

HIGH CAPACITY | PRECISION | RELIABILITY

**Plasser & Theurer**



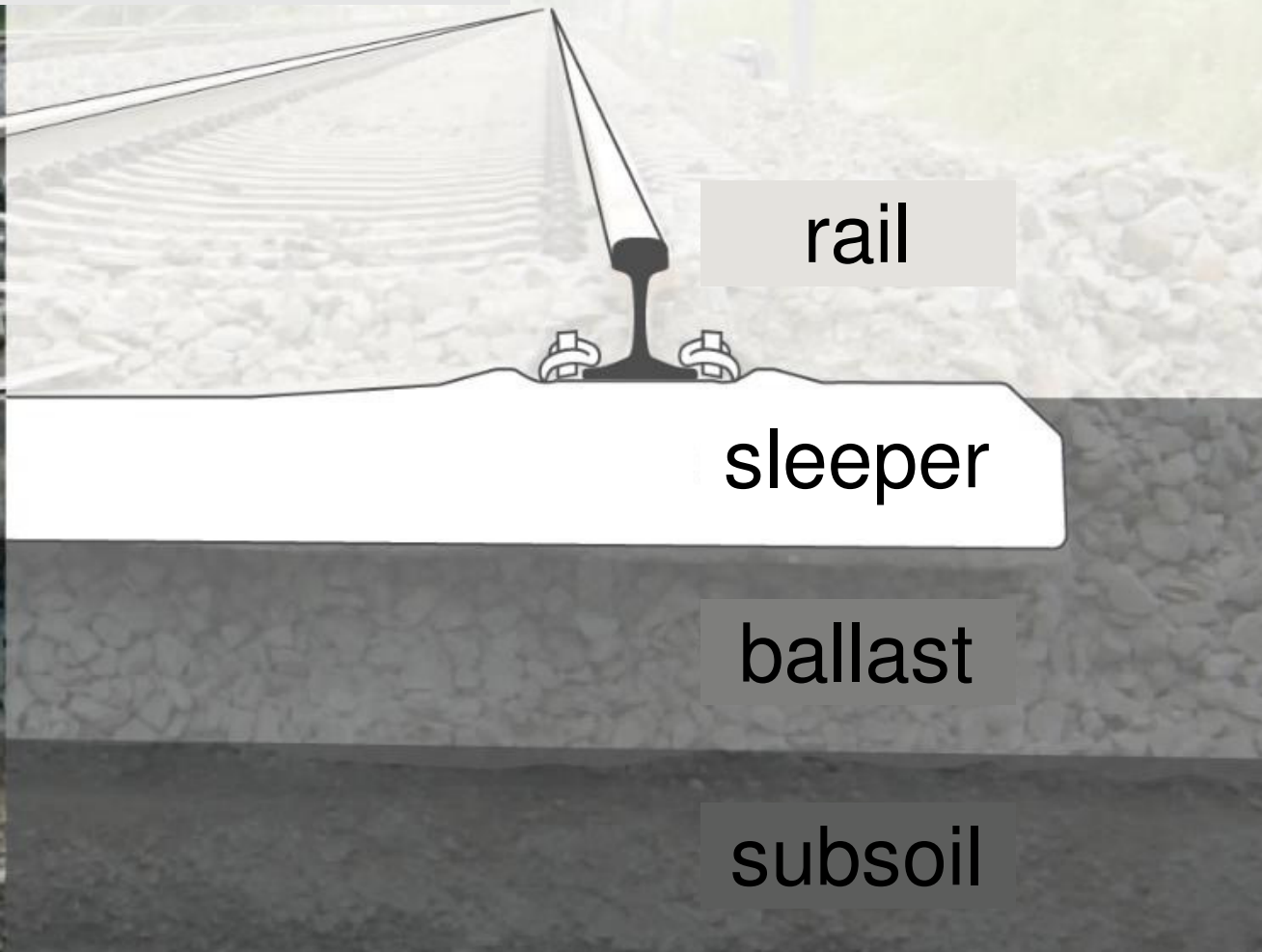
## Smart Machines Gleisbaumaschinen, neue Datenlieferanten

Florian Auer | ÖVG-Tagung Graz | 14.09.2021

# Permanent Way

Simple – Robust – Multiple – Cost-efficient

**Plasser & Theurer**



rail

sleeper

ballast

subsoil



INNOVATION WEEK 2021



# Track Geometry

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Safety – Speed – Riding comfort





# Linear Asset Railway Track

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Precise – Durable – Cost efficient

HIDDEN  
ECOLOGIC &  
ECONOMIC  
CHAMPION

# 1001



# End-to-end solutions for track maintenance

Highest process-safety



# Use Case Autonomous Tamping

Preparatory Work

Condition Monitoring

Assistant System

Holistic Documentation

[www.plassertheurer.com](http://www.plassertheurer.com)

