From real time asset monitoring toward dynamic maintenance in railway

Maintenance to support performance

Christophe Sanguina
Agenda

1. RAILWAY DIGITALISATION
2. HEALTHHUB RATIONALE AND STRATEGY
3. TOWARD DYNAMIC MAINTENANCE
4. KEY TAKEAWAYS
# Type of Maintenance

<table>
<thead>
<tr>
<th></th>
<th>CORRECTIVE</th>
<th>SYSTEMATIC</th>
<th>CONDITION-BASED</th>
<th>PREDICTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Every day</strong></td>
<td>![Image] Lowest</td>
<td>![Image] Medium</td>
<td>![Image] High</td>
<td>![Image] High</td>
</tr>
<tr>
<td><strong>Upon low fuel indication</strong></td>
<td>![Image] 100%</td>
<td>![Image] Low</td>
<td>![Image] Low</td>
<td>![Image] Lowest</td>
</tr>
<tr>
<td><strong>Upon a measurement (gauge) and a prognostic</strong></td>
<td>![Image] 100%</td>
<td>![Image] Low</td>
<td>![Image] Low</td>
<td>![Image] Lowest</td>
</tr>
</tbody>
</table>
It takes time to master Railway data

TrainTracer
- TrackTracer and preliminary detection w/ thresholds
- Health Indicator for detection and diagnostics
- 1st Health Indicator for detection and diagnostics
- Physics based Prognostics
- Asset Management at system level (ISO 55 000)

2006
2011
2013
2015
2017
2019

TrainTracer
- Motes & investment in point machines
- CatenaryTracer
- TrainScanner & Test bench simulations
- HealthHub Platform
- Dynamic Maintenance Planning

2010
2012
2014
2016
2018

ASSET MONITORING
DIAGNOSTICS
PROGNOSTICS
DYNAMIC MAINTENANCE

www.railway-asset-management.org
What is HealthHub™
Agenda

1. RAILWAY DIGITALISATION
2. HEALTHHUB RATIONALE AND STRATEGY
3. TOWARD DYNAMIC MAINTENANCE
4. KEY TAKEAWAYS
Asset management: objectives

- Finding balance between asset **cost**, **performance** and **risk** to:
  - Meet operator / manager’s **objectives**
  - Deliver **value** from the assets to company and stakeholders

<table>
<thead>
<tr>
<th>Cost</th>
<th>Risk</th>
<th>Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CAPEX</td>
<td>• Safety</td>
<td>• Reliability</td>
</tr>
<tr>
<td>• OPEX</td>
<td>• Commercial</td>
<td>• Punctuality</td>
</tr>
<tr>
<td></td>
<td>• Environment</td>
<td>• Capacity</td>
</tr>
<tr>
<td></td>
<td>• Stakeholders</td>
<td>• Customer satisfaction</td>
</tr>
</tbody>
</table>

- Higher financial performance
- Improved risk management
- Improved asset investment decisions & higher sustainability (reduced CAPEX)
- Improved service to customers/passengers, efficiency and effectiveness
- Better company image, compliance and social responsibility
Remote Condition Monitoring mainly to improve reliability and to increase effectiveness & efficiency of maintenance tasks

Prognostics & Health Management to move to health-based, dynamic maintenance maximizing asset availability
HealthHub™ on selected components

- Trains
- Infrastructure
- Signalling
- Bogie
- Traction
- Brakes
- HVAC
- Doors
- Toilets
- Catenary
- Track
- Track Circuits
- Point Machines
HealthHub™ data flow overview

Relying on project REX to constantly improve efficiency
HealthHub™ Fleet Support Centers

UK Fleet Support Center

Italy Fleet Support Center

LRH Tram Fleet Support Center

Benelux Fleet Support Center

Villeurbanne Data Center

Santiago Fleet Support Center

www.railway-asset-management.org
HealthHub™ deployment map

- HealthHub: 44TB of data / 436 users
- Rolling Stock: more than 2000 trains connected / 2131 rules applied / 54,000+ SMS alerts sent in 2018
- Infrastructure: More than 20 Networks Audited or permanently monitored
- Signalling: More than 500 Point Machine monitored

www.railway-asset-management.org
Agenda

1. THE INTERNET OF RAIL
2. HEALTHHUB RATIONALE AND STRATEGY
3. TOWARD DYNAMIC MAINTENANCE
4. KEY TAKEAWAYS
Mandatory new way of doing Maintenance
Toward Dynamic Maintenance

1. Planning maintenance assets opérations.
2. Define sequence to optimize the workload.
3. Dynamic planning adjustment & execution.
DMP deployment map

HealthHub: 44TB of data / 436 users
Rolling Stock: more than 2000 trains connected / 2131 rules applied / 54000+ SMS alerts sent in 2018

Infrastructure: More than 20 Networks Audited or permanently monitored

Signalling: More than 500 Point Machine monitored
Agenda

1. RAILWAY DIGITALISATION
2. HEALTHHUB RATIONALE AND STRATEGY
3. TOWARD DYNAMIC MAINTENANCE
4. KEY TAKEAWAYS
Key Takeaways

- Higher data volumes, transmission speed and processing capabilities = predictive maintenance
- Alstom well positioned: good understanding of the entire railway system
- Market maturity: from trial to operation

Alstom is a partner on this journey
Christophe Sanguina