Network Rail risk based maintenance

Simon Gates – Director of Route Asset Management in Sussex Route

20 November 2012
Risk based maintenance

Frequency and scope of asset inspection or scheduled maintenance based on risk

work arising optimised through risk based rectification timescales

Failure modes and frequency of failure against consequence in terms of safety of staff, safety of trains, cost of performance and environmental damage
Inspect at same frequency?

Photographed under possession
Route criticality

Gatwick Airport

Uckfield
What is the purpose of RBM?

- To target resources where the business most needs them
  - to maintain safety levels
  - to improve reliability according to asset criticality
  - to balance the cost of inspection and servicing to the needs of the business
Network Rail’s journey

Historic regimes

Signalling equipment

Track

OHLE & CRE

Size of the prize

- Risk penalties: 5%
- Renewal and refurbishment: 64%
- Maintenance impacting on asset life: 19%
- Inspection and servicing: 10%
- Rapid response: 2%

Total cost of ownership
Size of the prize

Maintenance expenditure

- Railway spares management: 2%
- Telecoms network contracts: 3%
- Route / HQ indirects: 6%
- Delivery unit indirects: 4%
- Signalling rapid response: 3%
- Asset-related indirects: 12%
- Other non-functional indirects: 3%
- Group maintenance support: 4%

In-scope: 63%
In-scope signalling activities

<table>
<thead>
<tr>
<th>Maintenance activity</th>
<th>Approximate percentage of in-scope signalling maintenance expenditure currently implemented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of equipment housing locations</td>
<td>8%</td>
</tr>
<tr>
<td>Maintenance of colour light signals</td>
<td>5%</td>
</tr>
<tr>
<td>Maintenance of AC track circuits</td>
<td>3%</td>
</tr>
<tr>
<td>Maintenance of DC track circuits</td>
<td>4%</td>
</tr>
<tr>
<td>Maintenance of train protection</td>
<td>3%</td>
</tr>
<tr>
<td>Maintenance of level crossings</td>
<td>3%</td>
</tr>
<tr>
<td>Total of other signalling maintenance</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>27%</td>
</tr>
</tbody>
</table>
Benefits of new RBM regime

Stage 1 - Historic regime

Stage 2 - National regime

Stage 3 - Local regime

Signalling example
Methodology

Identify asset

Determine function

Required outputs

Failure modes

Failure effects

Degradation rates

Route criticality

Intervention types

Intervention frequency

Risk cost curves

Maintenance scope

Maintenance frequency

Strong project management

Local buy in for principles and process

Strong leadership across business

Review with improved data
Asset P-F curve

Condition of asset

Potential failure point “P”

Functional failure point “F”

P-F interval

“Age”

Condition of asset

P-F1

P-F2

P1

P2

F

“Age”
Evaluating cost regime

The graph shows the evaluation of costs in different maintenance frequencies. The graph includes the following three lines:
- **Risk cost** (red line)
- **Direct cost** (blue line)
- **Total Business Impact** (purple line)

The y-axis represents the costs, while the x-axis represents the maintenance frequency. The graph illustrates how the risk cost, direct cost, and total business impact vary across different maintenance frequencies.
Example

- Automatic Warning Signal (AWS) scheduled maintenance (photo)
- Function – gives driver an audible warning on the signal aspect being displayed (clear or caution)
- Original schedule is to measure depth of magnet to rail height and magnet strength undertaken on an annual basis
- Failure is picked up from train borne receiver
- Result of analysis was that no scheduled maintenance needs to take place on AWS
Implementation

• Be cautious in dynamic operating environments – assets must be more carefully examined for risk and trials are more important

• Undertake trials in locations where a mix of asset types and ages are present

• Undertake a thorough data collection on asset type, condition, work undertaken during the trial period, loading, condition changes, etc.

• Trials are not just about condition and failure rates they are also to check that the correct data is being collected to make a decision on risk assessment, frequency and scope of inspection

• Communication to front line maintenance and gain buy-in for change in regime – do not underestimate the importance of workforce buy-in!

• Use a control location for trial
Benefits of RBM

Signal maintenance- majority of signal scheduled maintenance has moved to annual from 13 weekly based on the likelihood that lamps will fail during that period

AWS magnets – from annual to no scheduled maintenance

Plain line CWR track inspections – moving from an average of 2 weekly to 26 weekly
Maximising opportunities

- 12 monthly
- 6 monthly
- 13 weekly
- 6 weekly FPL
Progress

Circa 70% gains to date

assets to date

The future

opportunity

0%
Next steps

• Optimising renewals and maintenance through whole life costing and route criticality