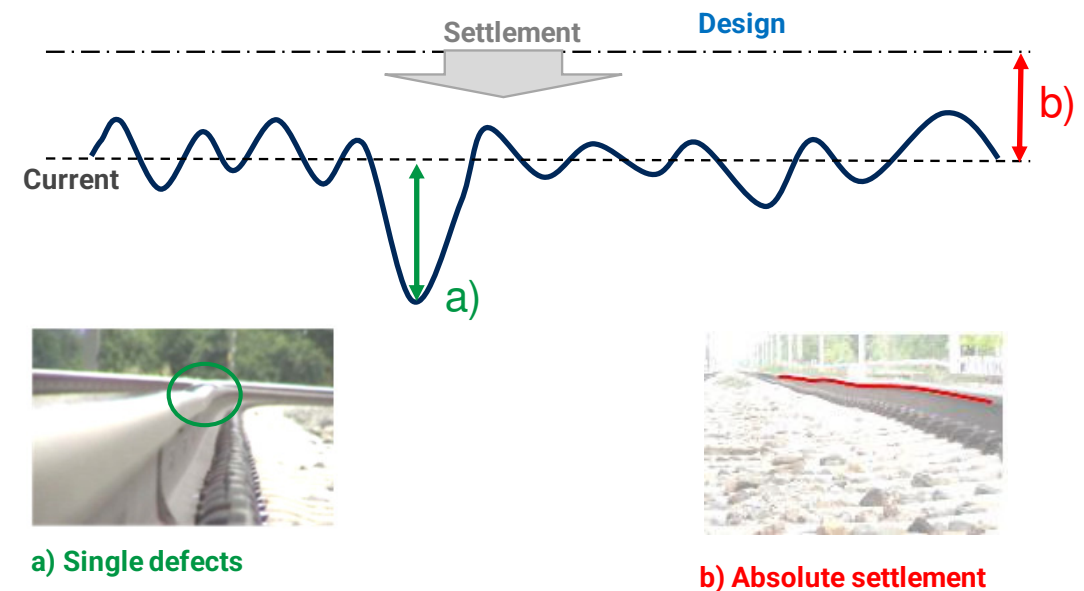




# Precise track geometry

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As precision increases, railway operation becomes safer and more cost-efficient



The maintenance interval of modern track is > 100 million gross tonnes.

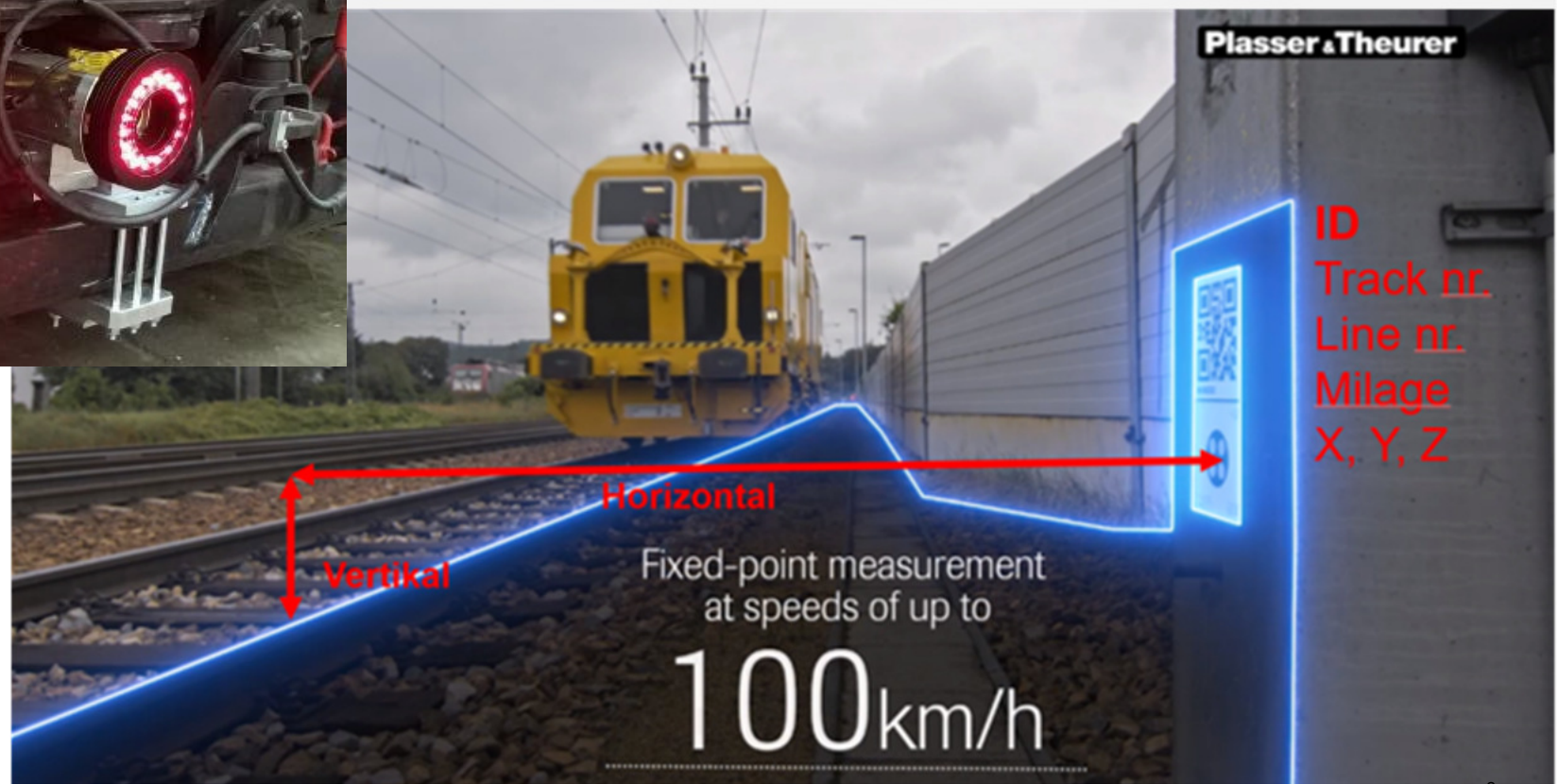
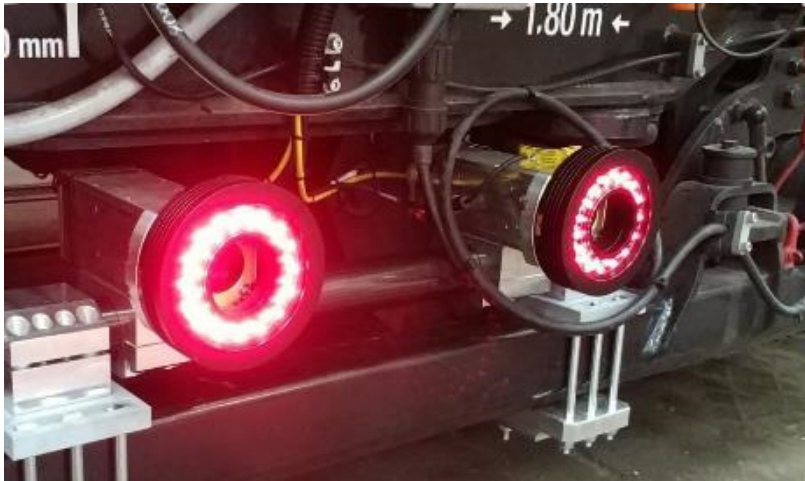
A homogeneous track geometry and the right work technologies can further extend the intervals between maintenance.



