PANTOINSPECT
IMAGE HOUSE

Introduction of the PantoSystem

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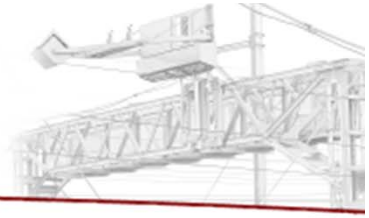
International Sales Manager
2016-10-14

PANTOINSPECT
IMAGE HOUSE

Todays presentation



How our railway customers can:

- prevent some accidents caused by defect pantographs

- cost savings using predictive maintenance concerning the carbon strips

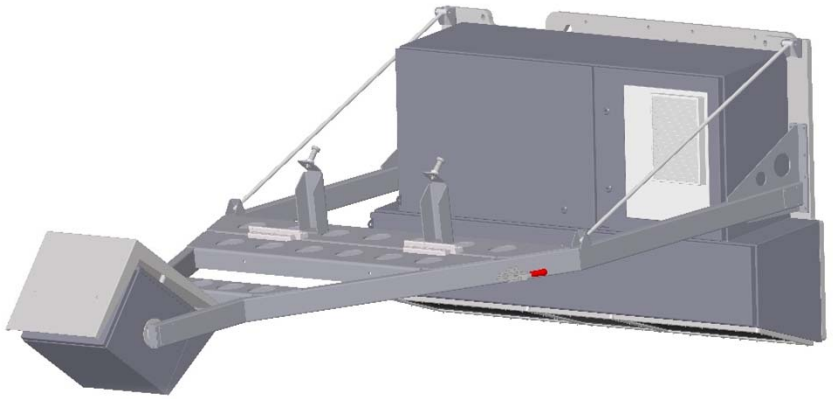


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IMAGE HOUSE

About us

- Pantoinspect A/S is the company behind the PantoSystem, developed for infrastructure owners and train operators within the railway industry.

- Our history started in 2008 where we initiated the first work and development with Banedanmark.

- The development of our core technology and the production of the PantoSystem is made in-house at our property in Copenhagen.

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Example of an accident that will cause passenger delays and high costs

- the wire is down (ex. tangled in a train's pantograph)- no trains can run until the broken equipment is cleared away…….

- significant costs are incurred as a result of each de-wirement incident, such as penalties and costs incurred repairing damaged equipment……. and bad press!

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Example of Overhead wire problems from september 2016 in Sweden

- incident outside Malmo in south Sweden where the train traffic was stopped several hours caused by a de-wirement

The overhead wire is down

This train had to stand still 3 hours before evacuation

- the total number of incidents in Sweden caused by defect contact overhead wires is 400/year
- the number of delayed hours have increased from 6000 hours 2013 to 8000 hours 2015 caused by increased train traffic

Source and pictures: The daily local newspaper Helsingborgs Dagblad 2016-09-04

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Example of an accident from October 2016 in India

The pantograph got entangled with an overhead

Bringing the train to an abrupt halt

- The incident took place at 12.32 pm, when a pantograph of the Kalyan-CST down train became entangled with an overhead wire between Kurla and Sion stations

Source and pictures: www.mid-day.com By Vedika Chaubey

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When Overhead Wires Are Torn Down ...

- Repair Costs
  - — Overhead wires
  - — Train pantographs
- Traffic delays
  - — Cost of service contracts
  - — Refund of passenger fares
  - — Cost of lost business
  - — Brand damage (Bad press)
- Risk of person injuries

