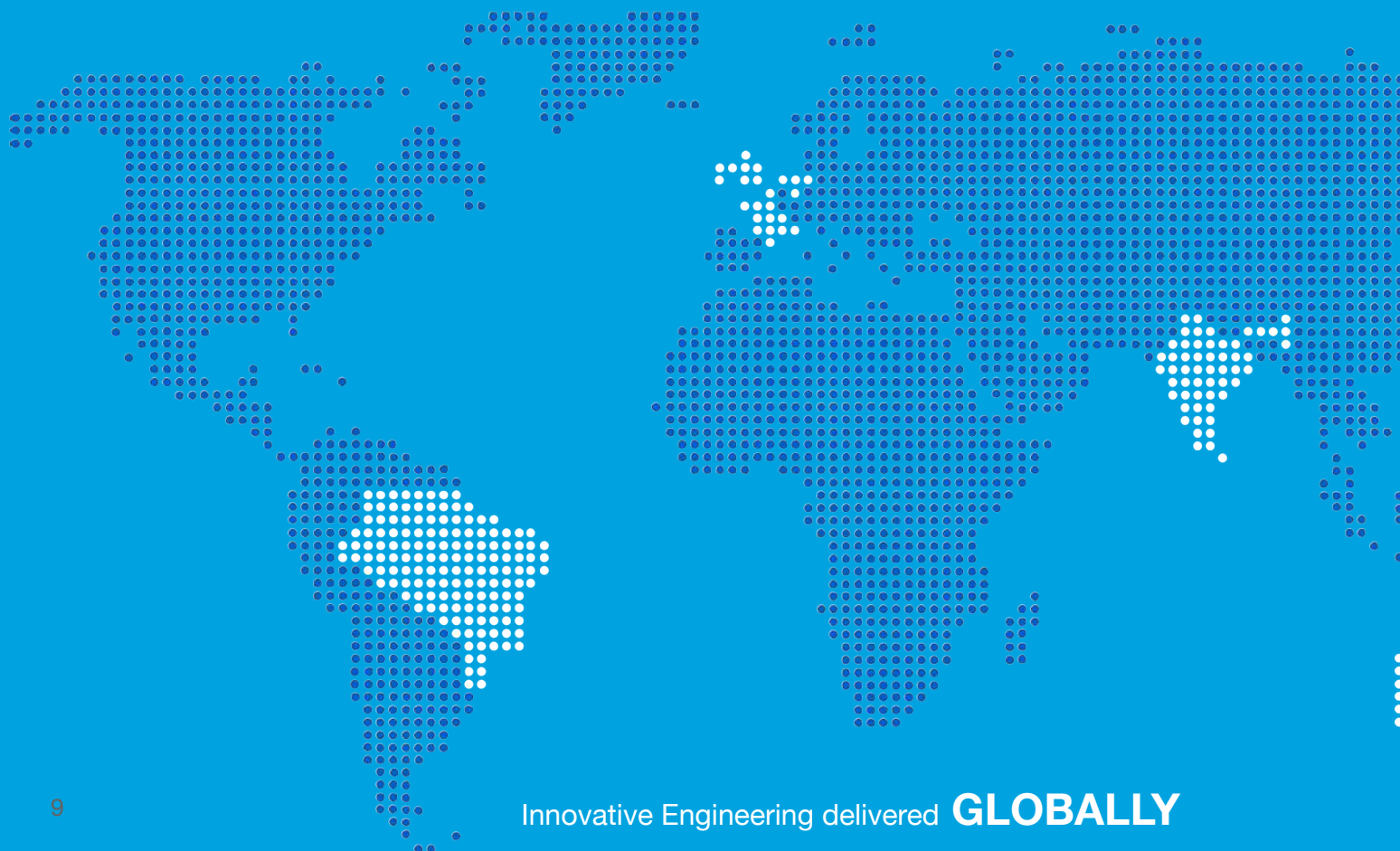
20

Years as an independent business

Delivered and in flight innovation portfolio since **2013**

£9,854,326

PURPOSE: Reduce excavations through alternative working





SYNTHOTECH
innovative engineering

Such is the unique nature of our developments, new specifications and changes to policy are required, all of which Synthotech can provide using our extensive experience and collaborative partnership philosophy.

Our strong working relationships are built on respect, belief, trust, confidence and reward.

Synthotech invite all customers to visit us and see first-hand what we have to offer.



25%

reduction in
our carbon footprint

VISION: TO ENABLE CHANGE THROUGH TECHNOLOGY

501

Award winning
SynthoCam
systems delivered



100bar

Camera and
Robotic Capability

MULTI AWARD WINNING:

- Gas Industry Awards: Company of the Year
- Gas Industry Awards: Innovation of the Year
- UK Energy Innovation Award: Best Innovation contribution to Customer Quality and Reliability Award
- Pipeline Industry Guild: Land Based Technology Award
- UKSTT: Environmental Award



21,000FT²

Advanced
machining, manufacturing, assembly and
testing facility in Yorkshire, UK

CORE VALUES

Creative, Dynamic,
Passionate with Integrity

SYNTHOTECH HUB

Made up of over 75 partners from technology, industry, manufacturing and project delivery companies

75+

22

Engineers including mechanical, electrical, mechatronics, robotics, electronic, software and quality

WHAT ARE THE BENEFITS OF TORS?



Saves time

Reduces materials
needed

Minimises traffic
management

Less disruption to
customers



Less chances
of cable
strikes



Reduced
risk to
pedestrians



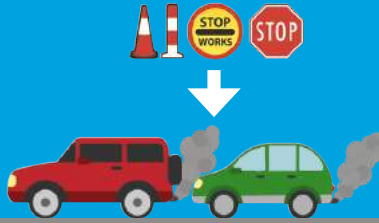
Reduced risk
of injury to
employees



Automated
governance record
of electrofusion
connections



Less
landfill/waste



Less traffic and
road management



Less habitat
and ecological
disruption



Less noise
pollution from
silent working

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