Ricardo Rail

In Field Implementation of Contactless Wayside Pantograph Monitoring

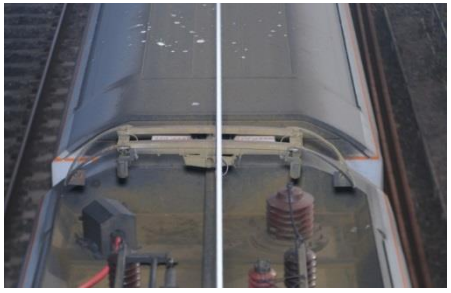
Name: Arjan Rodenburg

The Network Rail trial

Trial with Camera-based Uplift system & Pantograph Integrity monitoring

Goal Network Rail:

- Asset Protection WCML & Replacing obsolete Panchex (1980)
- Systems maintenance without disruption to traffic



Why would one monitor a pantograph

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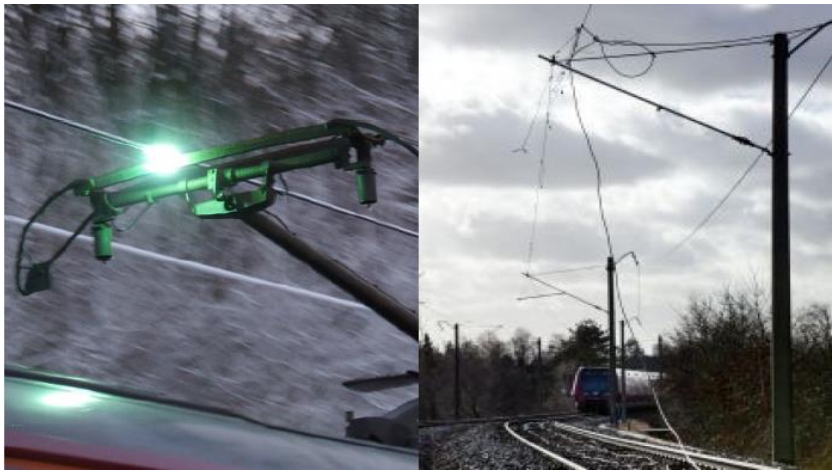
- Defective pan can lead to dewirement
- Dewirement leads to huge delays (negative impact on availability) and high costs
- Increased wear due to arcing or high uplift
- Prevent damage to the vehicle
- Optimise pantograph maintenance



Ricardo PanMon solution

A system consististing of two separate modules:

- The Sensys Gatso Advanced Pantograph Monitoring System with Ricardo Image Processing
- The Ricardo/DMA lineside Uplift system

Uplift

- High uplift generates increased wear of contact wire and carbon strips
- Low uplift leads to arcing and rapid wear of the carbon strips

