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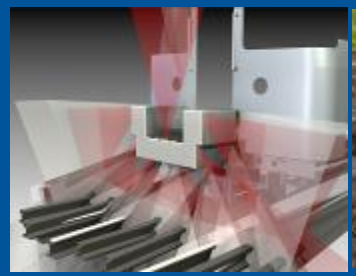
Rail

Balfour Beatty Rail

Engineering and Technology Solutions

'Delivering the benefits of technology to infrastructure asset management'



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Agenda

- Welcome and introductions
- Overview of Balfour Beatty Rail Engineering and Technology Solutions
  - Company information
  - Measuring and visualising infrastructure condition
  - Cost-effective capacity improvement
  - Signalling monitoring
  - Innovative track solutions
- Questions

Balfour Beatty

- Quoted on the London Stock Exchange
- An international infrastructure business:
  - UK plc but with around half the business now overseas
  - Significant operations in the US, Middle East, Far East and Australia
- Four business areas:
  - Professional services
  - Construction services
  - Support services
  - Infrastructure investments
- Lifecycle approach: deliver services essential to the development, creation and care of infrastructure assets
- 50,000 employees worldwide
- Acquired Parsons Brinckerhoff in October 2009

Construction services
2011 Revenue
£7,050m – EUR 8,440m

Infrastructure Investments
2011 Investments Results
£71m – EUR 84m

Support services
2011 Revenue
£1,584m – EUR 1,896m

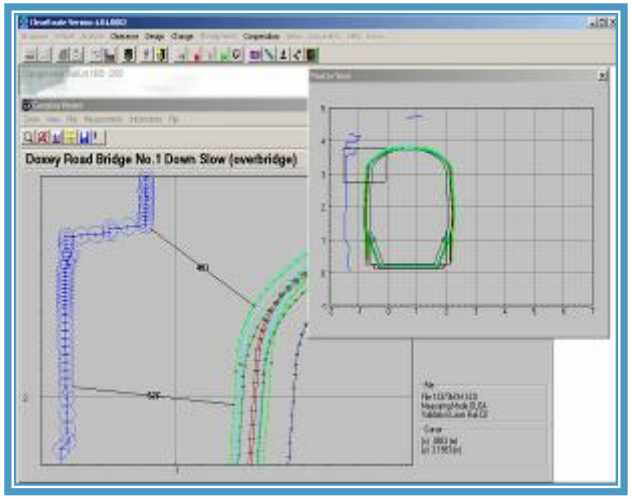
Professional services
2011 Revenue
£1,645m – EUR 1,969m

2011 Revenue £11,035m – EUR 13,210m

NB – Revenues including shares of joint ventures and associates / Exchange rate 31 Dec 2011

Balfour Beatty Rail Technologies

- Part of the Balfour Beatty Rail UK
- 130 professional engineering staff
- Core business is the application of technology to improve infrastructure asset management



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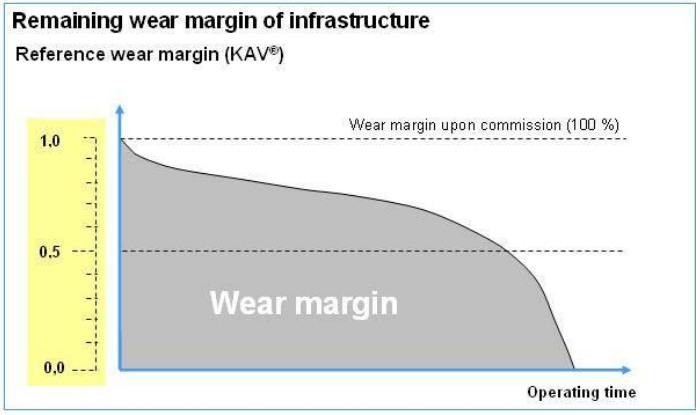
Asset Management Focus

- Innovative solutions that help deliver more reliable, safer rail infrastructure at reduced lifecycle cost
- Management systems for condition visualisation, decision support and planning
- Systems developed from knowledge of being a maintainer of the UK's 150 year old rail infrastructure
- Service proven measurement and data acquisition systems
- Applications include track, overhead line, conductor rail, switches and signalling systems



High-speed | Mainline | Commuter | Metro | Light rail / tram | Industry | Freight

The Business Case for Rail Infrastructure Asset Management

- The results show that some of the better performers achieve this through having better information with which to drive the maintenance process
- Asset management typically costs about 2% to 3% of the cost of maintenance
- Properly implemented it can deliver a 10% to 20% maintenance cost reduction…….a significant return on investment

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Measuring and Visualising Infrastructure Condition

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Attended Measurement Systems

London Underground – Tubelines Asset Inspection Train

Key Systems

- Inertial Track Geometry*
- Running Rail Profile*
- Check Rail Geometry*
- Conductor Rail Profile/Geometry*
- Corrugation*
- Tunnel Profile(*)
- RFID/GPS based location
- Multi Channel Video (Digital)
- Thermal Imaging
- Ride Quality
- Noise
- Synchronised data display

* = Triangulation measurement systems

Queensland Rail – Road/Rail Vehicle

Key Systems

- Instrumented Pantograph
- Non-contact OHL
- Mast Detection
- GPS based location
- Inertial Track Geometry
- Versine Track Geometry
- Ballast Profile
- Platform Clearance
- Corrugation
- Contact patch

