Investment Information

SIEMENS NetworkRail

What's happening?

# Improvement opportunity

## Equipment design, Material use and Waste management using TLP KO2 as a case study

Siemens Rail Automation

### *Background*

Automatic Warning System (AWS) is part of the signalling system and warns the driver about the next signal's aspect. It is divided into two major parts, the train-borne display equipment and the trackside equipment known as the AWS inductor. The AWS Inductor is positioned between the rails, in the 4-foot and it contains:

- a permanent magnet
- an electro-magnet
- middle protective ramp - bridge
- front and rear protective ramps
- mounting equipment


Pic 1.Vortok AWS Inductor (Yellow version)

The bridge is placed between the electro and permanent magnets and is used to protect the associated cables, while the front and rear ramps are positioned at the end of each magnet and are used to deflect anything hanging from a train in order to prevent damage to the magnet casings. (Pic1)

### *Problem 1 'The ramps'*

At 1830 chain couplers were introduced to trains that used steel hooks and links to connect the carriages. Despite the developments in rolling stock, the AWS Inductor design has not changed significantly over the years. Ramps are still installed even though trains now use mechanical couplers without exterior links. New Thameslink rolling stock, the Siemens Desiro, uses the Dellner coupling system that operates electro-mechanically without any exterior links or hooks.

Pic 2.AWS front/rear ramp

| AWS Ramps' waste | |
|---|---|
| Trackside Units | 264 |
| Steel used for ramps | 0.95 t |
| CO2 generated | 5.73 t |
| Cost | £29,568.00 |

Table 1.Ramps material usage and carbon footprint

For the TLP KO2 project some 264 AWS Inductors are going to be installed. The total number of ramps is double, taking into consideration that a pair of ramps is used for every Inductor. Each ramp weighs 1.8 kg, is manufactured out of zinc plated passivate clear mild steel and costs approximately £112. As a result almost 1 ton of potentially 'unnecessary' steel will be used. (Table1)

### *The Ramp Paradox*

Another type of signalling equipment the Train Protection Warning System (TPWS), is also located in the 4-foot and is manufactured from composite material rather than steel (Pic3). It has no protection measure to prevent any hanging object underneath the train to damage it. For the London Bridge area more than 645 units are installed. From May 2008 until November 2013, 16 total malfunctions were recorded. However, only 1 of those failures was caused by a physically damaged loop, raising the question of whether the ramps are now redundant.

Pic 3.TPWS loop installed on tracks

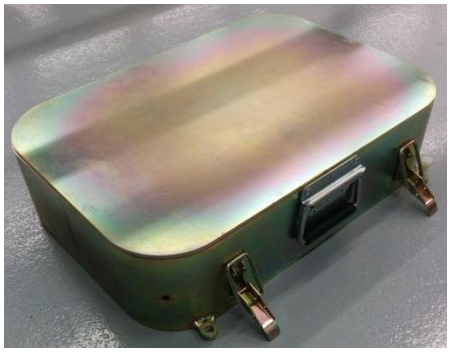
**Contact**: Evangelos.Tsiapalas@siemens.com, Graduate Development Engineer, Siemens Rail Automation **Version**: Draft 1, Apr 2014

## *Improvement opportunity*

There is room for improvement in the AWS system and more specifically in its trackside unit, the AWS Inductor. The **front and rear ramps** can be removed from the design process considering the lack of hanging objects or chains underneath the trains operating in the UK railway. Moreover, the use of more sensitive unprotected trackside equipment, like TPWS units where almost no failures due to impacts were recorded, point out the waste in material currently taking place.

## *Problem2. The flux shunts*

Until recently every AWS Inductor was purchased with a flux shunt cover, used for the permanent magnet. The flux shunt is a steel made cover, used only until the completion of commissioning. Afterwards, since it no longer serves any functional purpose it has to be recycled, even though in majority of cases, it is still in excellent condition and fully operational. Due to each shunt weighing 21kg, its disposal leads to a significant material waste. In TLP KO2 almost a ton of steel is potentially wasted due to the number of AWS Inductors installed.



Pic 4.Shunt cover used on AWS Inductor's permanent magnet

## *Improvement opportunity*

Considering that most **flux shunts** are in mint condition and fully operational even after their initial use, it indicates that recycling is not the most advantageous option. Most used flux shunts can be reused without any adjustment on a future installed AWS Inductor. SRA is able to purchase AWS Inductor's without the flux shunt supplied. Therefore, one option available is for SRA to store used flux shunts and re-use them on subsequent projects, only disposing of them once they are no longer fit for purpose. This would potentially save money (each flux shunt costs approx. £77) and also enable re-use rather than recycling of the flux shunts which is a more favourable option in the context of the waste management hierarchy. A potential issue with this solution is the logistics of storing the flux shunts until their next required use. One way of addressing this problem would be to arrange a take-back scheme with the supplier. This option was further explored by contacting one such supplier (Vortok) but will require further discussion in order for a take-back scheme to be established.

| AWS Shunts' waste | | |
|---|---|---|
| Trackside Units | 264 | |
| Steel used for flux shunts | 11.09 | t |
| CO2 generated | 357.65 | t |
| Cost | £20,328.00 | |

Table 2.Shunts' material usage and carbon footprint

## *Meeting our Sustainability Objectives & Targets:*

This initiative aligns with a number of sustainability commitments detailed in the TLP KO2 Sustainable Development Policy (dated June 2012) and specifically those related to:

- Marketplace: deliver sustainable design and construction solutions that represent value for money within the available budget;
- Environment: Maximise resource efficiency in planning, design and construction and adopt the waste hierarchy to minimise waste during design and construction; and
- Environment: minimise the carbon emissions associated with the design and construction of the Works.