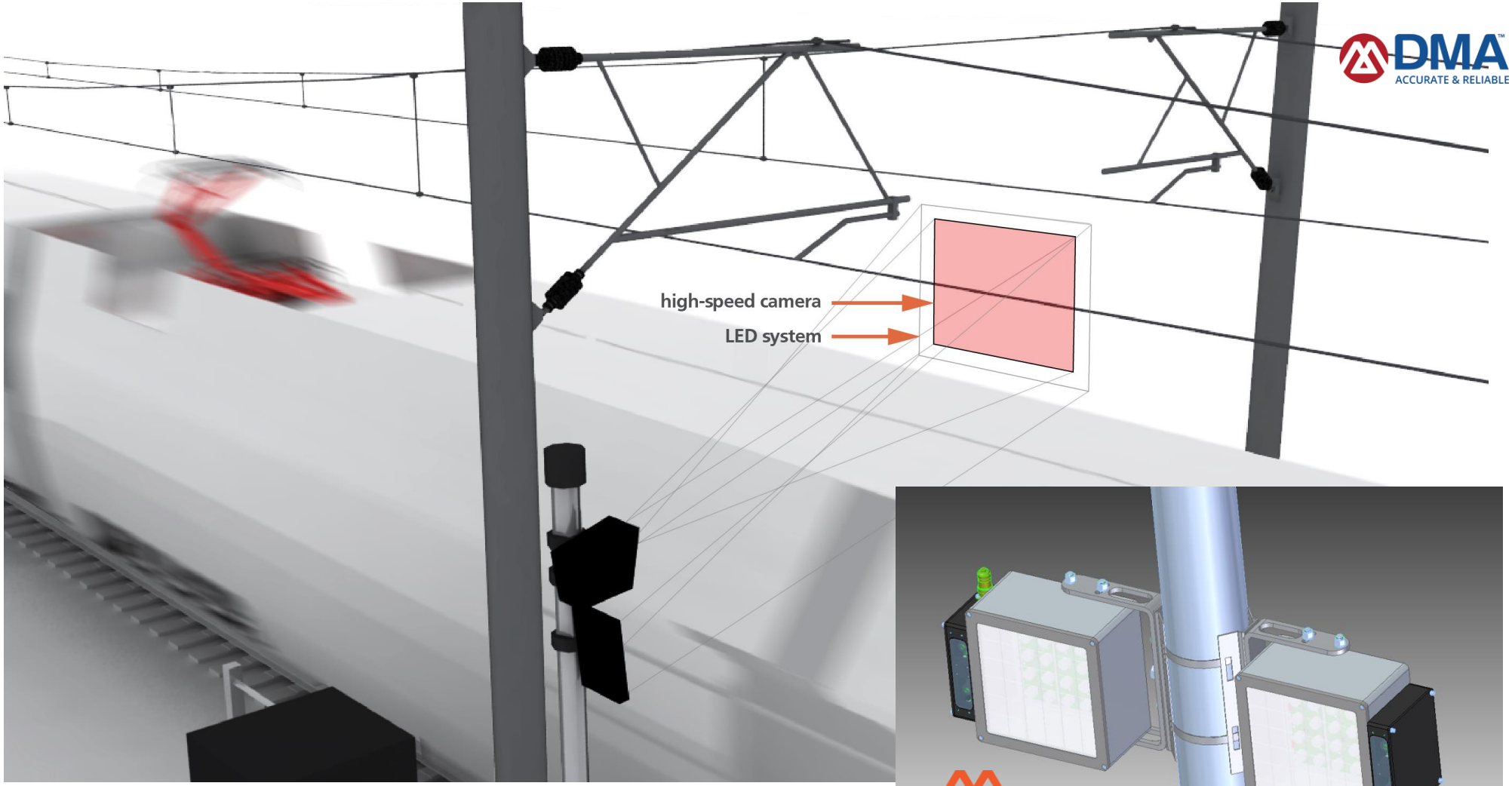
What should be measured?

- Displacement of the contact wire (alarm too high / too low)
- Train unit identification

