

# RILA enables track renewal designs

Passenger demand for train services has doubled in Britain over the last 20 years and more frequent services mean tracks need to be renewed more often

The Network Rail High Output teams, who carry out the majority of Britain's track renewal work, are on the railway every night replacing ballast and renewing rails and sleepers to minimise disruption to train services. It's a collaborative effort from the planning stage to logistics and delivery – so getting accurate survey data for design and validation of the work sites is essential.

In 2015, Network Rail awarded a contract to Fugro to supply the source survey data for its design and validation tasks for the East and West Coast Mainlines in Scotland. All elements of the survey work had to be undertaken in accordance with the survey accuracy banding for Track and OLE Design and carried out up to GRIP Stage 6.

## Innovations lead to continuous improvement

As part of Network Rail's drive towards innovation they sought a solution that would remove the requirement for surveying personnel to be on or near the track by using alternative techniques for topographical track and lineside feature surveys. Fugro's RILA train-borne survey system was totally complementary to Network Rail's aspiration.

The RILA absolute track measurement system has been developed to run on the rear of scheduled passenger service trains through connection by a buffer adaptor or coupler adaptor. When using the coupler adaptor, the entire system can be mounted onto or dismounted from the train in less than 2 minutes.

As the RILA system is power independent and runs off its own batteries, the system does not affect or compromise the operation of the train in any way. The use of regular service trains to mount the survey equipment replicates the safety and efficiencies provided by the High Output trains through maintaining capacity on the network and removing surveyors from the track and open line dangers.

Fugro's innovative RILA technology offers a fully remote survey system of working that combines GNSS and inertial measurement technology to supply highly accurate and repeatable survey information of the track and the wider rail corridor.

Integrated lidar and camera sensors simultaneously capture high definition imagery and point clouds that can be viewed in a desktop environment enabling designers and engineers to undertake virtual site visits from the safety and convenience of their desktop.

The remotely and rapidly acquired RILA rail profiles, point clouds, imagery and video provide a repository of real world survey data at the time of collection. The information can be repeatedly accessed in a desktop environment for post processing into track geometry, rail condition, topographical survey information and georeferenced imagery for use in an engineering design application without the need to access the track or its environs. On-track preparatory works require significantly fewer man hours when compared to traditional survey methods. The only reason for Fugro personnel to access the track is for the mounting and dismounting of the systems.

## Ground breaking solution

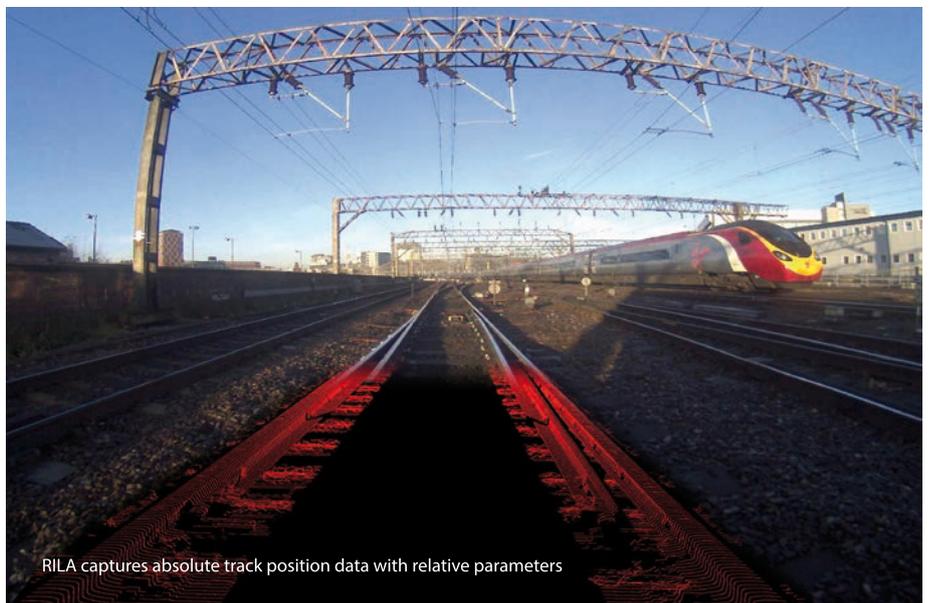
Introduction of the RILA technology to the High Output function was considered ground breaking in a number of ways as



New RILA 3.0 system with integrated 360° scanner and high resolution imaging and video cameras

it involved a completely new method of working. Traditionally, tertiary level control was installed and coordinated and used to link pre-design and construction stage survey phases, whereas the new technique involved observation and coordination of real world objects in the RILA point cloud and re-observation by the IMS track measuring device at construction stage.

Once this conceptual seed change had been proven and accepted, the true value of RILA was recognised through rapid



RILA captures absolute track position data with relative parameters

acquisition of data, route-wide acquisition that could easily accommodate location changes to the High Output Programme and use of the value-added imagery and video as a desktop tool.

### Rapid data delivery

A key requirement of the contract was that the survey data for any individual site could not be older than 6 months from Core Works start date; this includes rails, OLE Height & Stagers and structure gauging data.

Conventional land survey techniques would struggle to meet such timelines, but measurement runs of all 64 work sites in Scotland were undertaken using RILA in a 2-week period; demonstrating how quickly the survey data could be collected even in challenging weather and light conditions at the end of the year. This translated into on-time and even early data delivery that enabled the High Output team additional up-front design time.

### Clear business benefits

The use of RILA train-borne systems provides clear and defined business benefits to the High Output function through significantly enhanced health and safety, cost and delivery programmes.

