

Centre of Excellence in Testing

Helping to accelerate adoption and transformational change in rail systems technology, new railway products and services

Part of the UK Rail Research and Innovation Network







Introduction

Introduction to the Centre

The Centre of Excellence in Testing (CET) is led by Network Rail and incorporates access to existing at-scale test facilities, including Network Rail's Rail Innovation & Development Centres (RIDCs) in Melton in Leicestershire and Tuxford in Nottinghamshire, Transport for London (Acton and Stratford), and Quinton Rail Technology Centre (QRTC) at Long Marston building on the expertise of the recognised teams at these locations. The CET partners look forward to working with the rail industry to turn the exciting opportunities UKRRIN offers into reality.

Our Expertise

Network Rail owns and operates RIDC Melton and RIDC Tuxford. The RIDC Team are part of the Safety, Technical and Engineering directorate within Network Rail. These two strategically important facilities provide a safe operational environment for the testing, trialling and validation of new and modified rolling stock, plant, on-track machines, infrastructure, equipment and technology.

Quinton Rail Technology Centre (QRTC) is the only privately owned and independent rail testing and trialling site in the UK. It has the only looped test track in the UK and is used extensively for reliability and mileage accumulation testing and trialling. Able to operate 24/7, its operational staff all have extensive trials and development experience in both the rail and other sectors including defence, automotive and manufacturing. QRTC is home to the Rail Alliance and has a long-standing relationship with the University of Birmingham playing host to a wide variety of research projects and providing education opportunities.

Transport for London (TfL), is vertically integrated, and provides full-stack experience of operating, maintaining and renewing all asset types. Modern technologies are constantly being researched and adapted to the needs of the network to increase reliability and efficiency, whilst keeping costs at a minimum. This provides excellent opportunities to accelerate the development of the rail industry within one of the world's most challenging yet iconic rail environments.



The Remit of the Centre

UKRRIN, for the first time, brings together world-class research activities within universities across the full landscape required to deliver systems-level technology innovation into the rail industry, and co-locate this with the key UK rail industry supply chain and support companies. The network incorporates access to existing at-scale test facilities supporting the acceleration and adoption of transformational change in rail systems technology and new railway products and services.

Centre locations

RIDC Melton

Unit F, Melton Commercial Park Asfordby Melton Mowbray Leicestershire LE14 3JL

RIDC Tuxford

Lodge Lane Industrial Estate Ashvale Road Tuxford Nottinghamshire NG22 ONL

♀ Transport for London (TfL) Hearne House (Acton, London)

118-120 Gunnersbury Lane, London, W3 9BQ

Transport for London (Stratford, London)

5 Endeavour Square, International Quarter, Stratford, E15 2DU

Quinton Rail Technology Centre

Station Road Long Marston Stratford-On-Avon Warwickshire CV37 8PL Transport for London (Acton)

Transport for London (Stratford)

Rail Innovation & Development Centres (RIDCs)

What they are?

Enablers for new and modified technology within the rail industry, in a safe and reliable testing and trialling environment.

Why do they exist?

Network Rail own and operate RIDC Melton and RIDC Tuxford. The RIDC Team are part of the Safety, Technical and Engineering directorate within Network Rail. These two strategically important facilities provide a safe operational environment for the testing, trialling and validation of new and modified rolling stock, plant, on track machines, infrastructure, equipment and technology.

The RIDC team prides itself on working collaboratively with all current and prospective customers to deliver their testing requirements. The RIDCs are truly representative of the operational railway and include many characteristics found on the national network.



This unique collaboration offers a step change in R&D and innovation to complete globally. The RIDCs provide a safe testing and trialling environment used by industry to support the acceleration of transformational change in whole rail systems technology, products and services."



Amanda Mackie, RIDC Senior Programme Manager, Network Rail

"Network Rail is a key strategic partner to Bombardier. Their network of facilities and continual investment in infrastructure and associated technologies are essential to Bombardier to test and deliver some of the most complex rail build projects in the UK including the new trains for Crossrail and our other projects. We also both continue to collaborate

through our relationships with UKRRIN – Bombardier being a founding member."