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Rail Infrastructure Measurement

- A very large part of the UK Network is now measured with Balfour Beatty Rail systems
- Track Geometry Measurement
  - TRC
  - PLPR 1 & 2
- Overhead Line Measurement
  - Mentor upgrade
- Structure Gauge Measurement
  - LaserFlex on SGT1
  - and soon on SGT2

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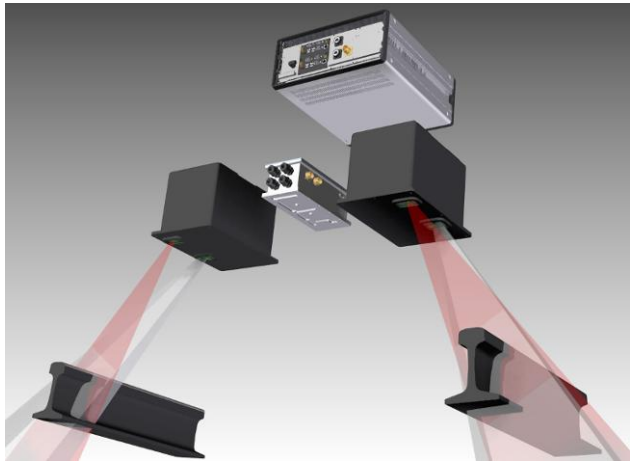
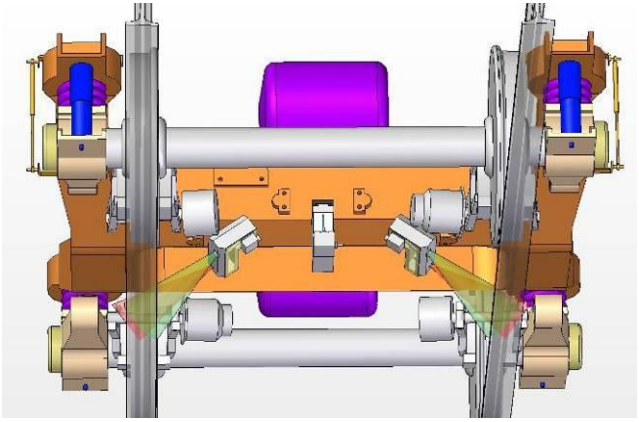
Unattended Track Geometry Measurement

- New track geometry measurement equipment compact and automated for fitment to normal service trains:
  - Dramatically reduced cost
  - Much more frequent measurement
  - Mandated for all new fleets by DfT
- Frequent measurement provides an early indication of developing faults and a clearer understanding of deterioration rates and causes
- This allows the right maintenance to be carried out at the optimum time
  - At an early stage where it can be seen to be cost effective
  - Where safe, as late as possible to minimise intervention costs





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Ultrasonic Rail Testing

- Balfour Beatty Rail is working in exclusive partnership with RTI, one of the leading ultrasonic testing organisations, to deliver the **8000SX™** testing system.
- Total Flexibility – service or product offering
- Train borne, RRV or trailer mounted
- Very accurate detection and discrimination of rail faults - ensuring the highest Probability of Detection (POD) with the lowest False Call Rate (FCR)
- Survey to survey comparison to assess defect growth
- Proven with some of the most demanding railways in the world

Data Management Challenge

- More frequent measurement and earlier identification of faults places greater demands on data management systems
- Systems must be more automated and ensure excellent positional repeatability to give confidence in early fault detection and allow right first time intervention
  - Is that a series of defects, or just one inaccurately located?
- This led us to develop ***DataMap™***, an asset condition visualisation system, built on a location based model of the network with automated tools to 'fit' data streams with an accuracy of 0.5m even underground

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DataMap™ supports the visualisation of a complete range of asset condition information

- Track geometry
- Ride quality
- Overhead line
- Lineside structures
- Structure gauging
- Rail profile & wear
- Conductor rail
- Noise
- Corrugation
- Rail flaw
- Traction supply
- Video
- Ground Penetrating Radar
- Thermal imaging
- Ballast profile

Key Benefits of DataMap™

- Reduces maintenance costs
- Enables life extension rather than renewal
- Improves safety management
- Scalable solution from individual line to national network
- Information access from full corporate to individual trackside PDA
- Cost effective audit record of asset condition
- Identify operational train performance improvement
- Enables virtual track walking
- Supports more effective maintenance
- Better utilisation of costly plant
- Reduces unplanned maintenance activity
- Helps the user make sense of measurement information
- Reduce levels of analysis and management
- More pro-active maintenance monitoring
- Improved planning (tamping, grinding ballast)
- Helps contractor management
- Supports acceptance warranty management for new lines

