

Right on track

Brian Wall, editor of FAST magazine takes a look at the expertise and technology **Staytite** employed as part of its contract with Network Rail, starting with four miles of jointed track in Scotland

This is the prelude to more lucrative deals for re-railing jointed track totalling up to 2,500 miles.

Network Rail has a highly proactive approach to track infrastructure and safety, particularly in the wake of previous accidents. With a commitment of 'zero tolerance' to any situation that might give rise to such incidents in the future, the company has pursued a maintenance and safety strategy that delivers the highest possible returns, with Staytite, as a long-time and trusted supplier, advising on a range of projects.

Indeed, Staytite was consulted by Network Rail on the redesign of its stretcher bars where the Hardlock Nut was specified to improve safety.

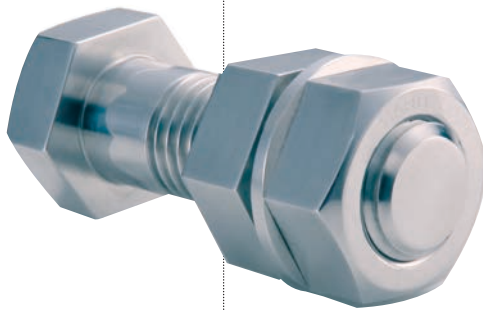
No surprise, then, that Staytite has won a crucial initial contract from Network Rail for the installation of 1,480 Hardlock Nuts, washers and bolts to secure around two miles of track at Inverness & Fort William in Scotland – which could pave the way to

similar deals covering up to 2,500 miles of jointed track across the UK.

The Hardlock Nut is promoted and sold in the UK and Europe by Staytite. Although it is not a cheap product, its efficacy is widely regarded as beyond question, being used in safety-critical applications, on account of its established performance and reliability. It is these high standards to which Network Rail has committed itself in the quest to meet passengers' expectations.

For the background to all this – and why Network Rail has sought out a supplier that can deliver the requisite solutions to help meet this goal – go back to July 2013 when a passenger train

carrying 385 people derailed and hit the station platform in Brétigny-sur-Orge in the southern suburbs of Paris. Seven people died and nearly 200 were injured. The initial inspection found that a loose fishplate – a flat piece of metal used to connect adjacent rails in a railway track – had caused the



The fastener used at present often requires special cutting machinery for the removal process

disaster where three of its four bolts had failed, due to the nuts working loose.

While the French investigation of the Brétigny derailment was ongoing, the repercussions of the accident spread way beyond its borders, prompting urgent action in the UK. Here, the Rail Standards Safety Board (RSSB) wrote to Network Rail in November 2013 to enquire what steps it was taking to prevent a similar accident from occurring in the UK. It was at this point that, in light of the established relationship between the two organisations, Network Rail contacted Staytite for a possible solution.

Safety standards

Network Rail then issued an expression of interest for companies to submit proposals for their solutions to the problem of fasteners coming loose on fishplates, with Network Rail's Tony Jackson, a senior engineer, Track & Lineside, appointed to oversee the project, in order to ensure the correct safety standards were applied to fishplates on UK rail going forward.

'At Network Rail, we've been looking closely at the components relating to track and lineside, with a view to how we can improve these, where they might be more liable to fail, and specifically around the fastenings that hold the joint together' says Jackson.

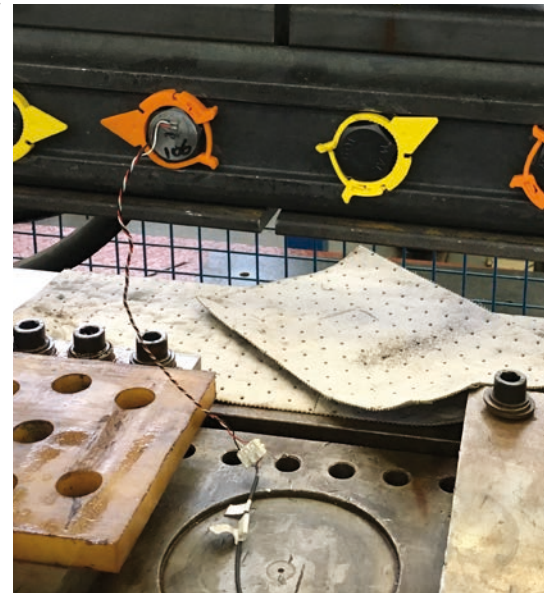
'We have a long legacy where we have used imperial-type nuts; but, now that we are moving over to metric, we want to improve quality at the same time.'

Along with ensuring the maximum levels of safety on its track, Network Rail was conscious that it was spending an inordinate



Initial jointed track application of the Hardlock Nut extends from Fort William to Inverness

Hardlock undergoes testing at Tata facility

**Fact file**

- Network Rail has invested heavily in safety and infrastructure since the Potters Bar rail crash
- Network Rail employs 38,000 people, and in 2015/16 spent £6.7 billion with 3,392 suppliers – 98 per cent of whom are UK-based
- Staytite continues to build upon its long-standing personal relationships with senior members of the Network Rail organisation
- The Hardlock nut is now specified and installed on TFL London Underground points and stretcher bars.

amount of money on nuts, bolts and fishplates (which connect lengths of track together).

'Bearing in mind how things have moved on, technology wise' Jackson adds, 'we would have expected a decline in demand, yet these components are costing us some £3 million a year for the whole of the UK. With jointed track at 12 per cent (of the 20,000 plus miles of track for which Network Rail is responsible) that cost should have been reducing.' He believes that cost can now be brought down by up to 50 per cent, with Hardlock playing a key part.