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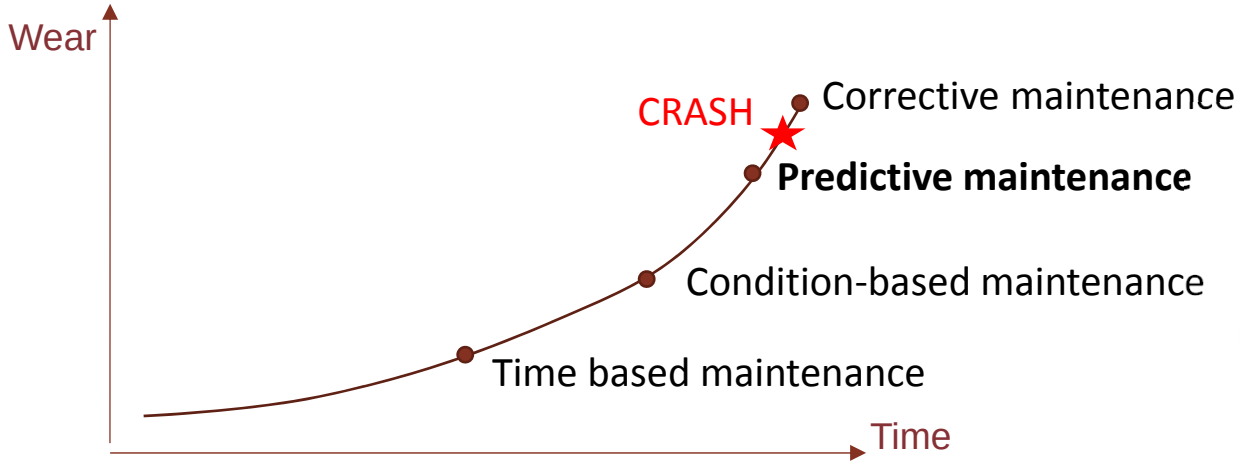
More effective replecement of the carbon strips

Reduce the lifecycle cost of the pantograph carbon strips

- effective and automated condition monitoring of the pantograph
- in combination with the use and analyzing of captured data against the individual pantographs



Predictive maintenance will reduce maintenance costs

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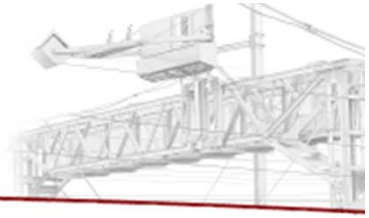
IMAGE HOUSE

Pantosystem and the advantages for the users?



Rolling Stock owners

- predict, when maintenance should be performed. This approach promises cost savings over routine or time-based preventive maintenance.
- get an indication of a defect or wrong adjusted pantograph
- protect your image and increase the customer experience by less by lower rolling-stock stops
- More effective use of the depots

Infrastructure ovners

- prevent that damaged pantographs can cause overhead wiring tear-downs
- avoid some of the costly network delays
- avoid costly infrastructure repairs
- avoid timely and costly manual inspections
- avoid bad press

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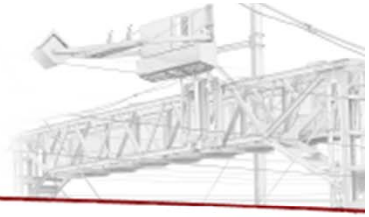
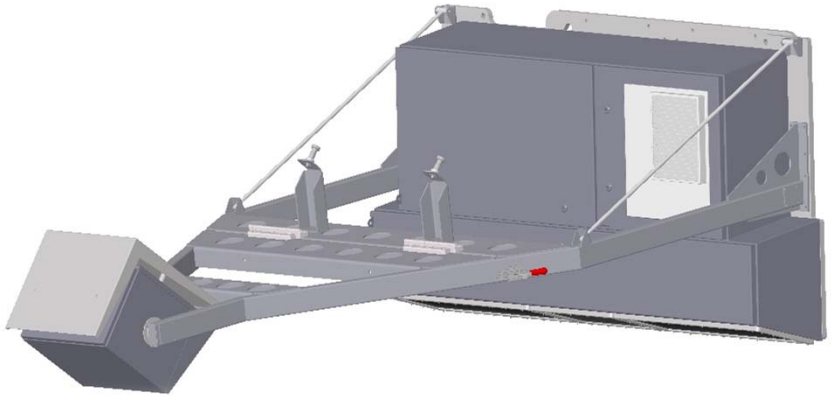
The PantoScanner