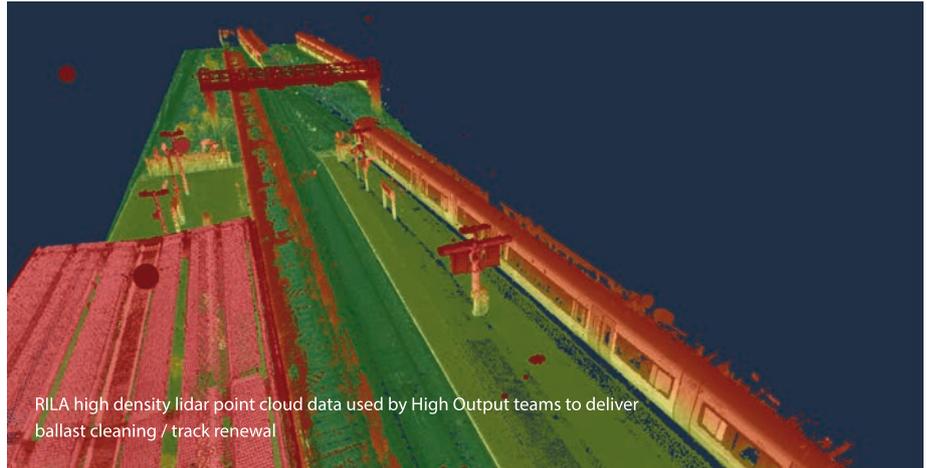
It directly supports Network Rail's 'Everyone home safe every day' health and safety initiative by negating the need for survey personnel to work on or near the track for collection of survey data. The laser scan data can be used as a source for real world feature extraction and digitisation.

RILA operates on a route wide basis and when deployed it measures and acquires data for entire route sections rather than just the individual work sites. This provides Network Rail with a considerable value-added strategic benefit as Fugro is banking large volumes of additional survey data that can be used for other route specific surveys.

The additional survey capture also meant that if Variation Orders had to be issued to meet changes in work site extents, the data had already been captured for the wider area; yielding additional cost savings as extending the site is likely to only require desktop digitising to complete the variation.



Fugro's train-based RILA system in action. Use of scheduled passenger trains reduces the pressure on line capacity



RILA high density lidar point cloud data used by High Output teams to deliver ballast cleaning / track renewal

### Proven success

High Output Track Renewals enable Network Rail to replace more and more track while allowing trains to run safely on adjacent lines, minimising disruption to services. It's a bigger, more strategic approach and the data that Fugro provides is helping the team plan far ahead and keep the systems in the same regions for as long as possible.

In the first year of the project a High Output benefits assessment estimated 1,609 track-man-hours had been saved using the RILA technology. In 2016 the contract was extended to cover LNW, Western and Wales, Anglia and the South East and in 2017/18 it is estimated that 6,590 track-man-hours will have been saved, providing a clear and defined cost and safety benefit through removal of personnel on the track.

As well as the direct removal of track-man-hours High Output also estimated

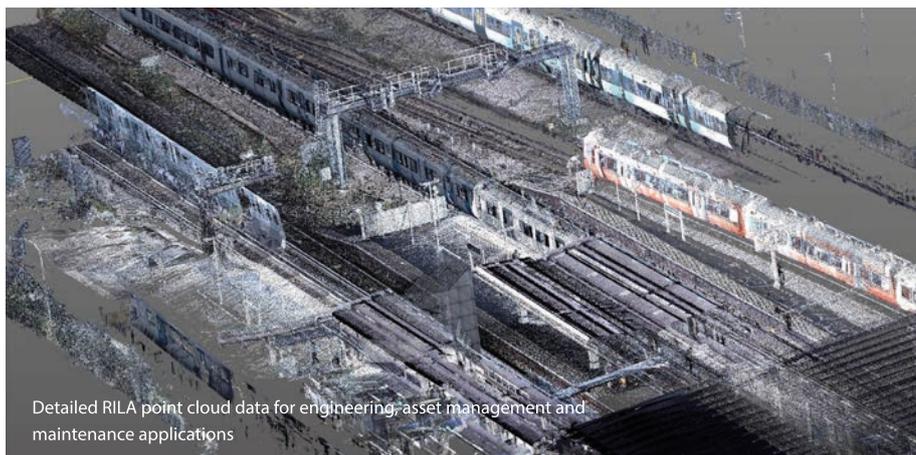
that in 2016/17 in Scotland, using the RILA method has saved over 215 site visits where survey personnel would have been required to access track. This of course includes 430 potential van/car journeys where an additional safety risk is present, particularly if driving fatigued following a night shift.

Lee Dalton, Network Rail Design Manager, said: 'Safety has been paramount throughout the project. Using the RILA method has saved over 215 site visits in 16/17, where survey personnel would have been required to access track. This speaks for itself. The quality of data supplied by Fugro has allowed High Output to implement thousands of yards of track renewal designs to a high level of accuracy.'

RILA technology endorses the 'survey once use many times' ethos that delivers cost and time efficiencies to Network Rail. As survey data is collected on a route by route basis, rather than just the actual track renewals sites, data for intermediate track sections can be used by other projects. As the data have already been captured and processed the information is readily available for accelerated delivery.

The data collected for High Output Track Renewals work sites on the section of the Great Western route between London Paddington and Didcot have been shared with a number of other projects including Crossrail, Great Western Route Modernisation, Electrification and for IEP Gauging. This has resulted in cost savings across all projects.

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Detailed RILA point cloud data for engineering, asset management and maintenance applications