Plus points

The particular appeal of Hardlock is that not only has it proved its longevity to Network Rail in trials, doubling the life of a fitting, but also the number of components required for each section of jointed track is far fewer, while also being reusable.

Another key factor in Hardlock's favour is that the nut can be 'spun down' by hand, reducing the installation time over the existing method of securing the joint. A powered torque wrench is then used to achieve the correct seating torque values. Staytite's director of sales, David Cartledge, points to how bolts need to interact with fasteners.

'With a fishplate on a rail joint, you don't

want that to be too tight. You want the rails to breathe. The whole aspect of joint safety comes into play and that requires a fine balance.'

Hardlock's ease of application and superior performance were demonstrated under testing, to Network Rail's satisfaction, he adds. 'Also, this was a known product, as Staytite has worked, first with British Rail and then Network Rail, for over 20 years.' A key aspect of that relationship was the supply of more than half a million components between 2008-2010 in a retrofit campaign, in the wake of the Potters Bar and Grayrigg accidents.

Here are the major milestones along the route to Staytite winning the Inverness & Fort William contract:

January 2014

BEA-TT (French Land Transport Accident Investigation Bureau) releases full report on Brétigny rail crash. Staytite initiates market research to discover the extent of fishplate fastening used across Europe. Research concludes the majority of European track uses a competitor product.

October 2014

Staytite opens a dialogue with SNCF (France's national state-owned railway company) and makes a number of visits to

introduce Hardlock and discuss applications for use on their fishplates and stretcher bars. SNCF declared itself 'happy with the quality of their joint' but considered using plastic markers to show visually to inspectors if the fastenings were coming loose. SNCF is now revisiting the application, with Network Rail, SNCF and Staytite in discussion, sharing knowledge regarding the fishplate application.

2013-2016

During this period, Network Rail conducts extensive testing to evaluate its standard solution for fastening fishplates to ascertain benchmark level for comparison against any future solution. Many solutions are assessed over this time period to gauge their suitability for the application.

September 2016

Network Rail organises independent testing at a British Steel (Tata) facility to establish which would be its preferred solution.

Testing times

All fasteners tested at this stage (static load test) were a known entity to Network



David Cartledge, director
of sales at Staytite



Tony Jackson,
Network Rail

Rail and had already been used on various parts of the network infrastructure. These included the Hardlock Nut from Staytite and several competitor solutions.

As a result of the first stage of testing, the search for a solution was refined down to a choice of two. The final exhaustive testing stage involved the conducting of 250,000 cycles over a period of 16 hours. These cycles embraced:

- zero Load on Rail - 89.9kN
- 20kN static load on rail prior to vibration testing - 89.1kN
- 200kN static load on rail prior to vibration testing - 64.4kN.

The two final tested solutions included the Hardlock, with standard bolt and washer, which won the day, based on it meeting the following selection criteria:

- test results showed Hardlock demonstrated the best performance in both static and simulation tests
- past performance. Network Rail has already installed over half a million Hardlock Nuts, with 0 per cent failure on stretcher bars alone
- the Hardlock solution offers a commercial benefit, costing less than the final rival solution, which also met the test criteria
- Hardlock installation was assessed as simpler and, importantly, it can be retro-fitted to existing bolts.

It is a fact that the Hardlock piece part cost is higher than the existing nut design. However, the Hardlock joint solution offers several cost benefits, compared to the current one in use – and that has made it the preferred choice, as far as Network Rail is concerned. For example, the current installed fasteners may have to be cut



A newly fitted fishplate using the Hardlock Nut



Close-up of Hardlock jointed track/fishplate installation

Fact file

Overall, Network Rail is responsible for more than 20,000 miles of track, of which 2,500 miles is jointed track, with each section measuring up to 60 feet in length. A total of 88 track lengths equals one mile of standard track and thus 88 pairs of fishplates are required for every single mile of track. That equates to $88 \times 8 \text{ M24 or M27 Hardlock Nuts} = 704$ per mile of track. 2,500 miles of track = 1,760,000 Hardlock Nuts.

off, which often requires special cutting machinery during the removal process.

Moreover, the petrol-driven machine used for removal and reinstallation is very expensive. It can only be operated for eight minutes in every hour, due to health and safety practices, (RSI – repetitive strain injury) and (HAVS – hand-arm vibration syndrome). Additional concerns are the level of fumes emitted and the fact that the machine weighs in at a hefty 33kg each.

By contrast, the Hytorc Lithium Battery Gun, model BTM-1000, along with associated sockets, has been proposed to operate with Hardlock. This allows for continuous operation, while the accompanying electric driver also offers significant savings over the cost of the current tools used.

Go-ahead given

In September 2017, fishplate engineering approval was issued after extensive consultation and testing, updating the current fishplate design to include grade eight bolts to enhance the strength of the joint and Hardlock Nuts in class eight for 'Joint Safety'. However, while current Network Rail approval for fishplate fitment recommends Hardlock, its use is not yet mandatory, in the way that it was for use on stretcher bars.

Staytite still needs to sell the benefits of the Hardlock to each of Network Rail's 87 regional track maintenance depots and engineers.

That said, with the Network Rail order (before commercial sign-off) for Hardlock Nuts, washers & bolts for installation at Inverness & Fort William, the prospects look very positive for Staytite.

Beyond the UK, the potential for further rail business is vast, says Staytite's David Cartledge. 'The track maintenance approach we are delivering for Network Rail can be applied across every country and that is something we are now pursuing. We are looking at the possibility of many millions of pounds of contracts.'

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