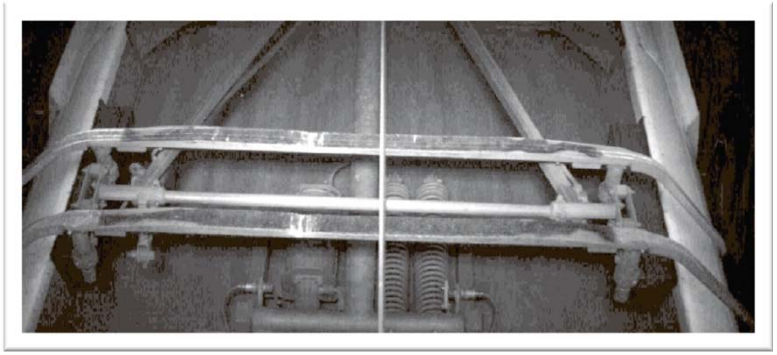


Measurements of:



- Carbon surface shape
  - — Dangerous cracks and chips
  - — Thickness of remaining carbon
- Pantograph uplift
- Pantograph yaw
- Horn presence

Additionally the scanner captures a regular image of the pantograph to allow for manual visual inspection.



Each train and pantograph is identified

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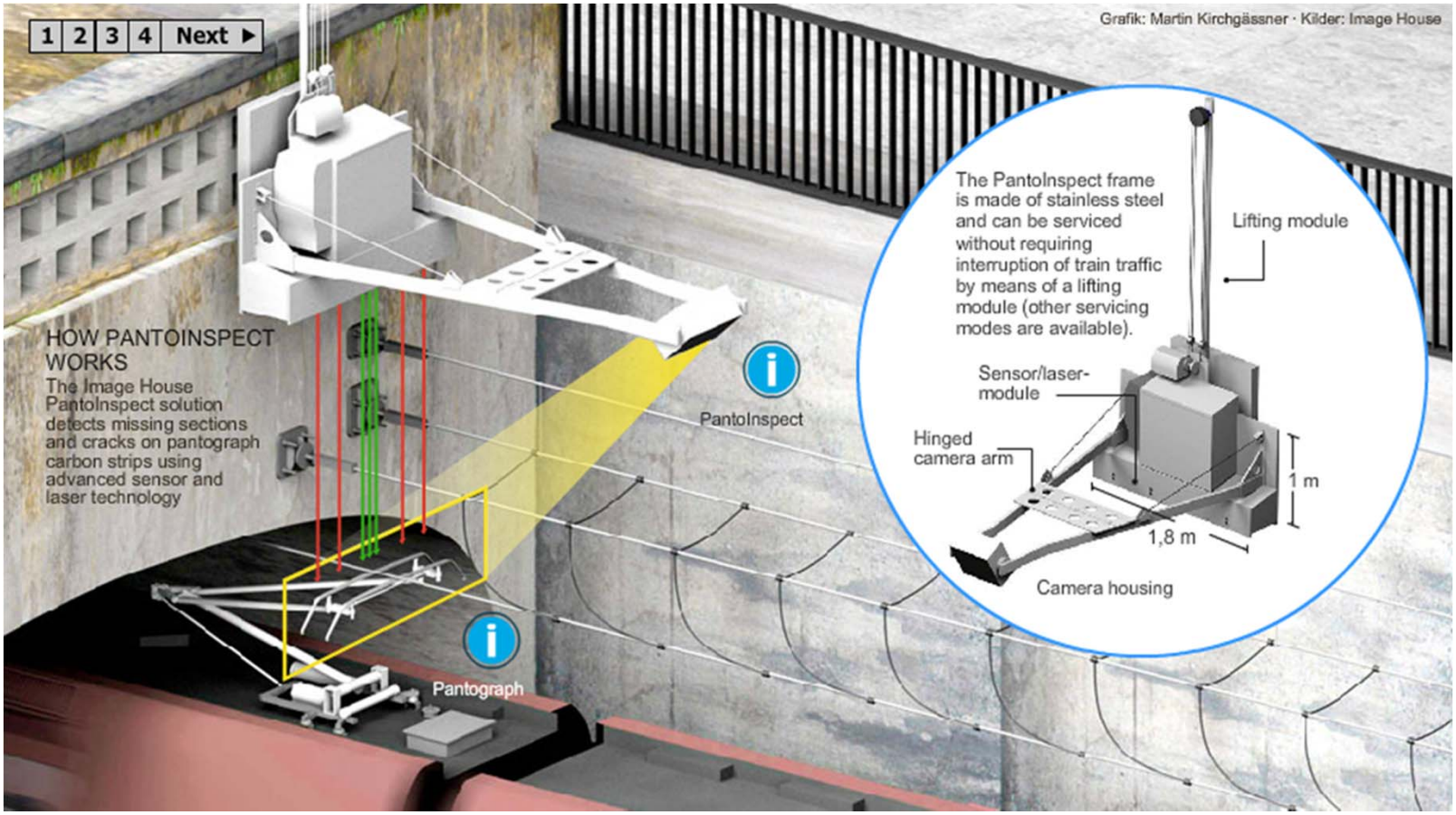
How The PantoSystem Works 1/2