A Synchronised View

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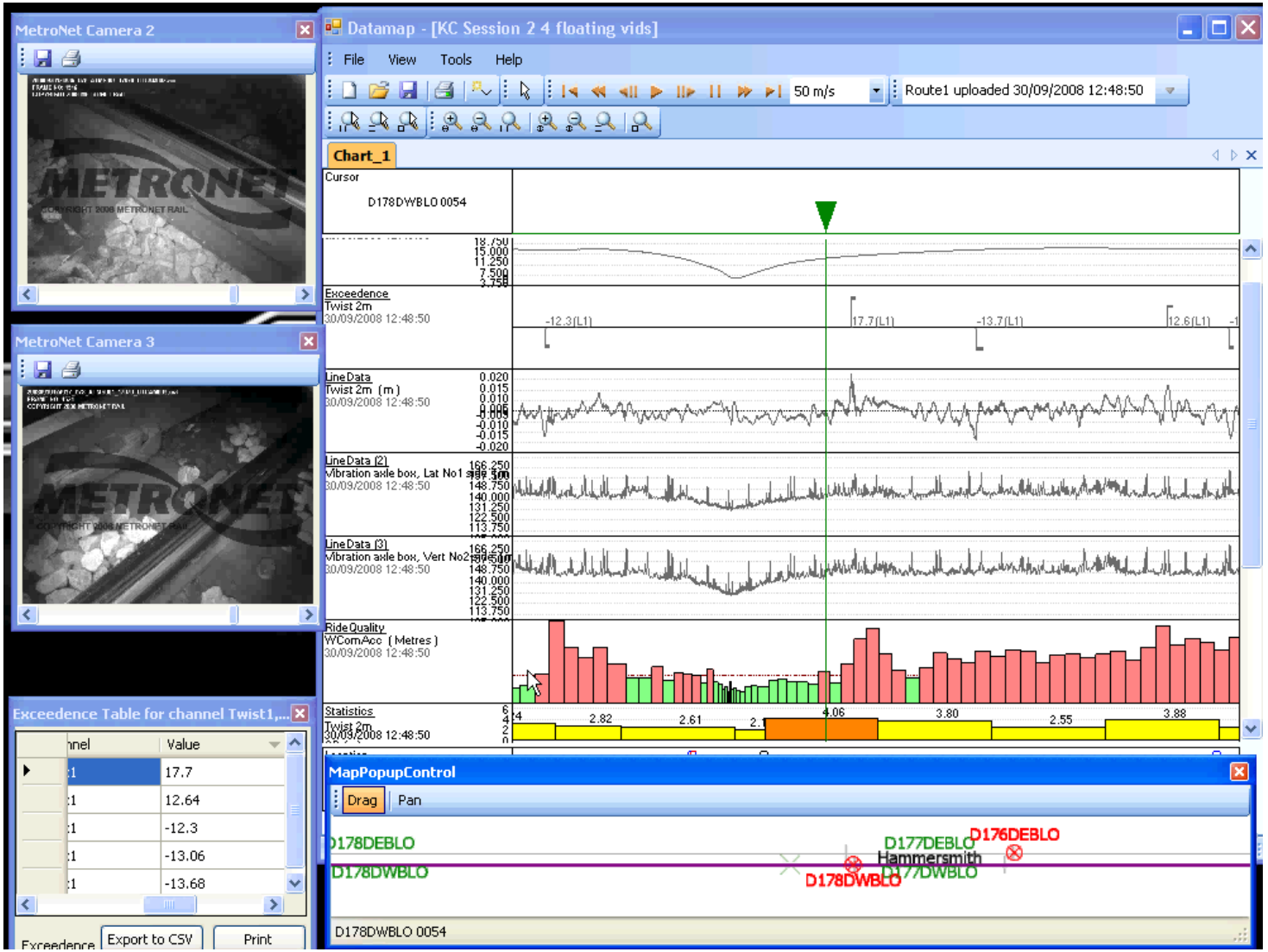

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Cost Effective Capacity Improvement

UK Structure Gauging

- The need to cost-effectively run larger and faster vehicles through tight infrastructure, has led the UK to develop the most advanced approach to clearance assessment in the world

- Over the past 15 years it has been possible to accommodate larger and faster vehicles, whilst at the same time minimising expensive infrastructure changes and managing risk

- This has been done by improving the analytical methods used in clearance assessment, in conjunction with highly accurate measurement systems

Traditional and Absolute Gauging

- Traditionally, most railways adopt a process called static gauging which is simple but uses worst case conditions and generous allowances
- Static gauging over-predicts and can 'waste' up to 300mm of usable space
- Increasing capacity (larger or faster trains) involves significant civil engineering works so this conservative approach is a very expensive option
- The UK now uses accurate measurement and enhanced analysis to understand the true clearances required, an approach known as absolute gauging
- The actual space required to run each type of vehicle along a route is compared with the actual size of structures and the position of adjacent tracks

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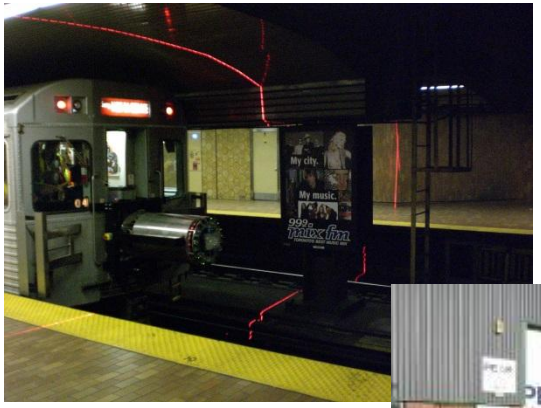
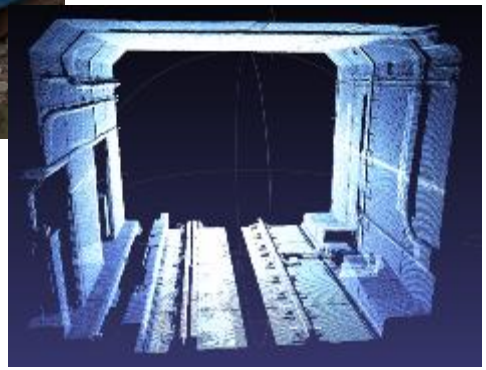


