

HIGH CAPACITY | PRECISION | RELIABILITY

Plasser & Theurer

A vintage photograph showing a yellow Plasser & Theurer rail machine on a railway track. Two men, one in a grey coat and hat and the other in a dark coat and hat, are standing next to the machine. The machine is a large, complex piece of equipment with various mechanical components visible. The background shows a building and other tracks.

Novità dal centro tecnologico

Bernhard ANTONY | Bologna | 18.11.2021



FIRST
MECHANISING
TRACK MAINTENANCE



SECOND
INTRODUCING THE
ASSEMBLY LINE METHOD



THIRD
MAKING CONSTRUCTION
METHODS GREEN



FOURTH
DIGITALISING TRACK MAINTENANCE



 digital
twin

Technology Centre Purkersdorf

Plasser & Theurer

Putting Ideas on Track

Tasks:

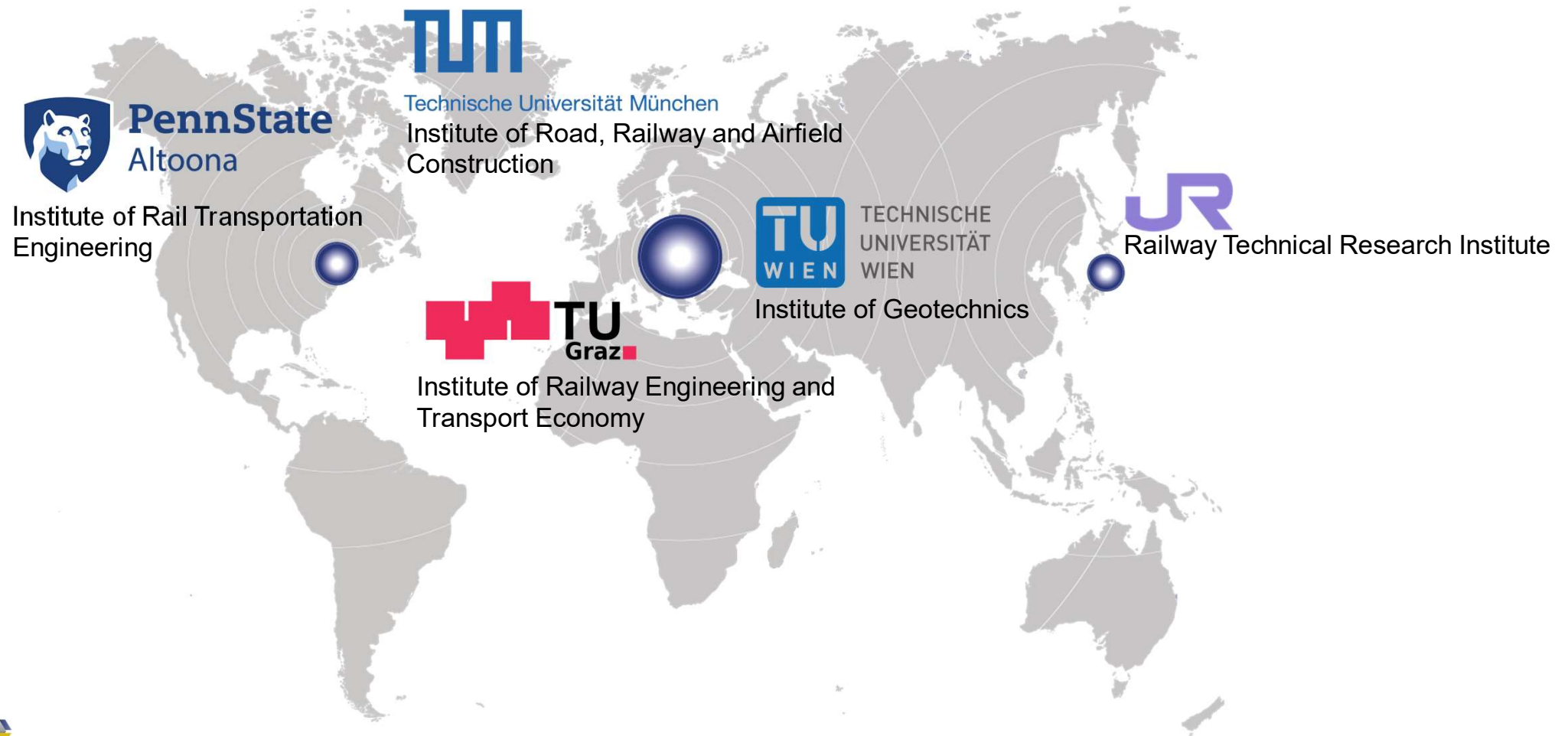
- Interface between theory and practice
- Basic research in permanent way
- Manufacturing, construction and operation of prototypes