BOMBARDIER TRANSPORTATION

Jon Ward, Project Commercial Manager – Crossrail, Bombardier

About RIDC Melton

Located at Melton Commercial Park, 3 miles from Melton Mowbray Station, RIDC Melton is a purpose-built test track for the testing of rolling stock, plant, on-track machines, infrastructure, equipment and technology. The facility has been designed to support high and low speed testing and has 25kV overhead line equipment and 3rd/4th rail DC equipment. RIDC Melton has two separate test tracks, a high speed test facility between Melton Junction and Edwalton, incorporating 13 miles of track up to 125mph and a slow speed test track from Old Dalby to Stanton tunnel, having 4 miles of track capable of up to 60mph.

It is the first 5G testbed for rail, working with Network Rail Telecom and Department for Digital, Culture Media and Sport.

RIDC Melton will also see its capability further enhanced in the coming months with a new ETCS system as part of the Digital Railway Programme. This will support rail industry first in class testing at the latest software release.

The centre has the capacity and capability to support new and modified technology demonstrators and trials, and now includes the recently added Telecom Innovation Lab.

Facilities:

- 4 workshop roads
- 1 fully pitted road
- Lifting and jacking facility
- Stabling
- Dedicated office space
- Ability to change infrastructure characteristics

Testing available:

- TSI high speed noise compliant testing
- Maximum over cant deficiency testing
- Overspeed testing
- Electromagnetic Compatibility (EMC) testing
- Brake performance testing
- Wheel Slide Protection (WSP)
- Single/dual pantograph testing
- Coupling compatibility testing
- Rescue and recovery
- Surge pressure testing in tunnels
- Low adhesion testing

About RIDC Tuxford

Tuxford spurs off the Robin Hood line, between Thoresby Junction and High Marnham, it is 10 miles of single line test track with a 3-mile double section, with testing speed capabilities of up to 75mph. It comprises a short section of non-live 25kV type catenary and a short section of non-live 3rd/4th rail. It offers a perfectly suited facility to develop rail vehicles, technology, equipment and to deliver operator training and competence assessments.

Facilities:

- Office and mess facilities
- Sidings
- Stabling
- Dummy OLE
- Dummy 3rd and 4th rail
- Ability to change infrastructure characteristics

Testing Available:

- Tamper and Stoneblower training area
- Adhesion testing
- Lifting training site
- Handbrake testing
- Slip brake testing equipment



Get in touch with the RIDC team to find out how to access these facilities

ridc@networkrail.co.uk

www.networkrail.co.uk/ridc

RIDC Case Study





Railway Overhead Line Equipment (OLE) foundations

How were the facilities used?

RIDC Tuxford was used to carry out full-scale testing of a new system developed by the University of Southampton and In Situ Site Investigation for installing an array of deformation sensors in OLE foundations to below the pile toe.

The Shape Accelerometer Arrays (SAAs) was demonstrated at the test facility and the research allows designers to use empirical methods for OLE pile foundations, leading to potentially significant cost savings for electrification. The trial provided a fixed datum for deflection, eliminating the need for a surveyor and total station. This reduced monitoring costs and facilitated remote monitoring improving accuracy.

What did they enable?

Dr Anthony Blake from the University of Southampton and Darren Ward from In Situ used the testing and outcomes working with Network Rail to help reduce the cost of OLE foundations and time for installation helping to potentially transform the economics of electrification.

Research Outcomes

- Network Rail issued new guidance for more efficient design
- University of Southampton attained research quality deformation measurements enhancing health & safety, at a reduced cost.

 In Situ identified, developed and trialled new applications for their plant and equipment.

About QRTC

Quinton Rail Technology Centre Long Marston (QRTC)

What is it?

QRTC is a privately owned and independent rail testing, trialling and development centre.

The looped test track is used extensively for reliability and mileage accumulation testing and trialling. It is home to the UK's only Light Rail test facility and hosts Rail Live each year - the largest outdoor railway show in the world. It is able to operate 24/7 and its operational staff all have extensive trials and development experience in both the rail and other sectors including defence, automotive and manufacturing. As one of the UK's largest off lease and new to service storage sites, it provides access to a wide range of traction and rolling stock.

Why does it exist?