Structure Gauge Measurement

- Any required platform
- High accuracy integration with track geometry data
- Output information compatible with industry standard CAD packages and in-house databases and clearance analysis
- Supporting the UK's leading approach to clearance gauging, giving more space for vehicle operation than any other method



References

- LaserFlex - high speed train based measurement for Network Rail, TTC, PATH
- LGV - RRV based measurement services for Network Rail
- LaserSweep - manual measurement equipment sales, hire and services

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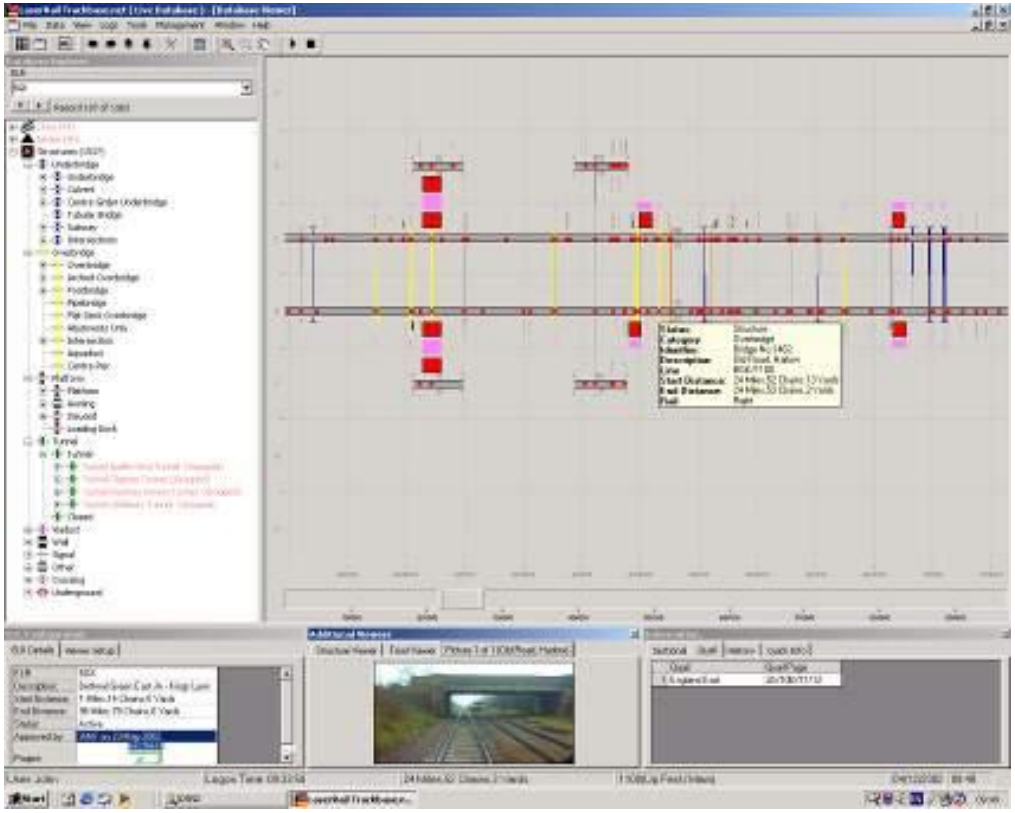
TrackRoute™
3D Infrastructure Database

- Used to manage all Network Rail gauging measurements
- Developed and hosted by BBR
- Links various fields such as profile, location, speed & track geometry
- Direct output to ClearRoute for clearance analysis
- Supported by BBR for over 15 years



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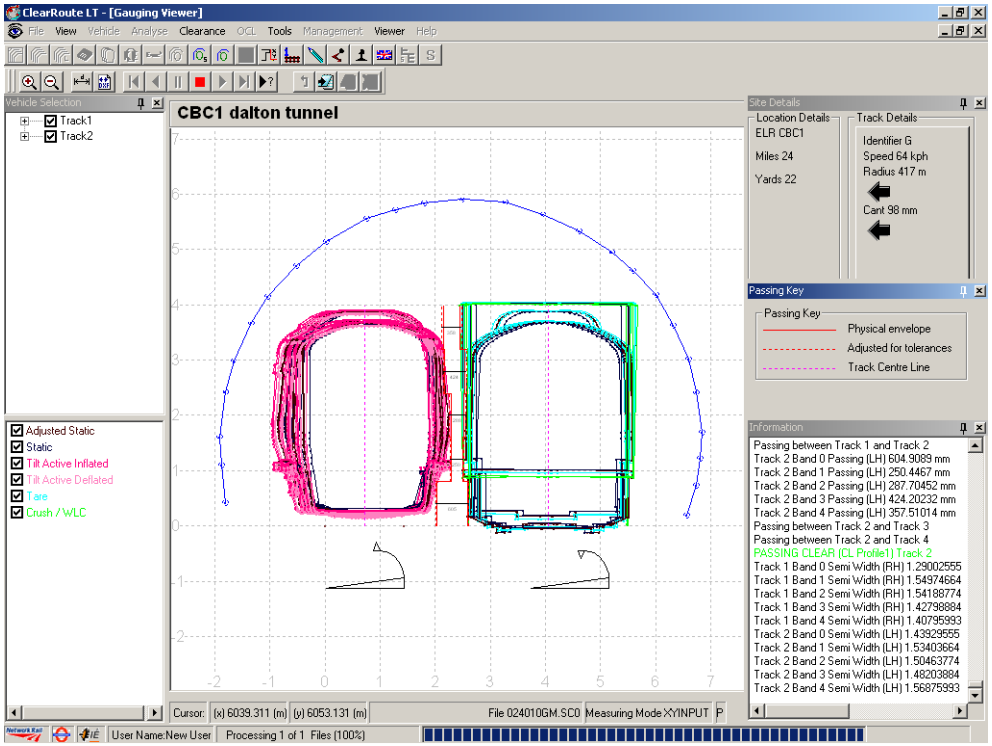
ClearRoute™
Clearance Assessment