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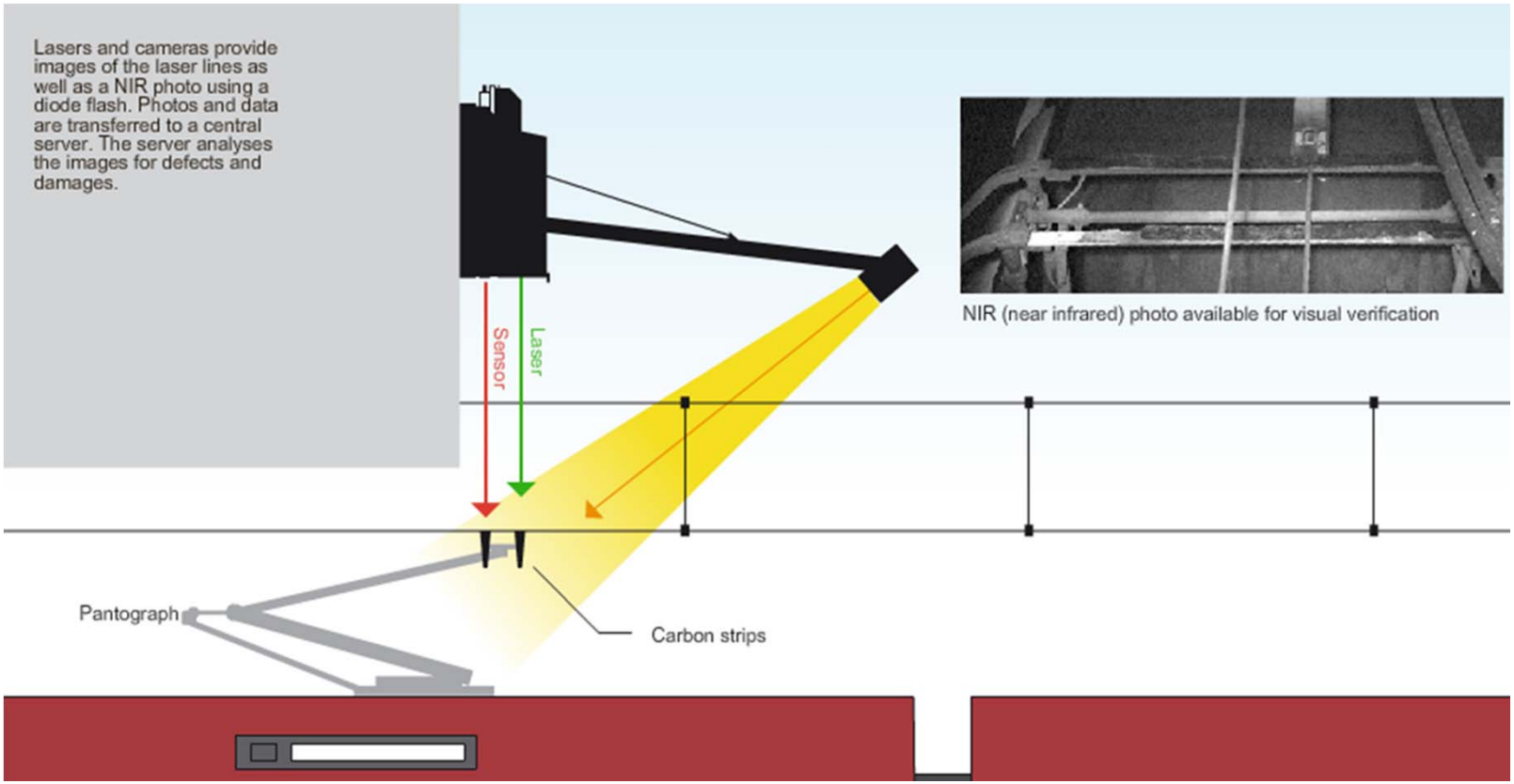
How The PantoSystem Works 2/2