QRTC has grown organically to meet the commercial needs of a wide range of local, national and global customers. It benefits greatly from the unique nature of both the site and the businesses based there. It is the only facility in the UK able to offer full scale crash testing to European TSI standard. QRTC is found on the national network connected to a spur line at Honeybourne on the Cotswold Line. This spur is also used for testing and trialling as well as enabling the delivery of stock to and from the site. There are extensive facilities and the space to host temporary structures to support campaigns etc. Due to its remote nature it has a very "quiet" EMC footprint and is used extensively for EMC related trials and was for example used as a reference site for Project SWIFT.

Facilities:

- 48 hectares of rail park with over 15km of stabling (approx 800 vehicles)
- Learning and Development office space with welfare facilities
- 700m² events/training pavilion
- Extensive workshop facilities including pitted roads and lifting and jacking facilities
- 415v shore supply and access to a wide range of portable generators
- Approximately 4 hectares of open hard-standing
- Crossings
- Embankments
- Variable infrastructure capability (geo test sites and civil engineering interventions)
- Jointed track
- Continuously welded plain line track
- 3 km loop with 200m OHLE
- Light Rail test track with catenary
- Extensive training facilities



Testing Available:

The site is regularly used for testing and trialling/product development. The test track can be used for a variety of purposes, from TRL 2-8 and all levels of MRL; which in the past has included:

General

- Proof of Concept (University and Research organisations)
- Product Development (SME to LE and multinationals)
- Product Approval (to UK and International Standards)
- Product Demonstration (Customer, Stakeholder and General Sales)
- Crash Test Facilities (to TSI Standards)
- Publicity and PR (Local, National and International)
- Training (Individual, Collective and Inter-Agency)

Endurance Testing

- Track loop length 3000m
- Maximum speed 90 km/h
- Straight section 480m
- Curve radius 150 185m
- Weathering and Environmental trials

Overhead Line Equipment (OHLE)

- Track length 2 x 200m standard network and 250m Light Rail
- Overhead power supply as required

For more information or to speak to a member of the QRTC team about access to the facilities, contact:

info@qrtc.co.uk www.qrtc.co.uk T: 01789 721995

HydroFLEX Case Study

QRTC_

UNIVERSITY^{OF} porterbrook

Summary

HydroFLEX is the UK's first hydrogen-powered train which has been developed at QRTC in partnership between the University of Birmingham and Porterbrook, the rolling stock asset management company; providing an important milestone in decarbonising the railway and bringing hydrogen technology to Britain's network. The train was launched at Rail Live 2019. Team HydroFLEX have received overwhelmingly positive feedback from Train Operating Companies, Network Rail, and wider rail industry as well as across Westminster and Whitehall.

This project is a perfect example of what can be achieved when through the Centre of Excellence in Testing, academia and the private sector can collaborate to deliver innovative products that can then be offered to the market. Centre of Excellence in Testing (QRTC), Academia (BCRRE) and the Private Sector work together collaboratively to deliver innovative products that can then be offered to the market.

Solution

The project kicked off at QRTC in November 2018 and initial concepts led to detailed design and manufacture in just 9 months. As part of our approach to building a demonstrator vehicle, the fuel cell, battery, hydrogen storage tanks and other related equipment are housed in the motor vehicle. This 'lab in a train' enables the team to refine their traction system controllers in a suitable environment, and accelerate the engineering required to develop the traction system for full mainline application. It also allows key industry stakeholders to enter and familiarise themselves with the 'hydrochamber.'



Conclusion

The Rail Live 2019 launch at QRTC was an important milestone in decarbonising the railway and bringing hydrogen technology to Britain's rail network. Team HydroFLEX received overwhelming positive feedback from passengers, stakeholders and officials at Rail Live 2019. From a partnership perspective QRTC is very proud of the quiet role we have been able to play in providing engineering and technical support via site partners and ourselves to Porterbrook and the University of Birmingham, as well as other key suppliers to the project. This clearly demonstrates the benefits of collaboration and how each partner's particular strengths can help deliver a successful project, both today and in the future. All parties have also demonstrated considerable thought-leadership across a broad spectrum, in the hydrogen and decarbonisation debate.