# Optimising preparatory work

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Efficient track measuring using QR-Codes as reference

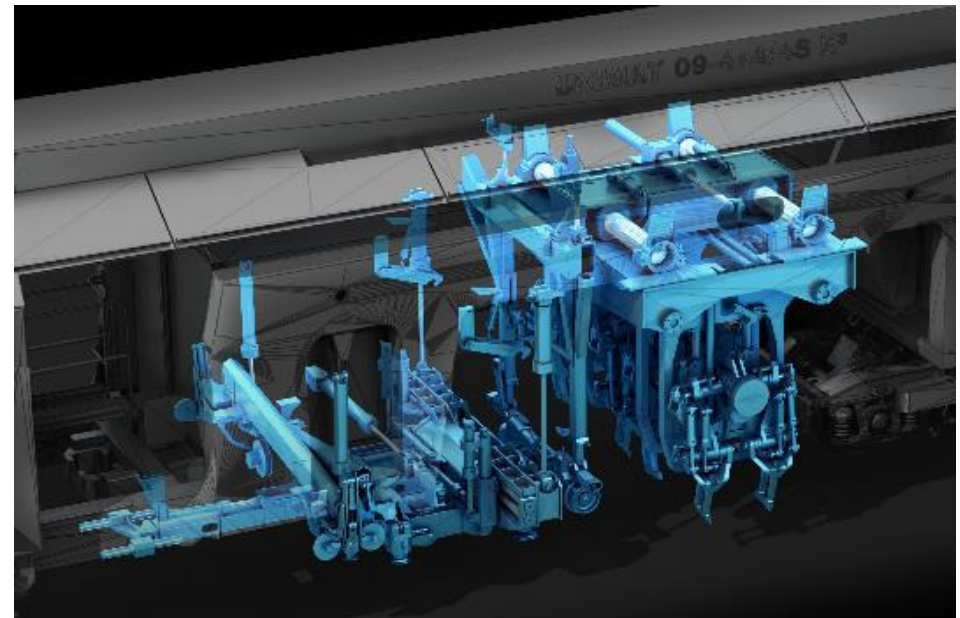
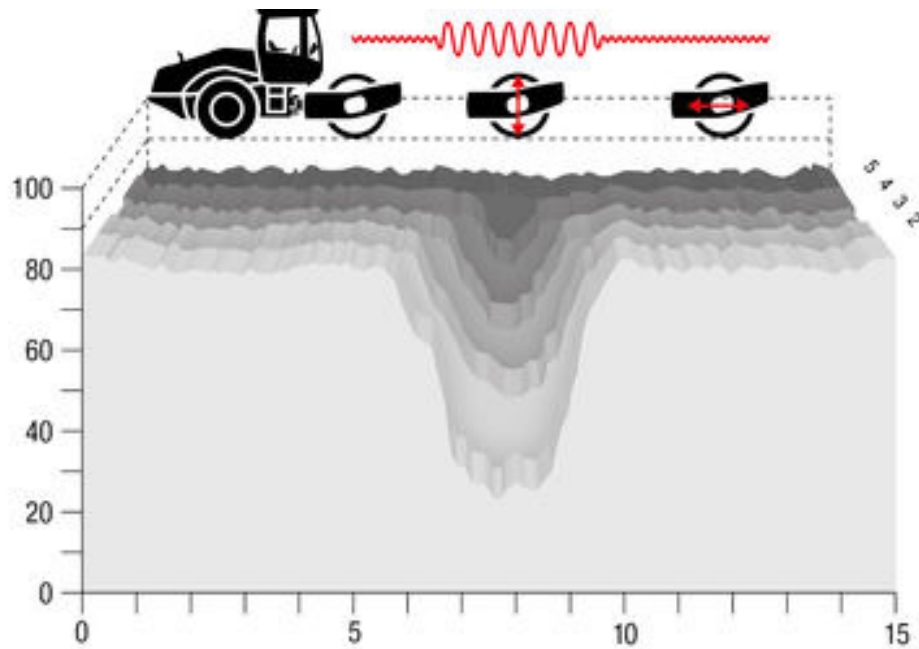