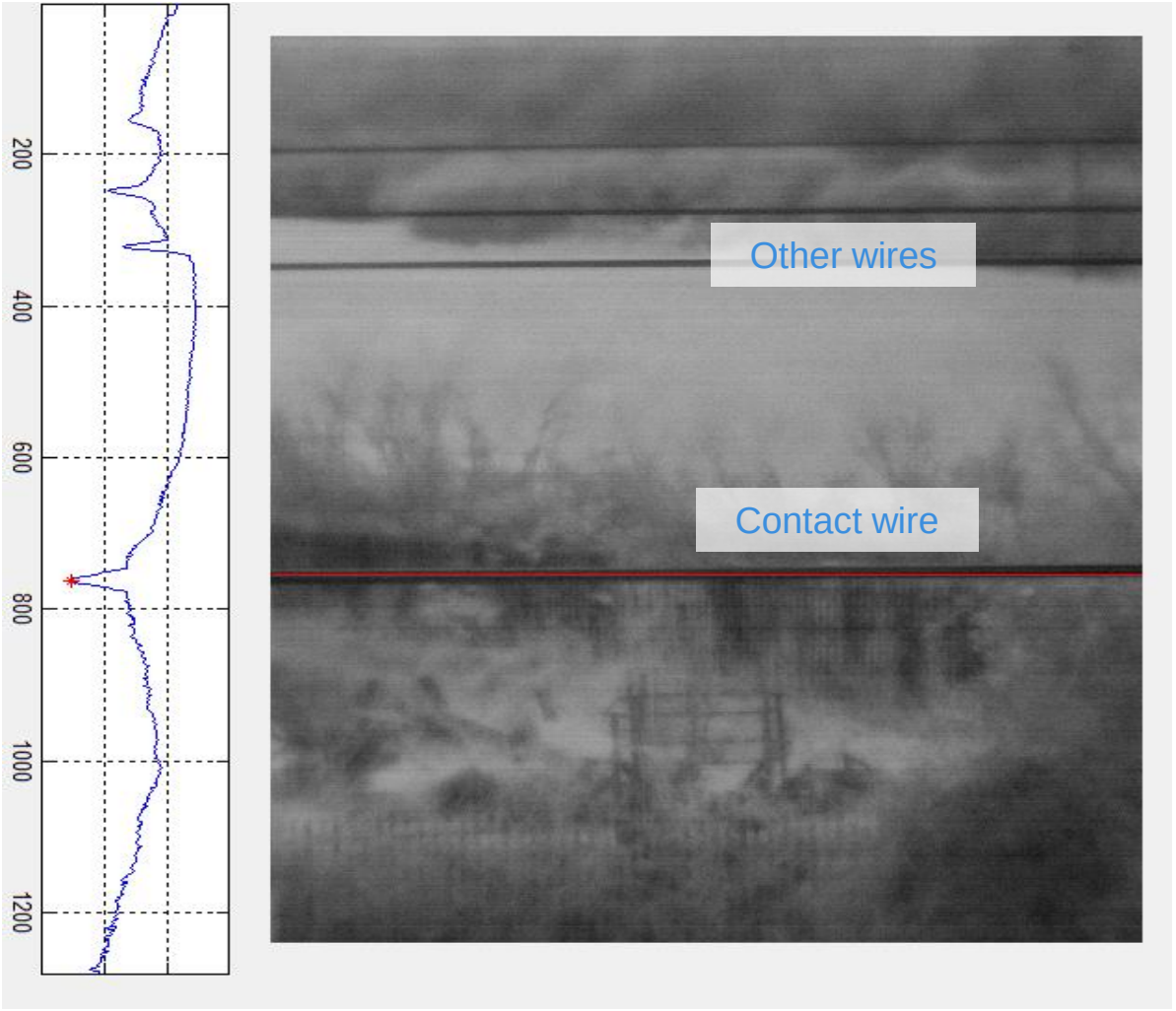
How can this be measured?

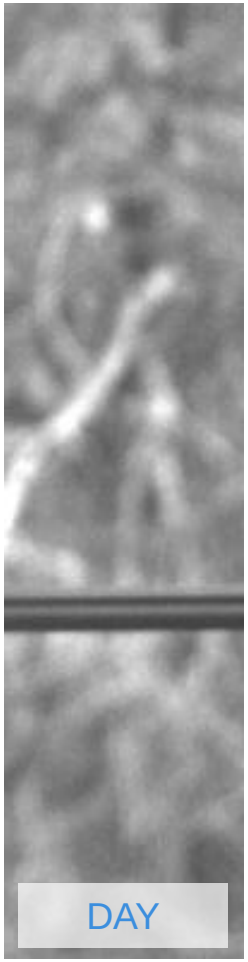
- With linear displacement sensors (non-contactless)
- With laser distance sensor (semi-contactless)
- With lineside camera (contactless) Implemented solution

