High Output Track Renewals
A Lean Yellow Railway Journey

Ben Brooks, Project Director
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The UK rail industry

1.3 billion journeys

225m
More passenger journeys will be delivered each year on the country’s rail network by 2019

170,000
More seats for commuters by 2019

Freight demand growth

Over the next decade we expect freight demand to grow by at least 30% and as much as 140% over the next 30 years

6.5m
Trains run on time every year

100 million tonnes of freight

Cost of running the railway

CP4
15%
CP5
20%
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Track Relaying System (TRS)

- Old Rail
- New Rail

- Working Direction

Old Sleepers → Plough → New Sleepers

P95

Track Lowering

D75

Ballast Cleaning System (BCS)

- Spoil Removed
- Ballast Screening
- Ballast Cutting
- Good Ballast Returned
- New Ballast Added

① ② ③ ④
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Timeline

Why High Output?
- Minimal planned passenger impact
- A safer working environment
- Minimal risk of overrun

What makes us unique?
- 3rd biggest High Output fleet in the world
- Working 12 months a year
- In short duration access
- Handing back at up to 100 mph
# High Output Track Renewals

## A day in the life

<table>
<thead>
<tr>
<th>Activity</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>P95 Marshalled into Mtc Road</td>
<td>60 mins</td>
</tr>
<tr>
<td>Daily Maintenance</td>
<td>4 hrs</td>
</tr>
<tr>
<td>Train Remarshalled</td>
<td>90 mins</td>
</tr>
<tr>
<td>6X95 Kingmoor - Tyne</td>
<td></td>
</tr>
<tr>
<td>6X95 Crew Change Tyne</td>
<td></td>
</tr>
<tr>
<td>6X95 Tyne - Ferryhill</td>
<td></td>
</tr>
<tr>
<td>6X95 Lay over Ferryhill</td>
<td></td>
</tr>
<tr>
<td>6X95 Ferryhill - Site</td>
<td></td>
</tr>
<tr>
<td>6X95 Enters Possession / Worksite</td>
<td></td>
</tr>
<tr>
<td>6U52 Northallerton - Site</td>
<td></td>
</tr>
<tr>
<td>6U52 Enters Possession / Worksite</td>
<td></td>
</tr>
<tr>
<td>Site Staff Travel Time</td>
<td></td>
</tr>
<tr>
<td>Site Staff Arrive on Site</td>
<td></td>
</tr>
<tr>
<td>Line Blockage Granted</td>
<td></td>
</tr>
<tr>
<td>Possession &amp; Worksite Granted</td>
<td></td>
</tr>
<tr>
<td>S&amp;T Disconnected</td>
<td>60 mins</td>
</tr>
<tr>
<td>Isolation Taken</td>
<td>60 mins</td>
</tr>
<tr>
<td>Line Blockages Granted</td>
<td></td>
</tr>
<tr>
<td>20 Safety Speed Erected</td>
<td>30 mins</td>
</tr>
<tr>
<td>Train Unwrapped</td>
<td>90 mins</td>
</tr>
</tbody>
</table>

MACHINE MAINTENANCE 7 HRS

TRAVEL TIME 5.5 HRS

POSESSION 8 HRS

TRAVEL TIME 4.5 HRS
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A different mind set?

Planning applying time - distance methods

Logistics dedicated operating bases

Engineering Innovation
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Where on the journey?

Key measures

- Safety
- Cost
- Volume
- Impact

Volume loss is major area of concern for High Output

Key areas of focus

- Access & utilisation
- Process efficiency
- Reliability
“The very best of railway engineering in practice, although quite possibly the least efficient production line I’ve ever seen.” Richard Parry Jones, former Chairman

Root cause analysis has led us to be more data driven in access negotiation - dedicated team to look at engineering work impact vs. TOC/FOC costs to enable balanced industry decisions.
Process efficiency

via time saving initiatives

Visual management principles

Process mapping redesign
A robust, data-driven process involving workshops, briefings and training events for supervisors, trackmen and operators

Equipment improvements to remove waste

"5S" Cutter Bar Tool Storage

Cutter Bar Hole Gauge

Possession Hours

Pre-Production
2 hrs

Full Production
90 mins

Post Production
4.5hrs

0 1 2 3 4 5 6 7 8

Typical Midweek Possession 2011/12

0 1 2 3 4 5 6 7 8

Typical Midweek Possession 2015/16

Pre-Production
1.5hrs

Full Production
90 mins

Post Production
4hrs
Case study

Safe & efficient access

Project remit

1. To effect a step change improvement in safety when securing access for engineering work
2. To move from an operational railway to a worksite in under 2 minutes.