# Automation of Tamping work

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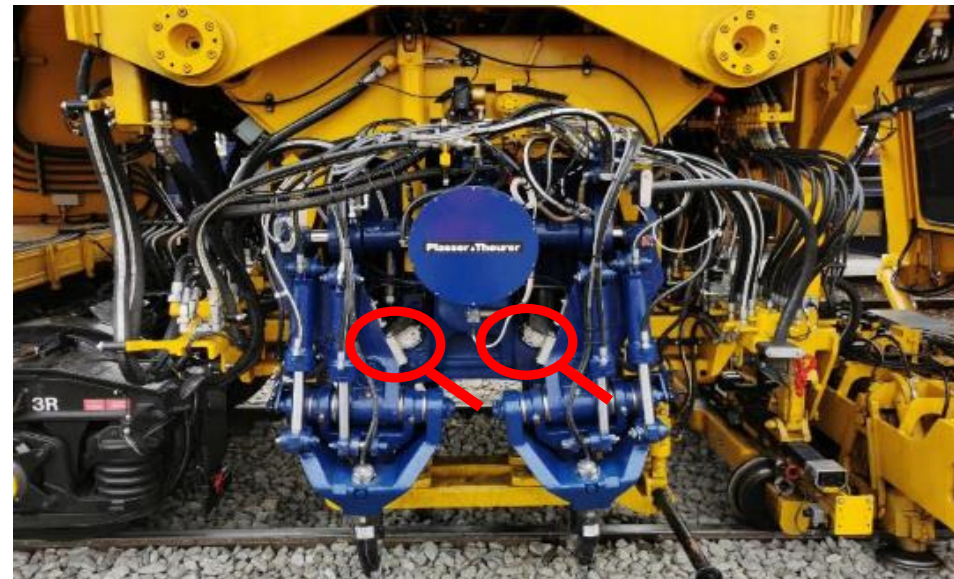
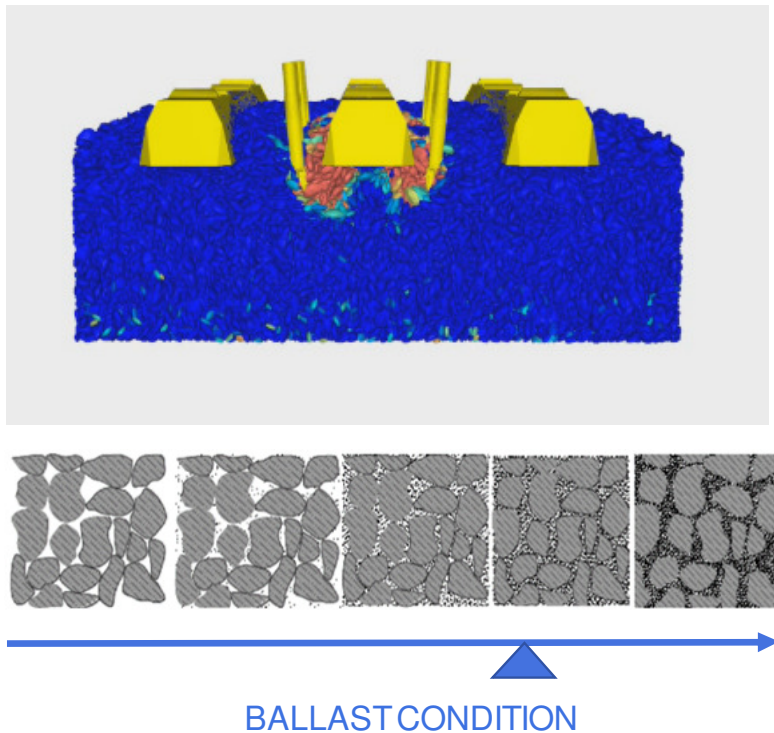
Automatic adjustment of working parameters



# Condition Monitoring

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Condition-based maintenance using sensing tamping tines



Increasing Transparency  
Ballast Compaction Control System

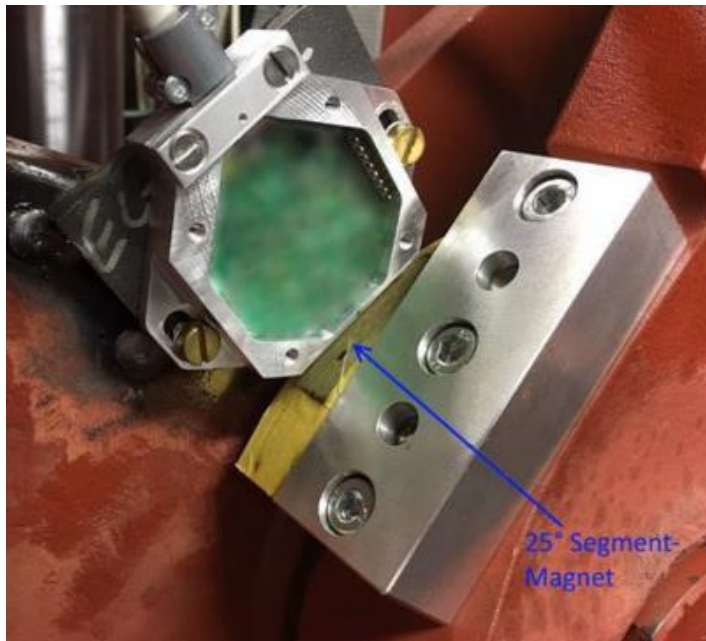




# Angle Encoder

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## Smart sensor fusion



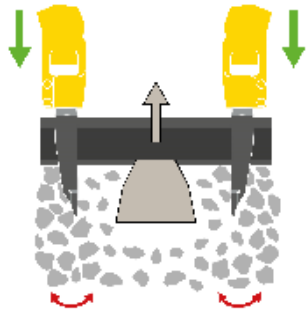
### ‘One for all‘

- Rotation angle measurement using diametral magnets
- Acceleration measurement in X, Y, Z direction
- Angular velocity measurement around X, Y, Z axis
- Temperature measurement
- Frequency measurement
- Amplitude measurement
- Squeezing measurement
- Dynamic energy consumption
- Ballast Stiffness



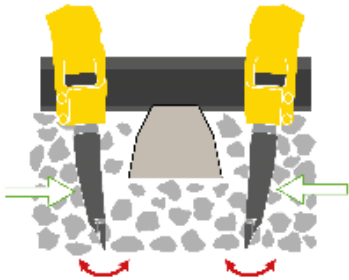
# Automation of Tamping

Demanding for highest quality and process safety



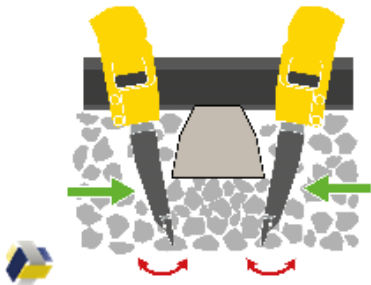
## Ballast Penetration Control System – Auto Penetration