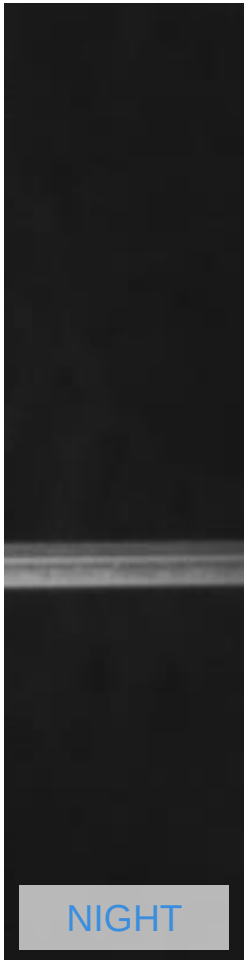
Uplift Lineside camera



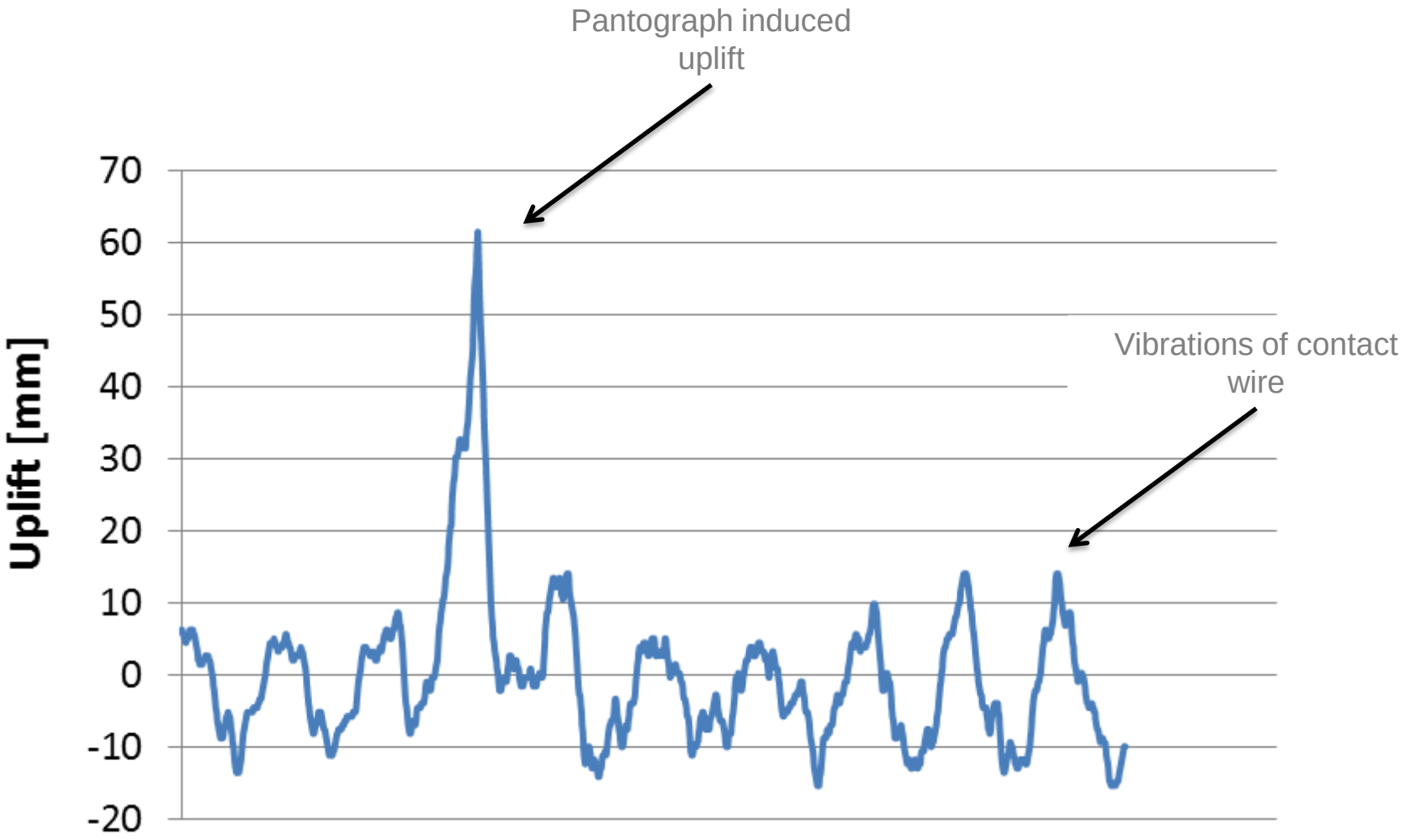
Uplift Lineside camera images







Uplift Lineside camera measurement



Pantograph Integrity, how

- Worn carbon strips need to be replaced to prevent damage
- Pantographs with defects need to be lowered to prevent damage