- Clearances between infrastructure and vehicle and between vehicles
- Static gauging and dynamic gauging with vehicle models
- UIC kinematic gauging
- Platform stepping calculations
- Allows complete route assessment
- Compliant with all relevant standards



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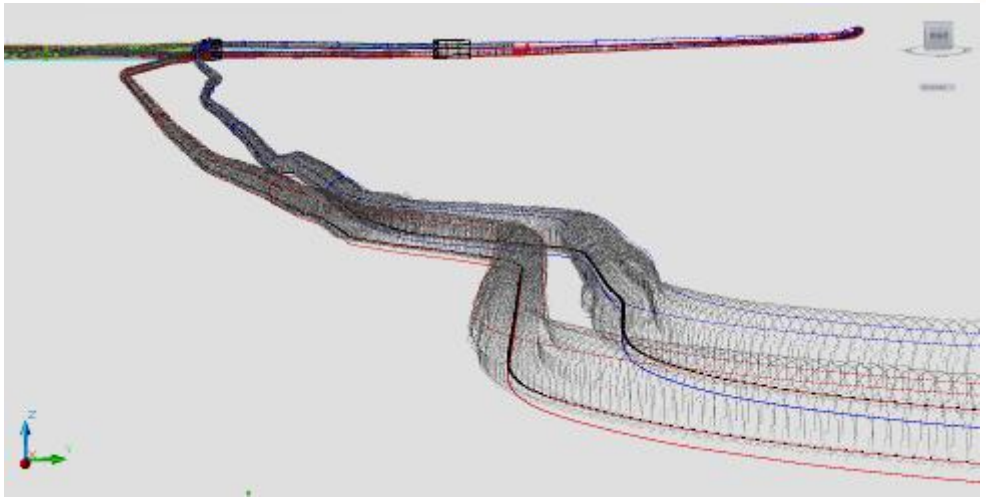
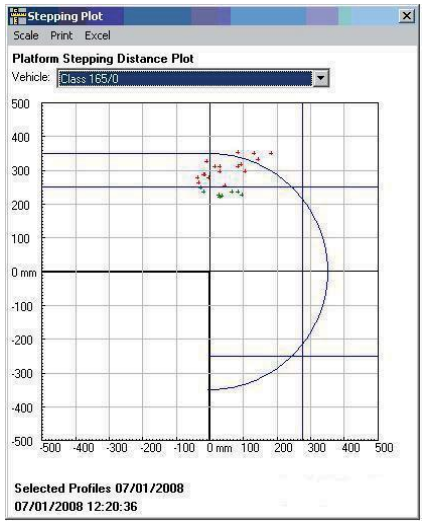
Gauging Services
Specialist Gauging Consultancy

- The consultants' consultant
- Advanced toolbox
  - ClearRoute+ and HyperRoute
- Specialist knowledge
- Proactive project involvement
- Full service – measurement through to certification
- Involved in all new trains for the UK since privatisation





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The Business Case – Infrastructure Benefits

- If it all seems to be much more complicated you would be right
- It's a significant exercise in infrastructure data collection and management.
- So is it worth it? …….UK experience says yes, very much so
- The analysis of true clearances reduces expensive modification work, resulting in very significant savings for infrastructure owners
- An analysis looked at the need for structure modification to accommodate the W10 gauge on a 150 mile route with 2187 structures
  - Using a static gauging approach, 66 structures would need to be modified
  - Using an absolute gauging assessment only 48 structures need be modified
- The saving from not having to modify 18 structures was estimated to be £25m
- With further savings from reducing the extent of the modification that still needs to occur

