



Development of an ultrasonic technique, sensors and systems of the volumetric examination of aluminothermic rail welds

- **Project budget: £1.2m**
- **End Users: Network Rail**

In Europe there are an estimated 11 million site aluminothermic welds on the rail network with thousands of new welds (estimated at 300,000 to 400,000 annually) being made daily. These welds form the basis of 'continuous welded rail' (CWR) that is a common feature of the European rail system. Although the aluminothermic welding technique is well proven, it is none-the-less a critical safety component of the rail infrastructure. An increase in rail speeds, density of rail traffic and freight train weights can now cause an increasing number of rail breaks across the European rail network.

On the occasions that rails breaks do occur, it is the experience of the industry that the majority of breaks occur at joints. There is therefore a strong need to adopt inspection techniques to assure the track owner that no damaging defects are present which might lead to track failure and, at worst, loss of life. The types of volumetric defects found in aluminothermic welds are those normally associated with gravity feed castings. They include shrinkage, hot tears, 'lack of fusion' slag inclusions and porosity.

The main two types of weld failure are a vertical fracture associated with centre line shrinkage and split web or S fracture resulting from the cyclic nature of torsional stress in the rail web on bends in the track. The consequences of a single failure could result in derailment, leading to loss of life and millions of Euros in cost.



Yet these welds are not volumetrically examined in any of the countries in the European Union as there is currently no suitable NDT technique due to the complex structure, geometry and thickness of the aluminothermic welds. A step change in the approach is required to develop a new family of testing equipment with associated local intelligence which is:

- Robust.
- Capable of being used by an individual or mounted on a rail buggy.
- Effective without the need for highly trained staff.
- Able to analyse the findings from the inspection and deliver a 'traffic light' view of the joint.
- Capable of comparing the inspection results with previous results for the same joint.

RAILECT is a collaboration between EU companies and research organisations with the objective to develop, produce and demonstrate a novel prototype device that will ultrasonically carry out a volumetric examination of aluminothermic rail welds with the UIC 60 profile. This has been successfully carried out and the project is now completed.

www.railect.com

TWI Ltd

Granta Park, Gt Abington, Cambridge CB21 6AL

T: +44 (0) 1223 899000 **F:** +44 (0) 1223 890952

NDTinfo@twi.co.uk

www.twi.co.uk