Asset Life Cycle Management applied to Rolling Stock of Netherlands Railways

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Customer Journey

- Social media interaction & customer service
  - Journey Planner app
- Ease of payment for public transport
- Personal safety in trains and at stations
- Travel for people with functional disabilities
- The station experience
- Customer satisfaction
- The train experience
- Clean trains
- Sustainable mobility
- OV-fiets
Our Aim: Happy Customers
NS Rolling Stock in Actual Numbers

- 3,000 technicians
- 3.000 coaches
- 10 types rolling stock
- 2 million € per coach
- 250,000 km per year
- 350 million € maintenance costs per year
- 6 billion € investment value
- 3.5 billion € overhauls costs per year
- 2 million € per coach
- 100 million € overhauls costs per year
- 3.5 billion € overhauls costs per year
- 35 year life cycle
Asset Management following ISO 55000

Different roles

Owner
CFO

User
NS Network Design

Manager
NS Technology

Operator and Service Provider
NS Service & Operations (Transport)
NS Maintenance & Service
NS Refurbishment & Overhaul

Long Term Needs
(“Richten”)

Technical Asset Management
(“Inrichten”)

Execution
(“Verrichten”)

International Union of Railways
Asset Management following ISO 55000
Collective Design Reviews
Design for Maintenance and Operations

*Accessibility of Roof Equipment*
Workshop in Maastricht
First Level of Performance Management

Rolling stock “fit” for processes
Maintenance programmes
Workshops and Equipment
Spare Parts
Well Trained Staff

Long Term:
Best Production Resources
Design for Maintenance & Operations
“Pit Stop” and “Overstag” for Availability
Planned and Unplanned Maintenance

![Chart showing planned and unplanned maintenance over time]

- **Gepland onderhoud & Reiniging**
- **Ongepland onderhoud & Reiniging**
Second Level of Performance Management

Rolling stock “fit” for processes
Maintenance programmes
Workshops and Equipment
Spare Parts
Well Trained Staff

Long Term:
Best Production Resources
Design for Maintenance & Operations

Short Term:
First-Time-Right
Operations & Maintenance Execution

Daily Operations:
• Planning & Scheduling
• Train Operations
• Cleaning & Inspections
• Maintenance & Repair
• Overhaul
Root Causes of Cancelled Trains (technical failures)

- Design: 12%
- Component Quality: 17%
- Maintenance Execution: 10%
- Train Operations: 19%
- Maintenance Concept: 6%
- Infra: 2%
- Investigation: 3%
- Damage: 6%
Cancelled Trains
# per month
(technical failures)
Third Level of Performance Management

Rolling stock “fit” for processes
Maintenance programmes
Workshops and Equipment
Spare Parts
Well Trained Staff

Annual Evaluation and Improvement Proposals

Daily Operations:
• Planning & Scheduling
• Train Operations
• Cleaning & Inspections
• Maintenance & Repair
• Overhaul

Long Term:
Best Production Resources
Design for Maintenance & Operations

Medium Term:
Proper Operations & Maintenance
Operations & Maintenance Management

Short Term:
First-Time-Right
Operations & Maintenance Execution

International Union of Railways
Life Cycle Decision Making
Each Life Cycle Phase it’s own Focus

Life cycle phases of train series:
- Investing: design for NS-processes
- Phasing in: solving childhood diseases
- Guaranteeing: stable performance
- Phasing out: life time extension or demolition

Input for the long term fleet planning!
Asset Management following ISO 55000

Owner
User
Manager
Operator & Provider

Act
Plan
Check
Do
Strategisch Asset Management Plan Materieel
Real Time Monitoring
SLT 2432: Failure in Communication
SLT 2432: Failure of Diagnosis Screen
Standard Repair Advice and Procedure
Asset Monitoring shifts to Operational Support

- Design for Maintenance
- Strategic
- Asset Monitoring
- Operational Planning
- Tactical
- Maintenance Reliability Engineering
- Maintenance Scheduling
- Usage and Maintenance
Coming Soon: Prognostics & Health Management

Detection of slippery track from traction sensors

Early detection of suspension failures

Monitoring of axle bearings

Early detection of air leakages from compressor data
Hotbox Monitoring System

Relative Temperatures
Asset Life Cycle Management

Business Wide Approach Necessary!

Business Strategy

Customer

Technology

Finance

Operations

Transport & Maintenance Execution