- Minimum Ballast Stresses



## Compaction Control System – Auto Filling

- Filling the Voids



## Compaction Control System – Auto Compaction

- Optimum Compaction

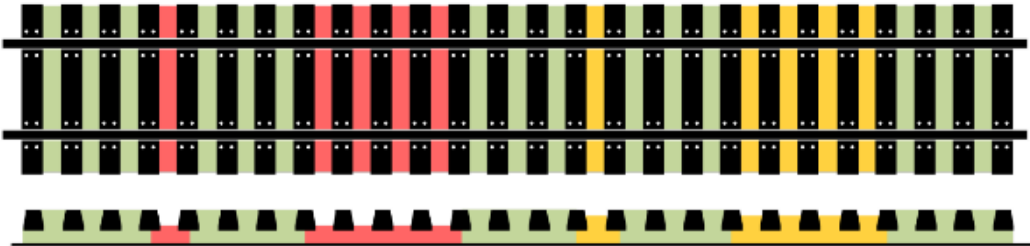
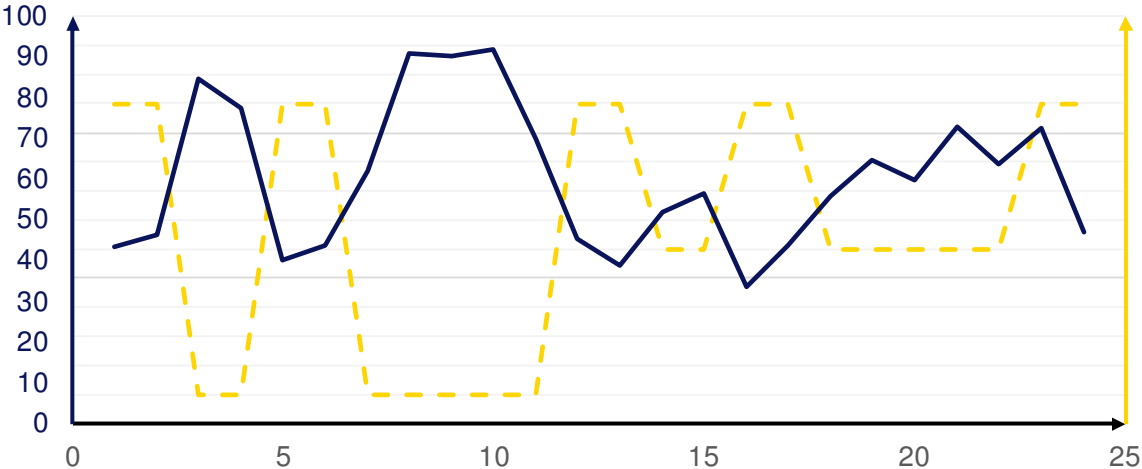


# Compaction Control System

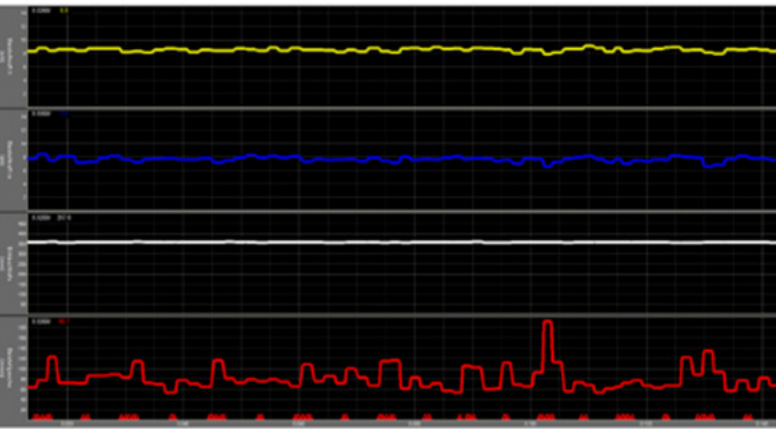
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## Process safety – detailed analysis

Signifikante Beistellgeschwindigkeit (mm/s)



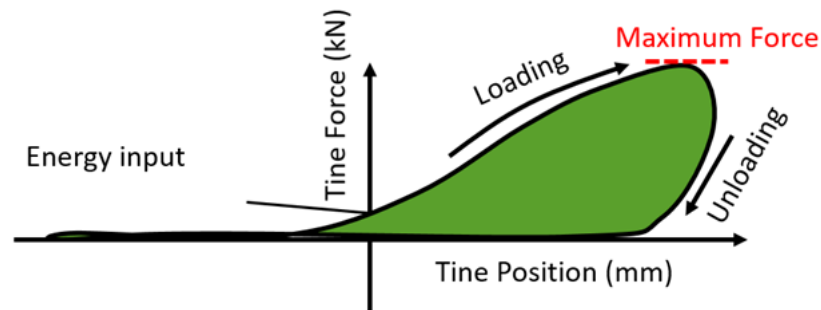
- Empty
- Reduced
- Filled



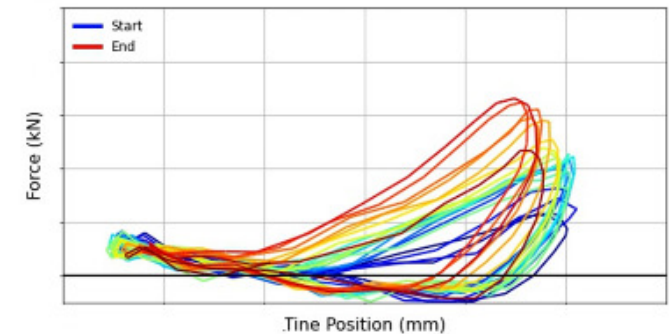
# Compaction Control System

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Dynamic energy consumption as key indicator



Area under force-displacement curve:  
Energy transfer to ballast during each  
tine vibration cycle =>  $W_{comp.cycle}$