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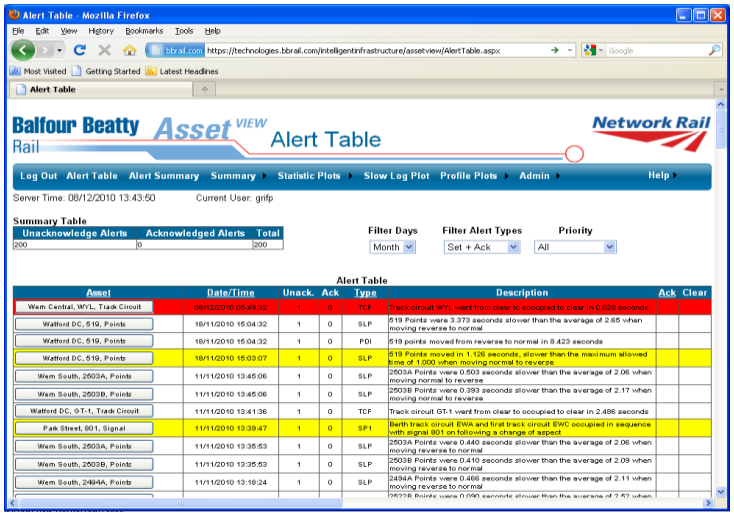
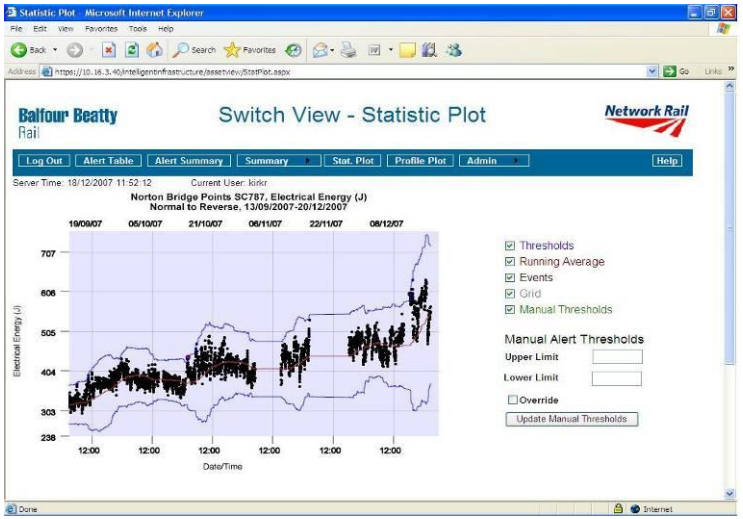
Signalling Monitoring

Signalling Monitoring

- AssetView is an event monitoring and analysis system that automatically analyses the results from analogue and digital event recorders, including data driven systems such as Solid State Interlocking
- Embedded signalling engineer 'know-how'
- Diagnostic and prognostic
- Now covers around 40% of the UK network
- Business case driven, primarily by delay minute reduction





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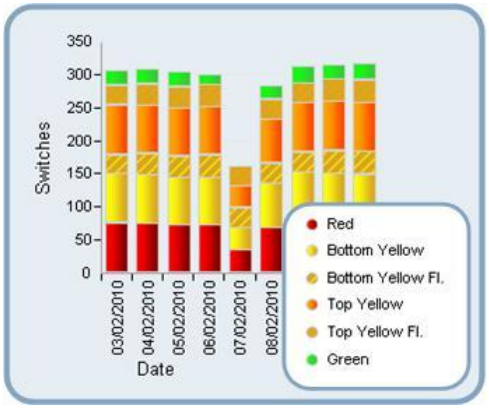
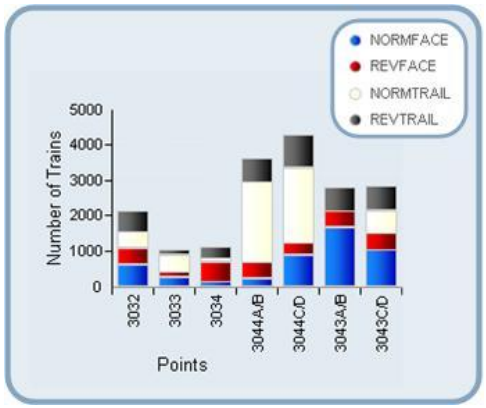
Intelligent Analysis

- AssetView processes data from a range of sources to provide meaningful information on the performance of the asset.
  - Point machine operating statistics
  - Signal lamp / LED burn times and operations
  - Graphical replay for incident replay and route cause identification
  - Operational performance statistics – e.g: aspect shown to approaching trains, direction of trains over switches
  - Predictive and reactive failure alerts – e.g: SPAD, Change of Aspect and asset failure alerts