What should be measured

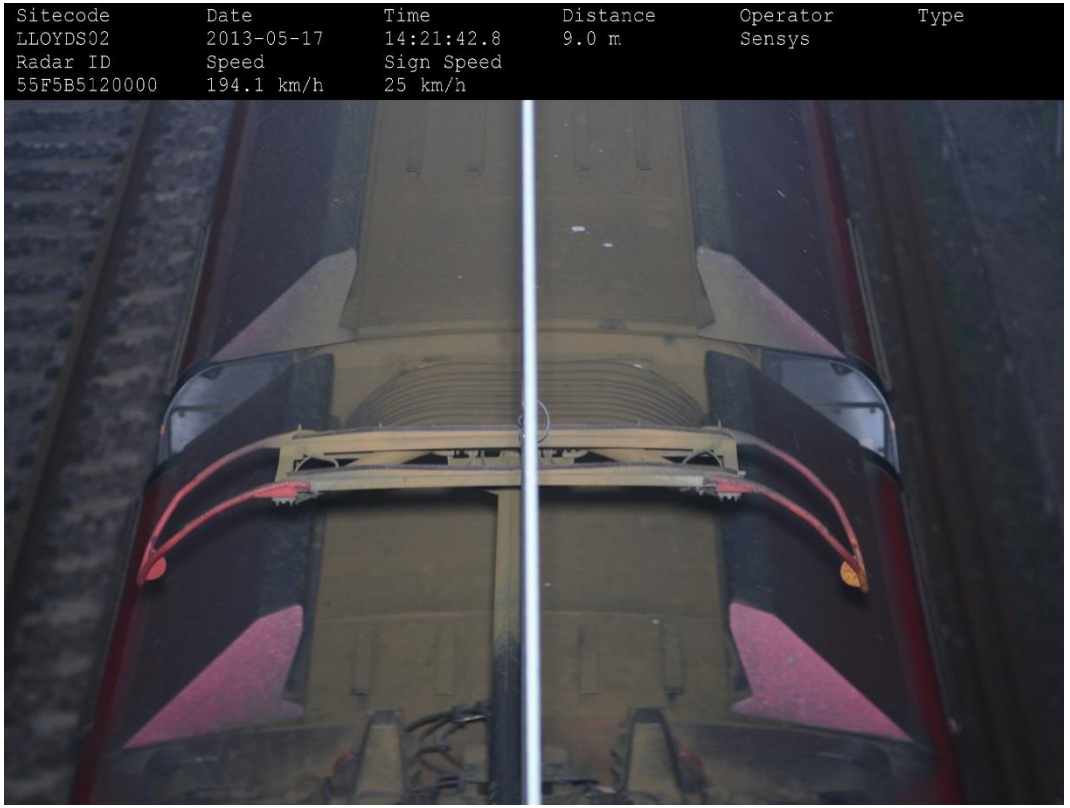
- Train unit identification
- Type of pantograph (automatic detection)
- Wear of the carbon strip (remaining thickness, thickness profile)
- Carbon strip integrity: discontinuities, chips
- Presence and status (broken, bent) of end horns
- Defects of the strip holder (bent, broken, misaligned)
- Detection of missing pantograph aerofoils

How can this be measured

- With laser scanners
- With camera and image processing (Implemented solution)

