MECHANISED MAINTENANCE PHILOSOPHY OF RAILWAY ASSETS

BY

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Traditional Maintenance Approach

Ownership of Assets
Individualistic Perception
Maintenance Approach - Requirements

Modern Assets
Complex Systems
<table>
<thead>
<tr>
<th><strong>Indian Railways – The Growth Story</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Table</strong></td>
</tr>
<tr>
<td><strong>In 1950-51</strong></td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td>Total Route Kms</td>
</tr>
<tr>
<td>Electrified Route Kms</td>
</tr>
<tr>
<td>Work force (in thousands)</td>
</tr>
<tr>
<td>Originating Passengers (no. in millions)</td>
</tr>
<tr>
<td>Passenger Kms. (in millions)</td>
</tr>
<tr>
<td>Freight (originating) (in million tonnes)</td>
</tr>
<tr>
<td>Freight NTKM (in millions)</td>
</tr>
<tr>
<td>Average Lead (in Kms.)</td>
</tr>
</tbody>
</table>
### Table 5.1. Data table on worldwide rail infrastructure (cont.)

<table>
<thead>
<tr>
<th>Line-km</th>
<th>Pass-km (000 000)</th>
<th>Ton-km (000 000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slovenia</td>
<td>1,058</td>
<td>1,196</td>
</tr>
<tr>
<td>Estonia</td>
<td>993</td>
<td>1,026</td>
</tr>
<tr>
<td>Latvia</td>
<td>2,384</td>
<td>2,297</td>
</tr>
<tr>
<td>Lithuania</td>
<td>2,000</td>
<td>2,007</td>
</tr>
<tr>
<td>Bulgaria</td>
<td>4,241</td>
<td>4,299</td>
</tr>
<tr>
<td>Romania</td>
<td>11,110</td>
<td>11,348</td>
</tr>
<tr>
<td>Ukraine</td>
<td>22,600</td>
<td>23,316</td>
</tr>
<tr>
<td>Belarus</td>
<td>5,512</td>
<td>5,569</td>
</tr>
</tbody>
</table>

### Big Five developing countries

| Brazil all concessions | 28,645 | 26,945 | 25,895 | 9.6 | (275.0) | 11,867 | 3,188 | 2,500 | 78.9 | (275.0) | 40,640 | 41,042 | 67,300 | 66 % |
| Russian Federation    | 82,600 | 85,969 | 85,500 | 3.5 | 2,900 | 227,900 | 274,000 | 157,100 | 30.9 | (2,900) | 2,316,000 | 2,523,000 | 1,664,300 | 28 % |
| China                 | 49,940 | 53,378 | 60,446 | 21.0 | 10,506 | 138,037 | 262,530 | 456,000 | 293.3 | (21.0) | 570,732 | 1,060,100 | 1,609,000 | 182 % |
| Indonesia             | 6,452 | 5,000 | 5,200 | 17.3 | (1,158.0) | 9,000 | 9,290 | 17,000 | 188.1 | (1,158.0) | 1,000 | 3,190 | 5,000 | 400 % |

| India | 81,240 | 87,267 | 82,132 | 3.1 | (1,982.0) | 208,658 | 295,644 | 515,044 | 147.0 | (1,982.0) | 158,474 | 235,283 | 282,184 | 122 % |

All other countries | 199,384 | 191,663 | 167,993 | 12.1 | (254,180.0) | 146,735 | 174,219 | 137,785 | 6.1 | (254,180.0) | 656,002 | 658,847 | 370,949 | (43 %) |

World total | 1,142,591 | 1,052,001 | 995,433 | 12.9 | (147,098.0) | 1,435,428 | 1,827,794 | 2,027,086 | 41.2 | (147,098.0) | 6,679,202 | 7,546,272 | 7,670,210 | 14.8 % |

Source: World Bank Railways Database.
Maintenance Approach - Requirements

- Dwindling ownership concept
- Complex Systems
  - Modern Sophisticated Assets
  - Electrification
  - New Signaling Systems
- Traffic Demands
- Efficient Use of Resources
- Safety of Assets and Asset Users
- Time
New Maintenance Approach