So far as QRTC is concerned this is just one of the latest of many successful collaborations we have orchestrated and very much... *"to be continued"*

About Transport for London (TfL) - London Underground

What are they?

Enablers for guiding through early technology and railway readiness levels; from ideas to operational trials using seasoned software, hardware and application experience.

Why do they exist?

London Underground is the oldest Metro system in the world. With so many years of experience behind it, 'the Tube' has become a world standard for city metro systems and continues to remain at the forefront of innovation. Its parent organisation, TfL, is vertically integrated, which means they have the full-stack experience of operating, maintaining and renewing all asset types. Modern technologies are constantly being researched and adapted to the needs of the network to increase reliability and efficiency, whilst keeping costs at a minimum.

This Test Centre provides an excellent opportunity to accelerate the development of the rail industry within one of the world's most challenging yet iconic rail environments.

Facilities:

- Mechanical Fabrication
- Instrumentation
- Railway Engineering Simulator (RES) system
- Virtual Reality suite

Testing Available:

- Systems Performance Simulation
- Compatibility Services
- Configurable Digital Modelling
- Monitoring and Surveying
- Rapid prototyping
- Multipurpose accelerometer and strain gauge testing
- Shock and vibration test tables
- Climate test chamber
- Electromagnetic compatibility chamber
- Noise and vibration surveying
- Digital point cloud and Geothermal surveying

Further to this, bespoke rigs are manufactured for designs requiring unique test parameters. We can tell you exactly how your product will react to real railway environments.

The Acton Town facilities offer, in addition to the above, fabrication processes such as:

- CNC milling
- CNC turning
- Waterjet cutting
- Sheet metal works (including bending, cutting, rolling and welding)
- 3D printing

Performance simulation

The Railway Engineering Simulator (RES) system is an in-house developed platform which performs multi-train simulation of rail systems. RES allows assessment and trade-off capacity throughput, reliability and power usage / regen based on highly configurable inputs, from drive-train performance to processor rates in the signalling PLCs and all permanent way permutations.

RES can also be configured to model signalling and train movement, including:

- Gradient and adhesion profiles
- Train traction and braking
- Effect of using multiple signalling systems simultaneously
- ATO and Manual control
- Automatic Route Setting and interlocking

RES can also be used to model the effect on passenger flow given changes to dwell times and crowding. RES output reports can be fed into our 3D visualisation tool. This tool uses the results from a RES test to create an animated 3D world which plays back the RES results. This system makes the results from RES easy to understand and digest, and can be used in conjunction with Virtual Reality, providing engaging and comprehensive feedback. The outputs are also fed into our computational fluid dynamics modelling suite, which allows integrated simulation of air velocities and tunnel ventilation. Contact us if you want to know how your product will interact with a real or hypothetical transport system.

Digital Modelling

The London Underground Virtual Reality suite provides an immerse experience for designs to be viewed from a first-person perspective; allowing any problems to be more easily noticed and corrected without the need for expensive post-implementation alterations. We can provide an end to end service, from digital survey to model creation and then develop the code to allow interaction.

This technology has not only been used for physical designs such as station upgrades but has also been deployed as a tool for maintainability and operability modelling. Our preferred hardware for interaction is the HTC Vive controller; however, we often develop using Oculus and Hololens as well. London Underground's Augmented Reality systems also provide a way to non-intrusively test the maintainability of systems.



Get in touch with London Underground to find out how to access these facilities: Innovation.Office@tfl.gov.uk www.tfl.gov.uk/innovation "To me, London Underground and Transport for London represents over 150 years of innovation and I am proud to be part of this railway which pioneered many of the technologies that are standard on today's railways.

We are now faced with growing financial pressures, growing capacity demand, growing customer expectations, and the fast pace of change of technology. To deliver and sustain a worldclass service for our customers, we cannot do it alone. Being part of UKRRIN Centre of Excellence for Testing provides us with the unique opportunity to collaborate with innovators, big and small, and facilitate that difficult journey of bringing new technology into the rail sector - which will ultimately benefit our customers."

Kate Whelan, Business & Digital Engineering Manager at Transport for London Engineering. Fransport for London

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Contact us

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Coordinating Hub:

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