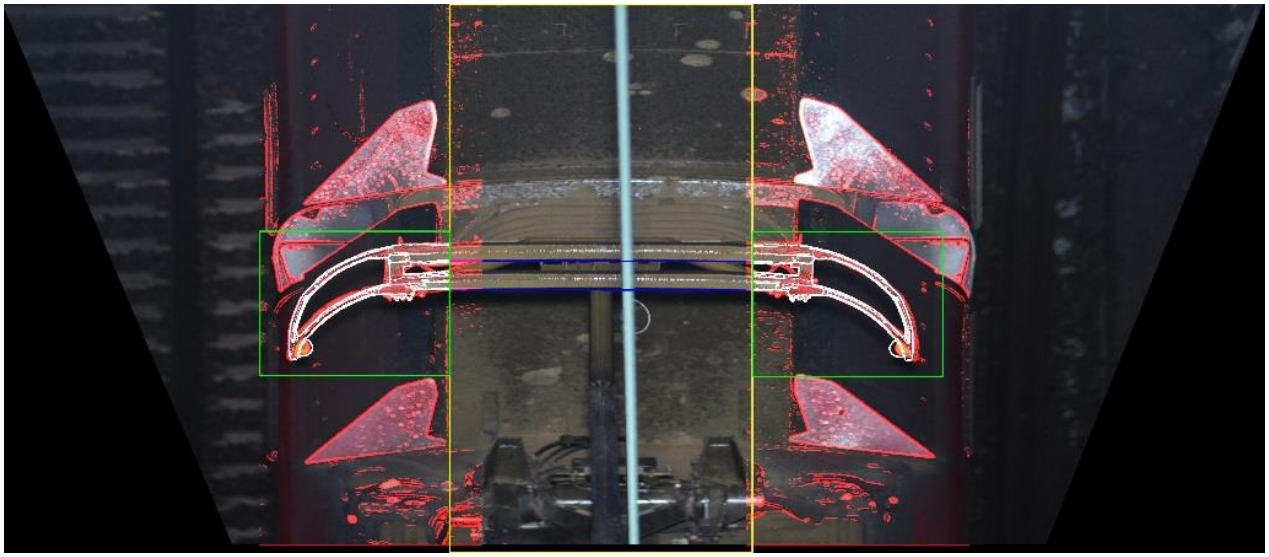
Pantograph Integrity, acquire pantograph photo

Technology for road traffic speed enforcement adapted to a rail application



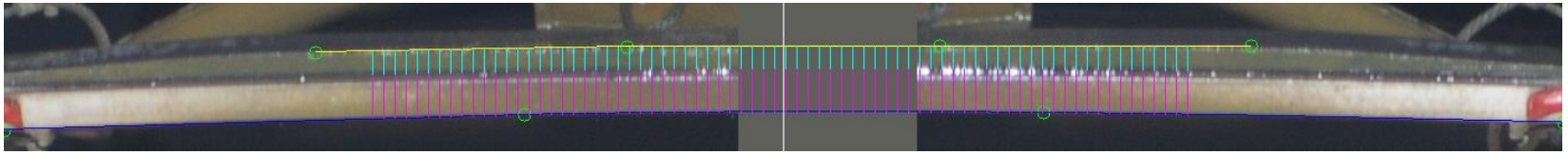
Pantograph Integrity, type recognition

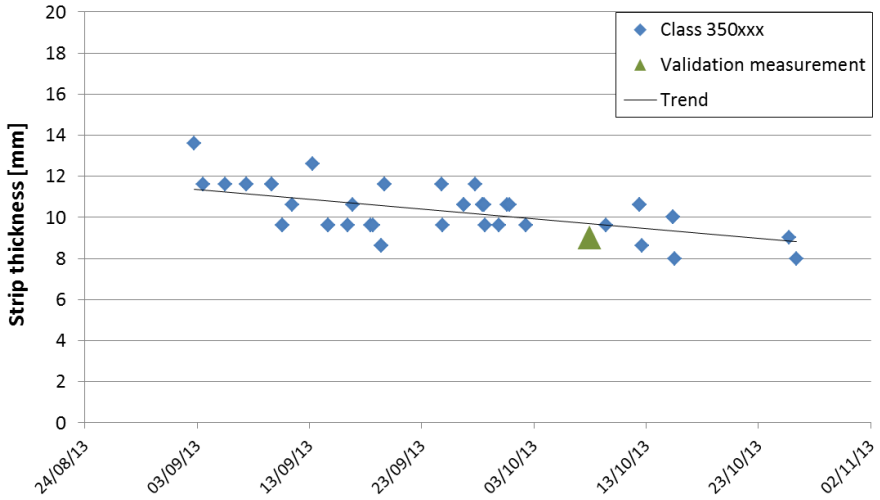
1. Acquire the photo
2. Transform photo to isolate site specifics
3. Define Region of Interest for endhorns
4. Search pantograph templates for best 2 matches
5. Zoom in on details to find the ultimate best match