Mechanised Maintenance of Assets
Mechanised Maintenance of Assets

**Mechanised Maintenance on Indian Railways**
- Mechanised Track Maintenance
Mechanised Maintenance of Assets

**Mechanised Maintenance on Indian Railways**
- 8 Wheeler Tower Wagon for OHLE
Mechanised Maintenance of Assets

**World Railways**
- Mechanised Maintenance at Other Places
World Railways
- Mechanised Maintenance at Other Places
Mechanised Maintenance of Assets

**World Railways**
- Mechanised Maintenance at Other Places
World Railways

- Self-propelled & off-track maintenance machinery
Mechanised Maintenance of Assets

World Railways

- Shinkansen System of Maintenance
  - Fully Integrated Monitoring Train
**Intelligent Mechanised Maintenance System**

- Every train, track section (or signal) and traction block is an intelligent system.
- An example for such a situation is shown in a simplified manner in next slide.
- Such a system requires IT tools to support decision making at the control center as well as a communication channel between the control center and the train (GSM or other).
Intelligent Mechanised Maintenance System
SYNTHETIC INSPECTION OF SWITCH BOARD
Mechanised Maintenance of Assets

1. The project
2. Project Architect
3. Project Civil Engineer
4. Review by Consultant
5. Client approval
6. Project implemented by the contractor
Mechanised Maintenance of Assets

- Part of in-built system
  - From inception stage of the project
- Construction and Design Features
  - RAMS
- Procurement – LCC based

How to Get it?
Mechanised Maintenance of Assets

DELIVERABLES

• Speed
  ○ Minimum Down Time for Maintenance

• Reliability of Assets
  ○ Zero Break-down Maintenance
  ○ Safety

• Efficient use of Resources
Mechanised Maintenance of Assets

- Integrated Approach
  - Fragmented Maintenance

- Combination of
  - Predictive Maintenance
  - Preventive Maintenance

- Intelligent Maintenance System
Assets on DFC

- 350 million m³ of Earthwork / Subgrade
- 20 million m³ of Stone Ballast
- Hundreds of thousand cum. of RCC / PSC
- 11 million Ties / Sleepers
- Close to a million Ton of Structural steel
- A million Tonne of Rail procurement /laying
- 7,000 small/big bridges
- More than 50 Rail to Rail Flyovers
- 1000 ROBs/RUBs

(All quantities are approximate)
<table>
<thead>
<tr>
<th>Assets on DFC</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>54 Traction sub-stations.</strong></td>
</tr>
<tr>
<td><strong>162 Traction Switching Station (SP &amp; SSP).</strong></td>
</tr>
<tr>
<td><strong>6000 Km of Contact &amp; Catenary Wire (Copper/Copper Alloy).</strong></td>
</tr>
<tr>
<td><strong>6000 Km of Aluminum (ACSR/AAAC) Conductor.</strong></td>
</tr>
<tr>
<td><strong>3 Lacs Insulators.</strong></td>
</tr>
<tr>
<td><strong>Thousands of tonne of Steel Structures for OHE &amp; Switching Stations.</strong></td>
</tr>
<tr>
<td><strong>81 Traction Transformers.</strong></td>
</tr>
<tr>
<td><strong>600 Auto Transformers.</strong></td>
</tr>
<tr>
<td><strong>TCP/IP based SCADA.</strong></td>
</tr>
</tbody>
</table>

(All quantities are approximate)
• 114 Stations Signaling complete with Electronic Interlocking and Track Detection.

• More than 2000 Signals.

• 1 Master Switching Centre, 5 Base Switching Centre, 320 Base Transmitters and 1400 Cab Radios (OPH+GPH+GSM Hand Set) for GSM®.

• 121 Telecom Facilities (Exchanges).

• 6000 Kms OFC and Quad Cables & Laying.

• 130 OFC Nodes.

( All quantities are approximate )
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Thank You

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