Industry norm

Explosives and flags still used to protect workforce, despite significant improvements in signalling technology - workforce put at risk in placing this protection.
Case study

Historic approach for protecting worksites

17 separate phone calls – just for the ballast cleaner
Case study

Issues with historic approach

• The process is long winded, complicated, involves many parties, relies on multiple 1:1 verbal communications. This creates opportunity for error.

• Placing detonators / possession markers is a hazardous job. It is a major cause of possession irregularity and requires staff to enter the railway whilst trains are running.

• The process is slow, eating into valuable time which could be used to improve the underlying asset condition (current planned time = 20mins).

• It is acceptable to rely on signalling to keep trains apart. But the same reliable system is not used to keep engineering trains apart. Detonators are explosives – but won’t stop a train (TPWS activated by a signal at danger would).
Case study

Technology and innovation solutions

**FTAP**
- Flexible train arrival point

**ZKL(RC)**
- A remotely activated track circuit operating device (TCOD)

**Protection Zone**
- Tampers using the signalling system as protection
Case study

Worksite arrangements now under trial

4 separate phone calls – for the ballast cleaner
Case study

Safe & Efficient Access

Safer
• *Eliminated the risk* of exposing staff to moving trains when placing / removing protection on the night

Quicker
• *40 minutes more production* - 16 minutes at the start can be reduced to just 2 minutes to start work after train arrival - a further 24 minutes saved at handback

Fewer train delays
• More responsive to exiting trains / machines at end of possession, preventing overruns

*I can't believe how quick and easy that was.*  
*Is that it? It's so simple!*  
*Definitely the future…*
Process efficiency via structured continuous improvement
IP Track Continuous Improvement toolbox

- Voice of the Customer
- Critical to Quality
- Process Mapping
- Value Add, Value Enabling and Waste
- 8 wastes
- 5S
- Visual Management
- Root cause analysis
- “As-is” and “to-be” mapping
- Collaborative planning
Reliability

Plant

Develop capability
• Plant reliability team and cross industry consultancy support.

Data capture & analysis
• Control charts / trend analysis

Actions
• Revised maintenance plans with greater focus on problem areas and more available shifts.
Reliability

**Stable plan**

**Stage gate focus**
- Visual management used to monitor stagegate progress.
- Escalation processes followed to bring issues to resolution or find alternatives.

**Weekly depot planning meetings**
- Plan-do-check-review cycles in place within depots
- Collaborative planning meetings
- Simple visual controls
Reliability

Route customer

Key Performance Indicators

- Engineering Train Timing - *Engineering Train Timings received at T-5*
- High Output System Timing - *HO trains at PAP within 10 minutes of requested time*
- Line Blockage Timing - *Blockages granted within 5 minutes of planned time (line blockage remaining same duration)*
- T3 Possession Timing - *T3 possessions granted within 15 minutes of planned start time*
- Isolation Timing – *Isolation Form B provided within 15 minutes of planned time*

Visual Management

Weekly “control room” meetings designed to highlight both High Output and Route team performance.

Reasons for volume loss (weekly and trends) reviewed in detail and actions monitored to conclusion. Focus on demonstrating benefits.
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Summary

High Output Track Renewals
• Renewing the nations railway unseen
• Safely, efficiently and in reducing access windows as we run more trains than ever
• World leading – short duration access and high handback speeds, all year around

Lean tools
• Applied to improve access, process efficiency and
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Summary

It’s a long lean yellow journey…

• Feed the teams desire to improve

• Encourage the culture you’d like to see

• Provide the right tools / techniques

• Empower the team to change things for the better
Any questions?
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