Carbon strip wear

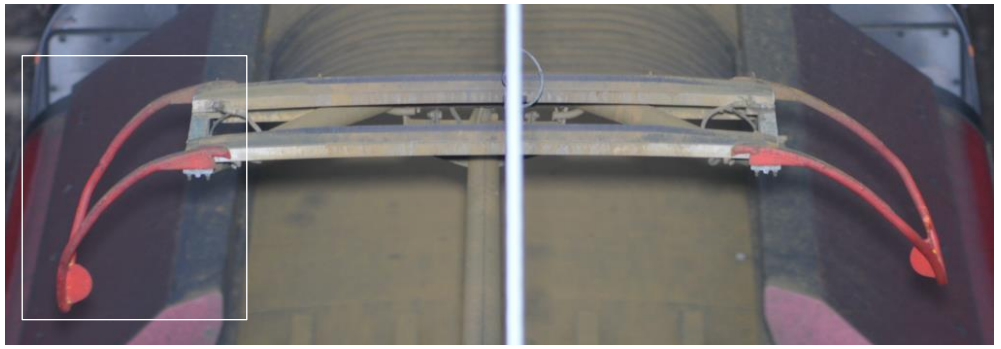
- Trace top and bottom of carbon strip
- Calculate remaining thickness
- Send alert when wear limit is reached
- Trend analysis to predict when wear limit will be reached