Graphics: Martin Kirchgässner

Examples of a pantograph and damaged carbon strips

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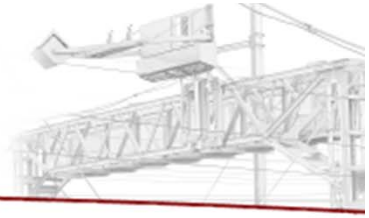
The PantoSystem is Unique in Several Ways



- Delivers real-time condition monitoring of trains during operation
- Designed and proven for outdoor 24/7 use - all year
- Detects large carbon defects, small cracks and measures a rich set of wear features

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The WEB based PantoClient

- Provides access to measurement data through an easy to use graphical interface
  - Which is prepared for integration to custom IT and maintenance systems
- Allows an individual configuration of thresholds and other settings
- Receives alerts and subsequently manages workflow

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Example of alarm

EXAMPLE

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IMAGE HOUSE

PantoSystem
Traffical Alarm Report

Main Report
PantoSystem Traffical Alarm Report - Train D 6139 - Location Thornleigh Up - Time 2015-02-10 17:15:29

ID: D 6139, vehicle: 1
Pantograph 1
Pantograph type: A/BW-SEG

Pantograph image. Train Average Velocity: 76 km/h = 47 mph.

Pantograph 1
Carbon strip2

Profile image

Status Report	#	Analysis	Status	Value	Alarm rule
	1	Yaw angle	Ok	0.3°	
	2	Horn deformation (left)	Ok	3 mm	
	3	Horn deformation (right)	Ok	-2 mm	
	4	Carbon thickness	Ok	8 mm	
	5	Uplift	Ok	-3 mm	
	6	Uplift force	Ok	97 N	
	7	Edge chip	**Alarm (medium severity)**	Width: 26 mm Depth: 2 mm	Edge Chip Medium Width: 26 mm Depth: 12 mm

www.PantoInspect.com

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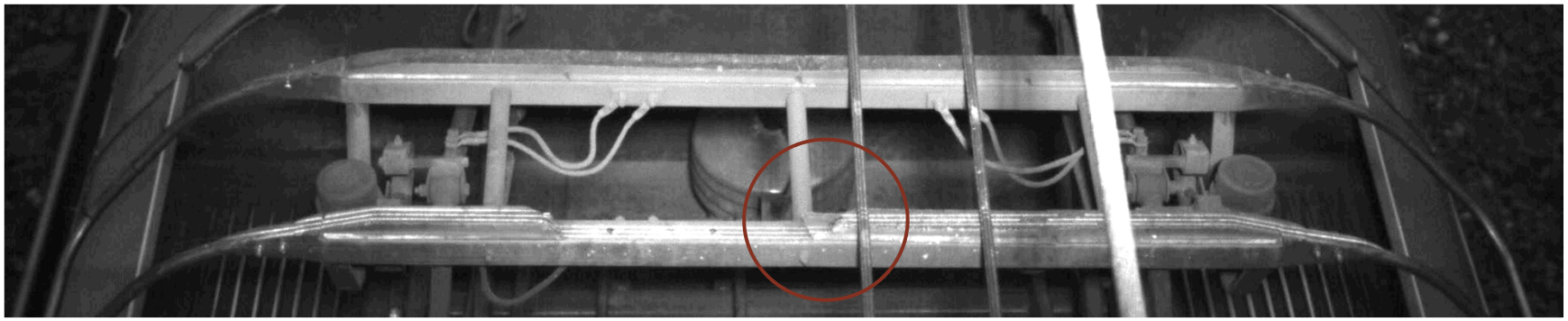
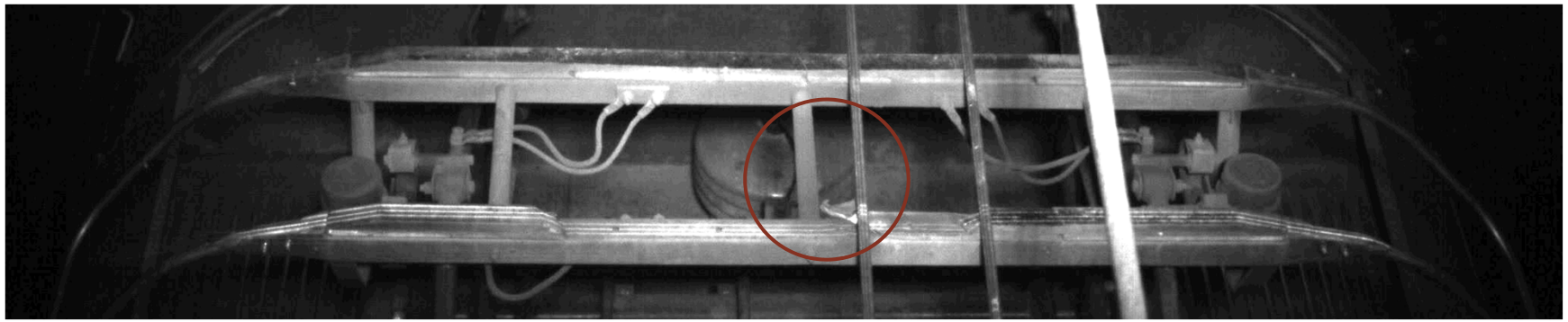
Missing Carbon in Australia
March 3, 2015