Lamp / LED Operations

Graphical Replay



Trains Over Points

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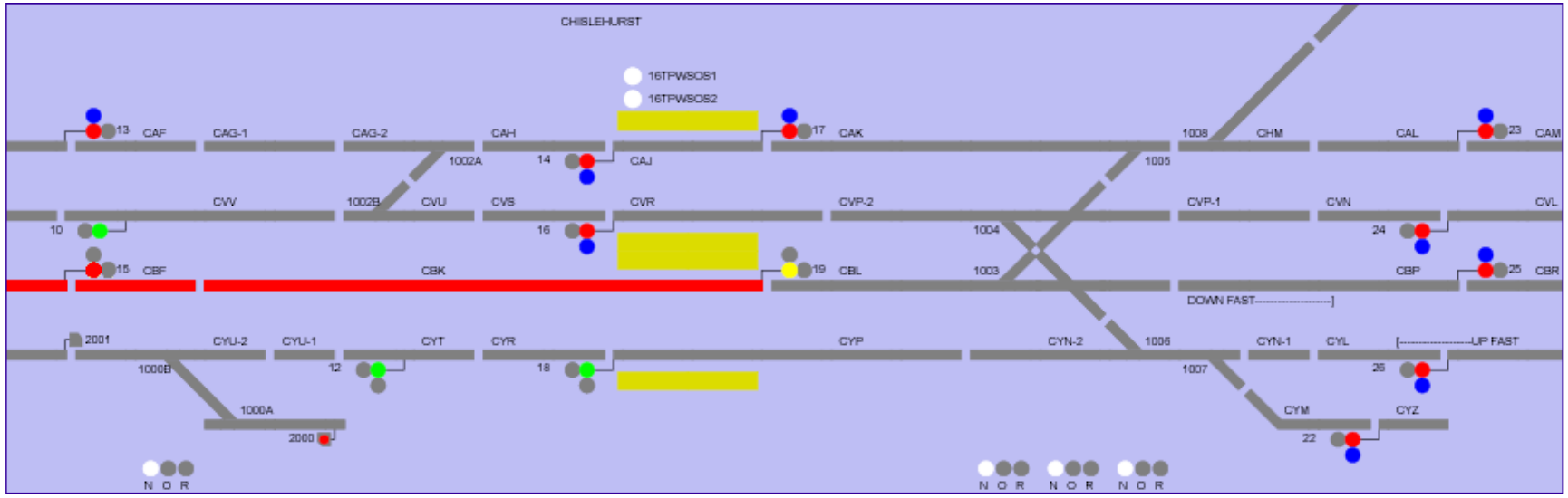
Delay Reduction Focus

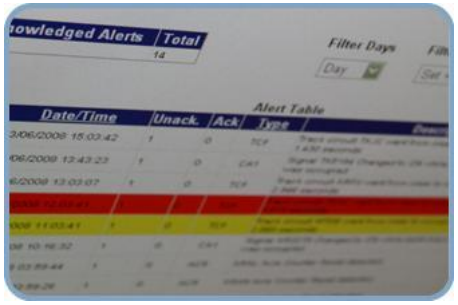
- Benefits provided in a range of areas including maintenance optimisation and operational planning

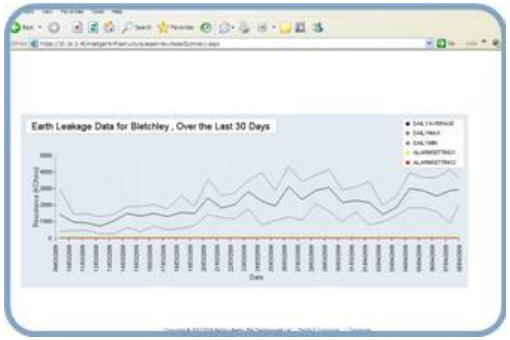
- The main focus however is on delay minute reduction, speeding up access to data, aiding diagnosis and demonstrating what really happened to help with driver 'management'



Delivering Benefits

- At a key London station the system provided circa 10,000 minutes (£600,000) delay savings over 18 months by:
  - Identifying the root cause of a Change of Aspect fault without testing
  - Early detection of slowing points at a key Junction
  - Identifying point detection flicking under passing train – preventing a potential Change of Aspect fault
  - Diagnosing the root cause of a Signal Passed at Danger at a key location





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Innovative Track Solutions

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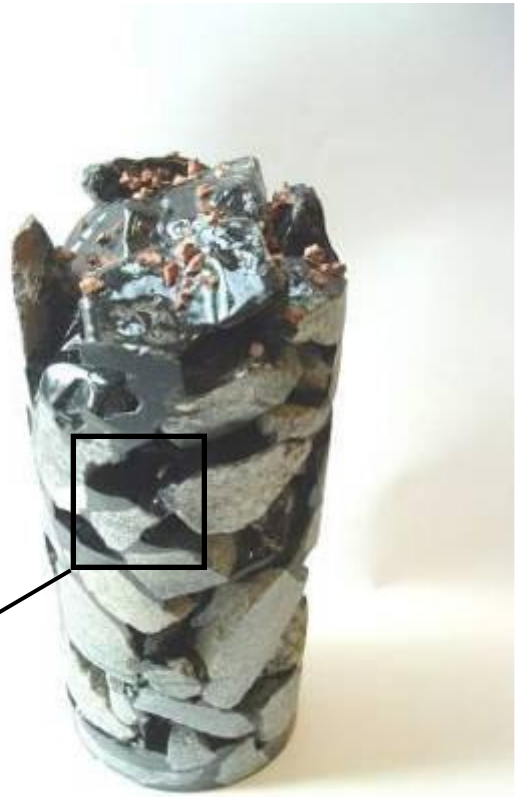
XiTRACK®

Eliminating the Cost of Ballast Maintenance

- Polyurethane provides a strengthening ‘cage’
- Free draining matrix
- Ballast degradation eliminated
- Ballast movement eliminated
- Track stiffness consistent and sustained



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XiTRACK Examples of Use

Heavy Haul / High Speed / Light Rail / Metro

No Ballast Maintenance Required

No Tamping of S&C

Track Support at Transitions

Maintaining Structure Clearance / Track Geometry

Lateral End Restraint for S&C/Curves

Ideal for High Speed with Crossing Traffic

Control of ballast on embankments and reducing dynamic loads on embankments

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Track Solutions

- Rail alignment and geometric design
- Clearance checking and reporting
- Stage designs for complex build schemes
- Management of manufacturing interface
- Specification for topographical survey
- Work with complex multidisciplinary interfaces
- Detailed track form design/formation specification
- Track drainage
- Track related civil engineering (retaining walls, foundations, walkways, platforms, UTX's)
- LRT, Mainline, Metro and Heavy Haul
- Predominantly UK – Network Rail, LUL, TfL
- Have worked internationally (Brazil/Argentina/Far East)