The total compaction energy is  
calculated by:

$$W_{compaction} = \sum W_{comp.cycle}$$

Increased transparency through

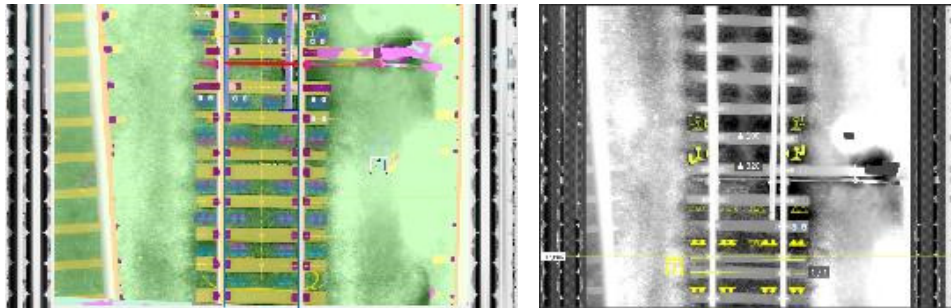




# Optimising the main work

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AI reduces human intervention



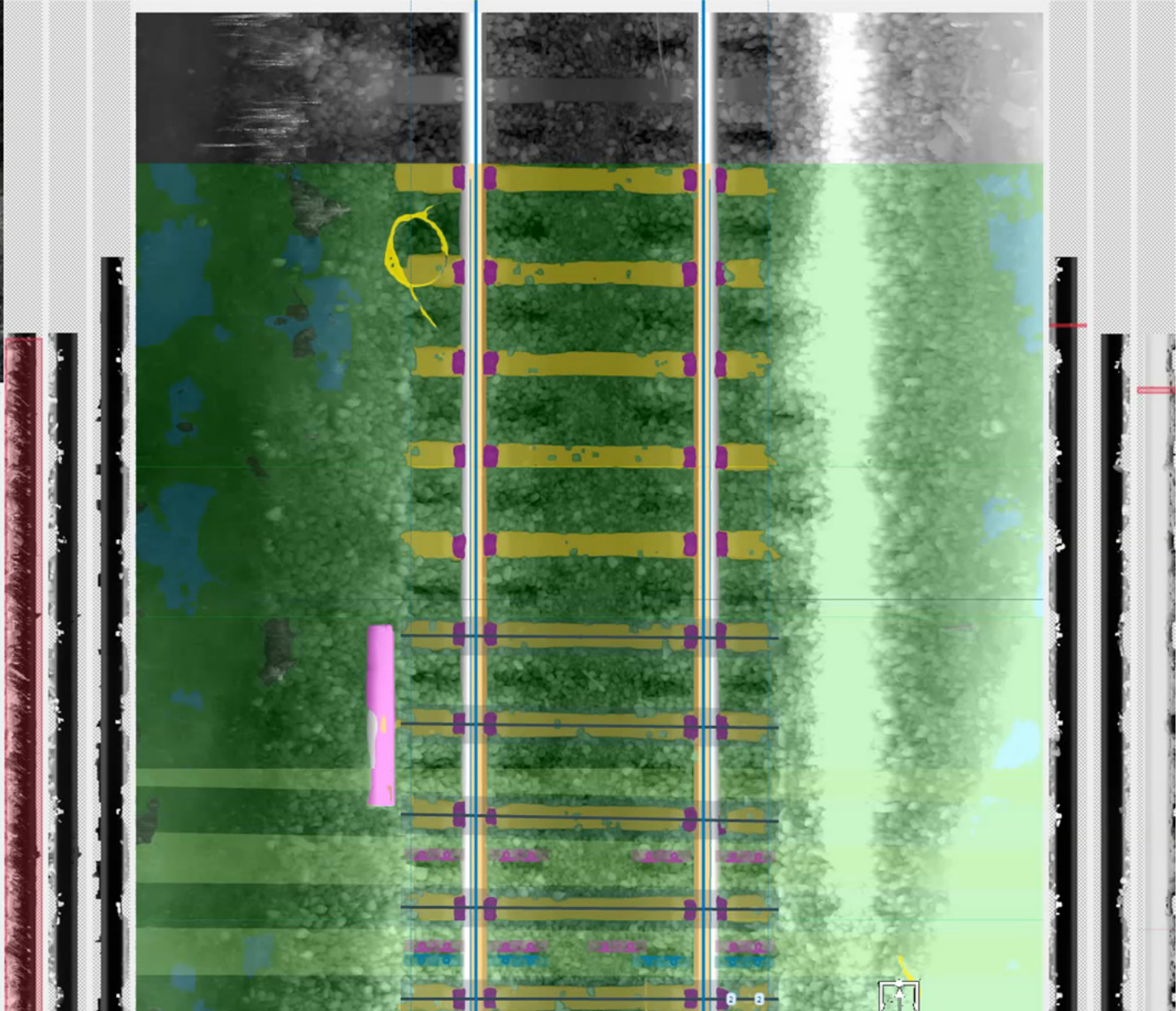
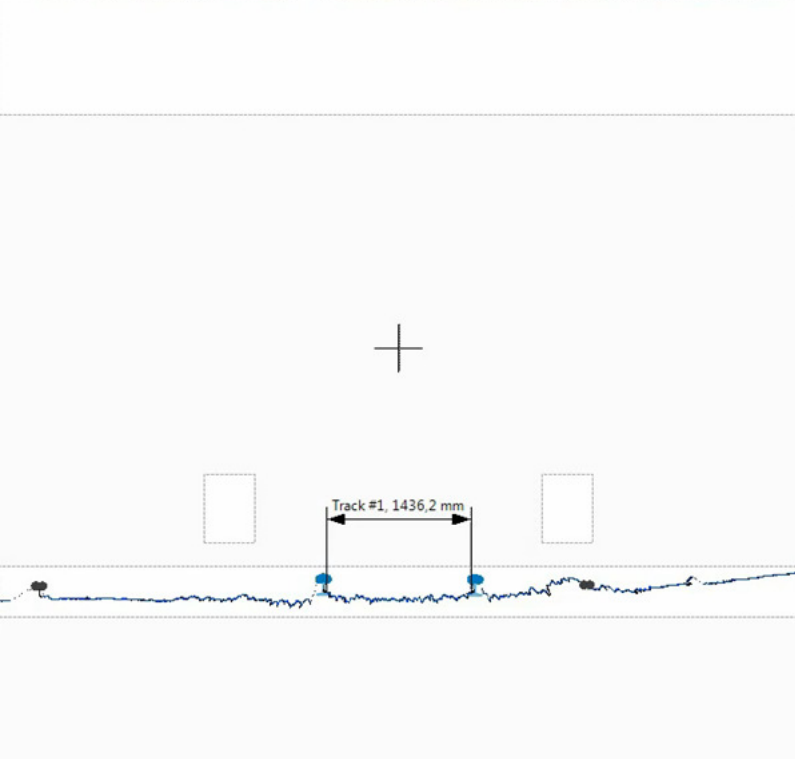
A logical next step in the digitalisation of track maintenance

