Holistic approach in the field of economic track maintenance

7th International Symposium on Railways
Dr. Florian Auer
Oct 4th, 2016
View of Asset Management

- Quality
- Measures
- Costs
- LCC Optimum

Quality Measures

Costs
Infrastructure strategy

Continuous improvement process

- Network strategy
- Operational management strategy
- Track strategy
- Maintenance strategy
- Track operation

- Technical improvement
- Technical innovation
- Integrated track possession planning
Performance of tamping machines

The working output of high-capacity tamping machines has increased significantly over time. Working outputs of up to 2,600 m/h can be reached using the 09-4X continuous action 4-sleeper tamping machine. Multiple-sleeper tamping units also offer many advantages regarding the working quality. Thanks to them, intervals between tamping cycles could be extended.
Performance of ballast management

When combining different work processes, track possessions can be used optimally.

The BDS 2000 system was specially developed to be combined with the 09-3X and 09-4X high-capacity tamping machines (mechanised maintenance trains).

It is equipped with two sweeper units, one extensive plough section and it enables intermediate ballast storage. On the ÖBB main network, for instance, it is the standard method of operation.
Infrastructure strategy

Network strategy
Operational Management strategy
Track strategy
Maintenance strategy
Track operation

Technical improvement
Technical innovation
Integrated track possession planning

Continuous improvement process
Infrastructure strategy

- Network strategy
- Operational Management strategy
- Track strategy
- Maintenance strategy
- Track operation

- Technical improvement
- Technical innovation
- Integrated track possession planning

Continuous improvement process
Track types

Crossings with moveable frogs benefit the distribution of the dynamic stresses exerted in turnouts.

On high-speed lines only crossings with moveable frogs are used.
Aluminothermic welds
Flash-butt welding robot APT 1500 R
Flash-butt welding robot APT 1500 R

Fully automated positioning and aligning of the rails
Flash-butt welding
Infrastructure strategy

- Network strategy
- Operational Management strategy
- Track strategy
- Maintenance strategy

- Technical improvement
- Technical innovation
- Integrated track possession planning

Continuous improvement process
Infrastructure strategy

Network strategy
Operational Management strategy
Track strategy
Maintenance strategy
Track operation

Technical improvement
Technical innovation
Integrated track possession planning

Continuous improvement process
Quality function in general

The deterioration function of ballasted track, similar to many building structures, is not linear.

Therefore, achieving the highest initial quality is of utmost importance.

The service life of a track decisively depends on its initial quality.
Quality function in general

Safety, functionality, condition and substance are like interconnected vessels.

The infrastructure manager actively can only influence the condition through the maintenance quality.

A good condition of the tracks coming from the correct maintenance is crucial.
Highest level of process safety

The **design** of the tamping units meets highest quality and process safety standards.

For the purpose of **quality assurance**, the relevant tamping parameters (tamping depth, tamping pressure) should be recorded digitally during work.
3D compaction of the ballast bed

The highest compaction is to be achieved when applying the ballast bed with the Dynamic Track Stabiliser. Lateral vibrations of the track panel lead to a wearless relocation of the ballast stones.
Track types

Bituminous track-bed layers positively influence the dynamic load transfer and drainage.

Ballast bed correctly installed in layers leads to highest quality.

“Premium product ballasted track”

Initial quality 0.3 mm SD (D1)
Tamping intervals: 100 – 150 mill. t
2D-Laserscanning

When using 2D laser scanners on tamping machines the following information can be provided automatically:

- Platform distance
- Catenary wire position
- Ballast profile
- Track distance

...
Track geometry quality behaviour

- Improvement through MDZ $\sigma$ before/after = 0.3
- Latest moment for ballast bed cleaning
- Beginning deterioration of the ballast bed

Graph showing:
- Standard deviation longitudinal level
- Mill. load tons

Values:
- Standard deviation: 0.3 to 1.2

Axes:
- Y-axis: Standard deviation longitudinal level
- X-axis: Mill. load tons
Ballast bed cleaning

Factors influencing ballast bed fouling

- Ballast quality
  - poor
  - high

- Axle load
  - high
  - low

- Sleeper type
  - concrete sleeper
  - wooden sleeper/ coated

- Speed
  - high-speed
  - conventional
LGV as an example

Paris - Lyon (LGV Sud-Est)

Route length: 429 km

Opened in 1981 (oldest TGV line)

Maximum speed: 300 km/h

13 trains per hour and direction

Total ballast bed cleaning

From 2009 to 2021 (about 50% completed so far)

Total excavation of the ballast, 350 mm

Working output per night-time track possession (23:00-05:00)

700 – 1000 metres of finished track
Ballast bed cleaning

High-capacity ballast bed cleaning on LGV line in France e.g.: RM 900 HD (Colas Rail)
Excavating depth of up to 500 mm under the sleeper.
Availability of the machine: 99.5%
Machine requirements

- High Performance
- Quality
- Process Safety
- Reliability
Machine requirements

- HIGH PERFORMANCE
- ECOLOGY
- USER FRIENDLINESS
- QUALITY
- ERGONOMY
- RELIABILITY
- PROCESS SAFETY

- HIGH CAPACITY
- PRECISION
- RELIABILITY
Machine requirements

- Quality
- Ergonomics
- Ecology
- Service
- User friendliness
- High performance
- Process safety
- Reliability
Machine requirements

- Quality
- Ergonomics
- Ecology
- Reliability
- User friendliness
- Process safety
- High performance

100%
Using electrical power
Machine requirements
Ergonomic Design

Look&Feel
User friendliness

When designing cabins, particular attention is paid to the improved ergonomic design and optimised visibility (user friendliness). The noise emitted by the machine can be reduced thanks to the option to power a machine via an electric motor (E³ hybrid drive) ("ecological wheelprint"). Quality assurance thanks to a modern control system and remote diagnosis via the Internet. This ensures improving process safety.
Machine requirements

- High Performance
- User Friendliness
- Process Safety
- Quality
- Reliability
- Ergonomics
- Ecology

100%
Infrastructure strategy

- Network strategy
- Operational management strategy
- Track strategy
- Maintenance strategy

Integrated track possession planning

Technical improvement

Technical innovation

Continuous improvement process
Plaster & Theurer
Export von Bahnbaumaschinen Gesellschaft m.b.H.

www.plassertheurer.com

"Plaster & Theurer", "Plaster" and "P&T" are internationally registered trademarks. Illustrations and descriptions may contain optional equipment. We reserve the right to make alterations in line with further technical developments.