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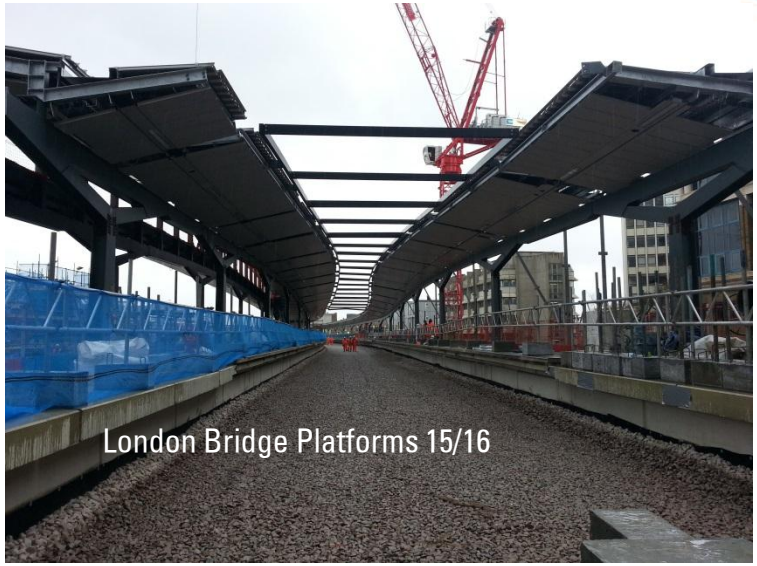
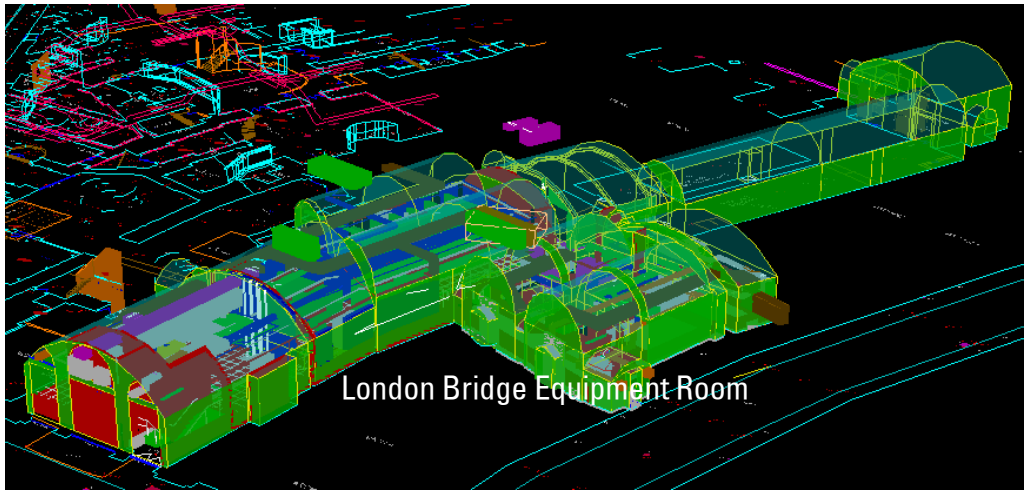
Example Projects

- KO2 Thameslink London Bridge Track
- KO2 London Bridge Equipment Room
- Crossrail West Outer Track Improvements
- South East Section
- Track Partnership
- ECML WCML Gauge Enhancement


London Bridge Platforms 15/16


London Bridge Equipment Room

Summary

- Secure and financially stable international company
- A unique combination of rail infrastructure domain knowledge and technology capability
- Proven measurement systems
- State-of-the-art condition visualisation software
- Innovative track solutions
- Proven delivery of significant client benefit

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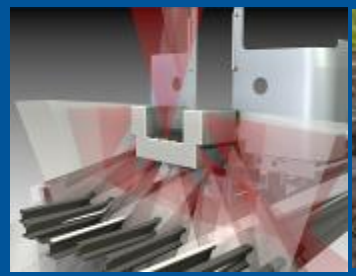








High-speed | Mainline | Commuter | Metro | Light rail/tram | Industry | Freight

Balfour Beatty Rail

The creation and care of tomorrow's railways

- Balfour Beatty Rail is an international rail infrastructure contractor offering single-discipline and multi-discipline solutions
- Design, supply, install and maintain rail assets to meet customers' needs through:
  - New technologies
  - Engineering capability
  - Own manufacturing facilities
  - Multi-disciplinary project management
  - High-speed expertise
  - Transfer of methods and solutions
  - Safety

References in Manila:

- Manila LRTA Line 1 Capacity Expansion 50% (1997-1999) - OCS upgrade depot switchgear
- Manila MRTC Line 3 (1999-2000) - OCS material
- Manila LRTA Line 1 Capacity Exp. (2003-2004) - DC switchgear replacement in all substations
- Manila LRTA Line 2 (2001-2005) - OCS system
- Manila LRTA Line 1 Capacity Exp. (2006) - OCS material depot
- Manila LRTA Line 1 North Extension (2009-2012) - OCS system & DC Traction power supply