Technology increasingly replaces the operating staff's practical experience

This leads to

- down-time-efficiency
- better quality
- fewer mistakes









Plasser Smart Maintenance

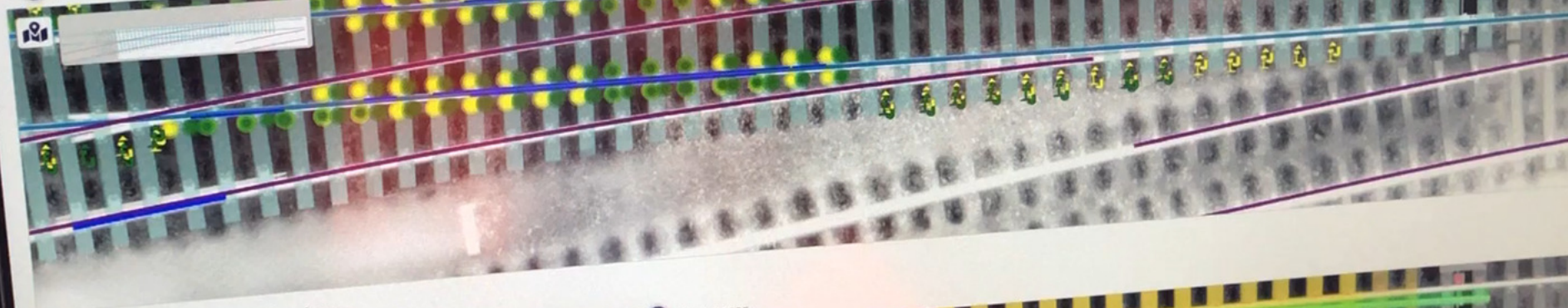
### Tamping Positions

- Depth image
- Rails
- Sleepers
- Suggested tamping positions
- Actual tamping positions



### Lifting-/Lining Positions

- Depth image
- Rails
- Sleepers
- Actual Clamps
- Suggested Clamps
- Actual Hooks
- Suggested Hooks
- Actual Additional lifting unit
- Suggested Additional lifting unit



### Detected Track Obstacles

- Depth image
- Tamping
- Hook head
- Hook foot
- Clamp rear



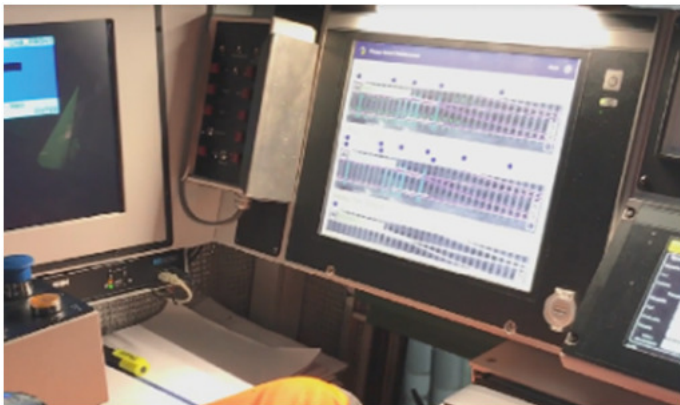
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# Optimising the proof of work

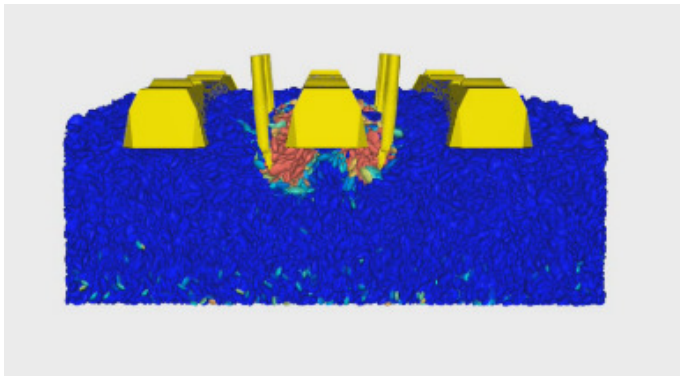
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For a safe handover to railway operation



Increased transparency through

- New tamping report
- User-friendly visualisation
- Integration of working parameters relevant to quality