At 17:34



At 06:53 next day ...



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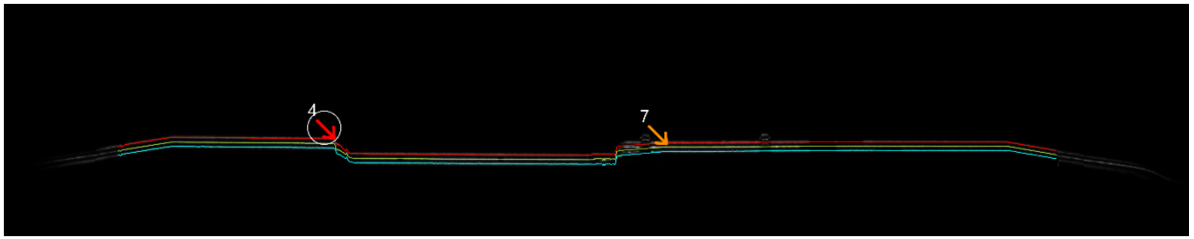
Example of false alarm rate



High Threshold – i.e. less sensitive analysis, only major defects detected:

- True Alarms: 12 corresponding to 0.027%*
- False Alarms: 2 corresponding to 0.004%*

The number of false alarms is less than 1 of 20 000

*** All test results based on live customer data from the PantoSystem Test Library**
Number of train passes tested: 6 542 (during 48 days)
Number of carbon strips tested: approximately 45 000

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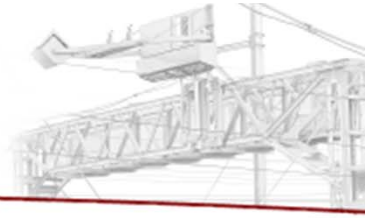
Example of the cost of dewirement



- 40 years = lifetime of a locomotive
- At least once in its lifetime every locomotive gets a dangerous pantograph
- Assuming 4500 locomotives running, the infrastructure owner may have ca. 115 dangerous pantographs in the net every year!
- Approx. 10% of this locomotives will turn down the wire
- Approx. 12 accidents x 100 000,- €
- **Approx. costs = at least 1.2 mio. € every year!**
- Image (bad press) loss and costs because of missing train operation are not taken into account

PANTOINSPECT
IMAGE HOUSE

PantoInspect is Currently in 4 Countries

Denmark Banedanmark

Australia Sydney Train

South Africa Transnet

Austria ÖBB

PANTOINSPECT
IMAGE HOUSE

Thank you!

Questions?

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