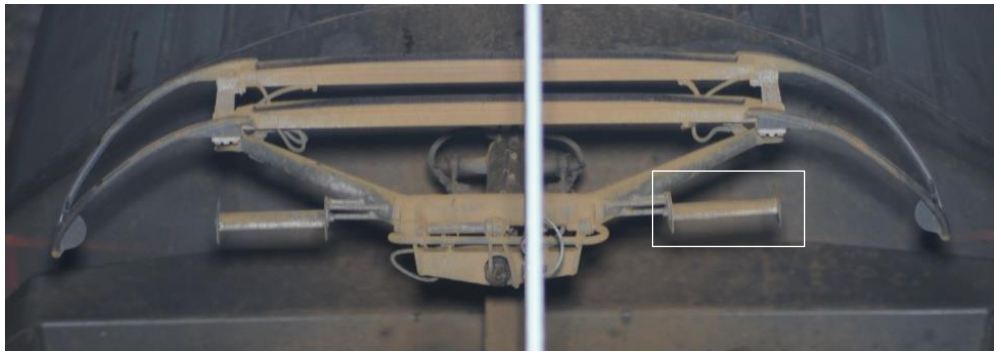


Defects detected

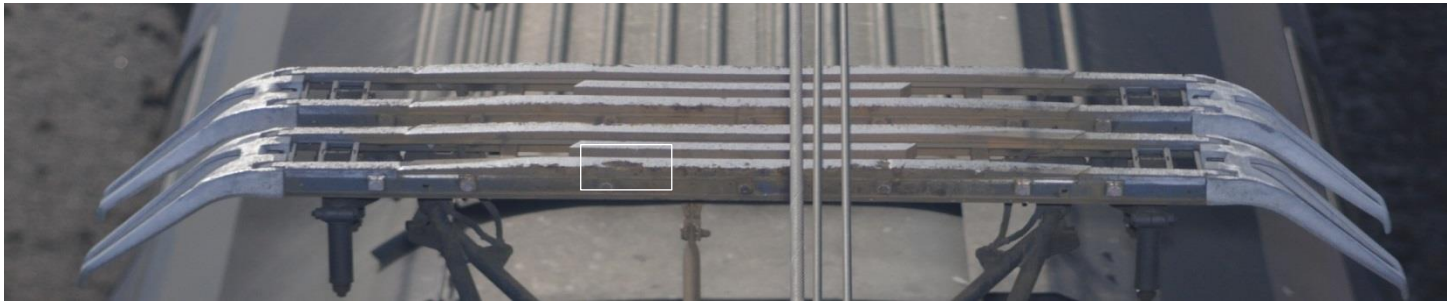
Damaged endhorn



Damaged aerofoil

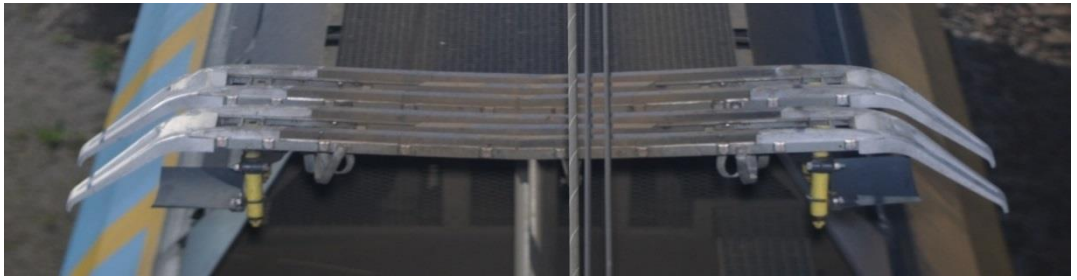


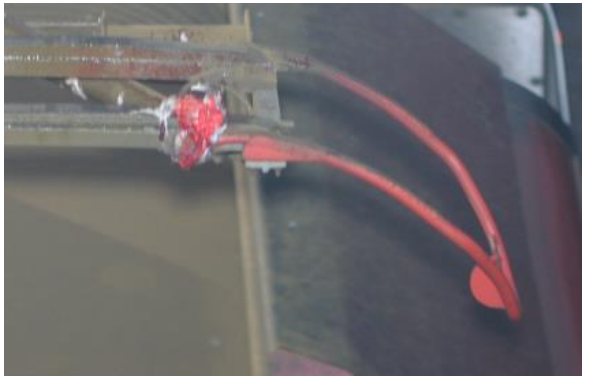
Missing pieces of carbon (chips)



Challenges we are facing

How to teach the software to detect defects that are likely to cause an incident but occur very rarely?





Network Rail Certificate of Acceptance

NetworkRail

Certificate of Acceptance PA05/05657

Manufacturer:
Ricardo Rail

Issue : 1
Valid From : 28/09/2015

Trackside Pantograph Monitoring System

Product Description

'Panmon' Trackside Pantograph Monitoring System

Scope of Acceptance

'Panmon' Consists of 2 integrated (but separable) sub systems:-

1) An Automatic Pantograph Monitoring System (APMS) which takes a photograph of each passing pantograph & utilises shape recognition software to identify defects.

2) An Uplift Monitoring System (UMS) which utilises a remote camera installed on a hinged lightweight signal post to measure contact wire uplift.

Subject to the specific & general terms contained in this certificate.

Note acceptance excludes the user interface – system currently requires manual interrogation of output data.

Network Rail Acceptance Panel (NRAP) hereby authorises the product above for use and trial use on railway infrastructure for which Network Rail is the Infrastructure Manager under the ROGS regulations.

Reviewed by:

Steven Reynolds
Product Acceptance Specialist

Authorised by:

Paul Conway
Acting Head of Plant

Please contact [illegible]

Network Rail Infrastructure Ltd Registered Office: 1 Eversholt Street London NW1 2DN Registered in England and Wales No. 2904587 [illegible]
Version 6.3 April 2015

Thank you for your attention

Contact details:

Arjan Rodenburg
Technical Consultant
Ricardo Rail
arjan.rodenburg@ricardo.com