Increased quality through

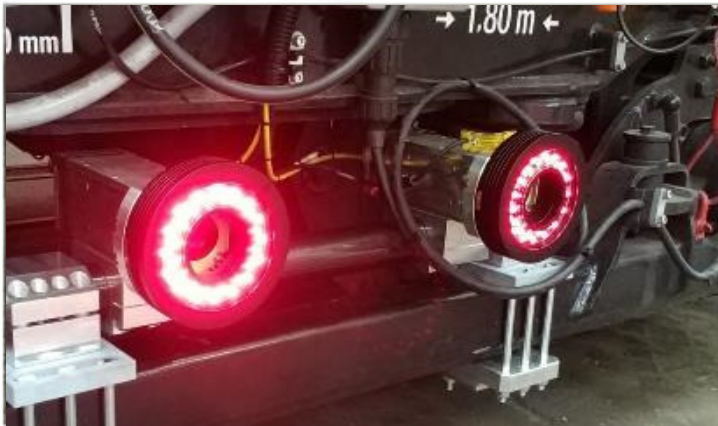
- Dynamic compaction control
- Ballast condition monitoring



# End-to-end solutions for track maintenance

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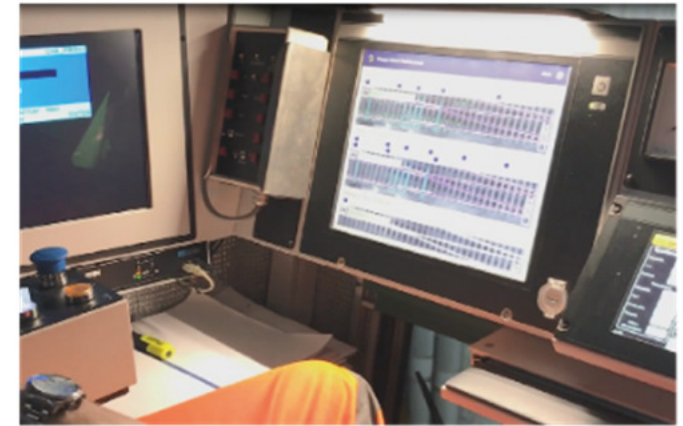
## Time-efficient Integration of Work Processes



**Inspection / Surveying**



**Track Work**



**Hand over procedure**

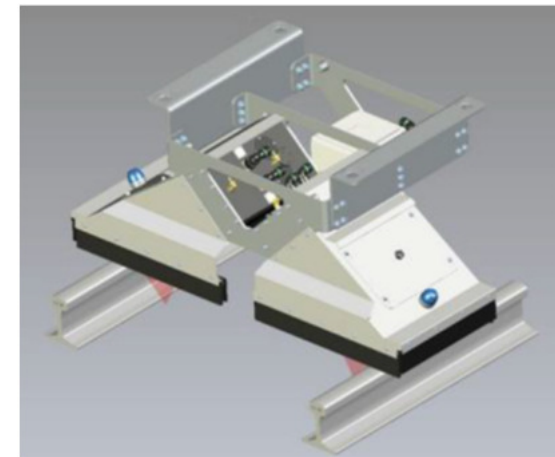
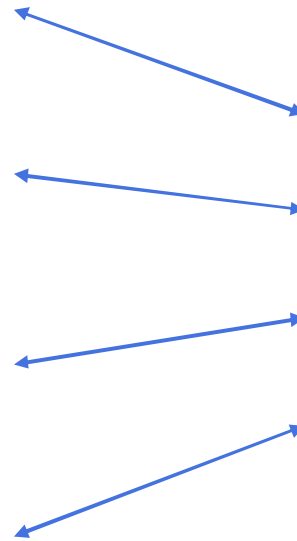
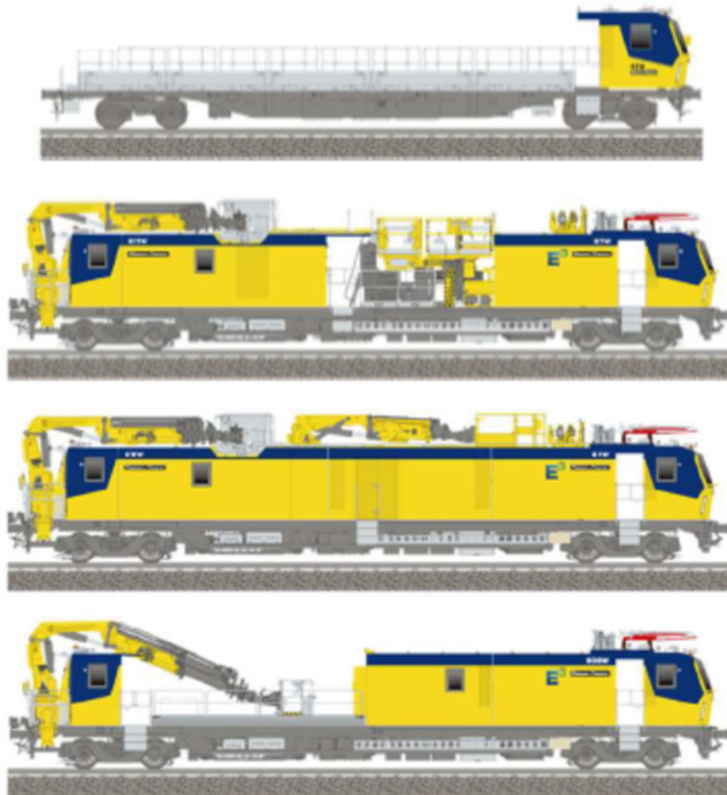
- Integration of surveying
- Assistance systems increasingly facilitate track work
- Acceptance of the work with new Ballast Compaction Control System and without entering the danger zone



# Frame Contract ÖBB

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## Modular concept





# Key facts



90

employees, or smart scientists rather. From all over the world. United. For the cause: making railways cooler than flying to mars.

100+

countries have machines with our software operational

300

machines connected delivering daily data

1Mio

data points processed / day

Founded 2019

Headquarter:  
Linz, Austria

CEO:  
Jochen Nowotny



CONFIDENTIAL

Wir gestalten und vermitteln  
Wissen für das Wachstum und  
den Erfolg des Systems Bahn

mehr erfahren





# Linear Asset Railway Track

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Precise – Durable – Cost efficient

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