Facts:

- Approx. 30 employees
- 2x measurement cars
- 1x tamping machine
- 1x grinding machine
- Several test stands



International research partners of Plasser & Theurer



Permanent Way

Simple – Robust – Multiple – Cost-efficient

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Different standards worldwide...

VARIABLE TAMPING PARAMETERS...

Tamping Force

Correction values

Squeezing Time

Number of
Insertions

Tamping
Depth

Frequency

Amplitude

DIFFERENT STANDARDS WORLDWIDE...

Minimum lifting values

- 20-25 mm
- 15 mm
- 50% of the nominal stone size



Tamping Depth

- 13-30 mm



Squeezing Time

- 0.8 to 1.2 s



Number of Insertions

- Multiple Insertions for track lifts > 25 mm



Source: Hansmann, Barbir (2020)

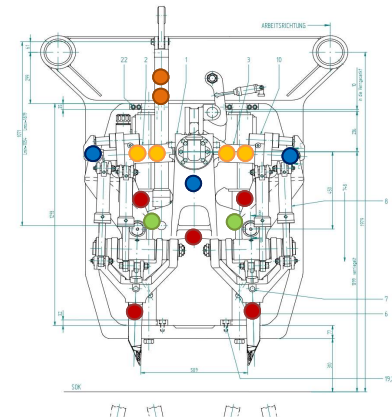


TAMP – From Research to Product

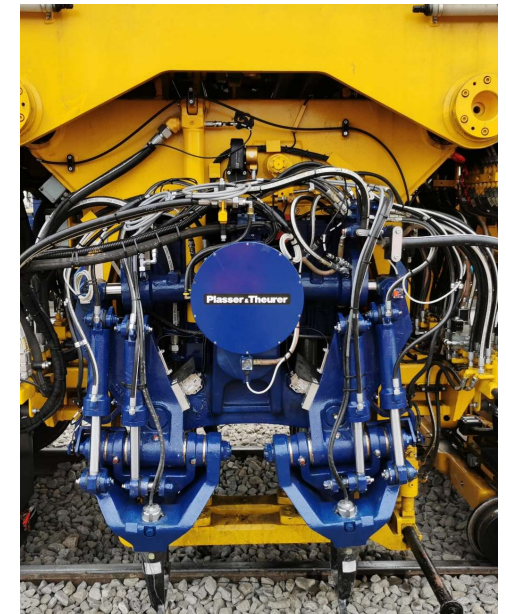
Basic-Research as foundation

What are the benefits?

- **Continuous monitoring** of ballast condition and optimization of the tamping process.
- Detection of the **level of deterioration** of the ballast.
- Determination of the **perfect timing for ballast bed cleaning or renewal**.
- Identification of the **influence of each tamping parameter** and definition of the **optimum values**.
- **Continuous improvement** of the system through post-analysis of the collected data.



- Accelerometers
- Strain Gauges
- 600 bar Pressure sensors
- 1000 bar Pressure sensors
- Angle encoders



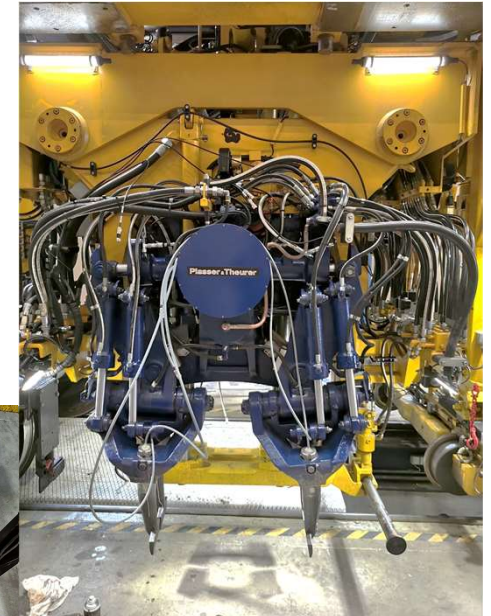
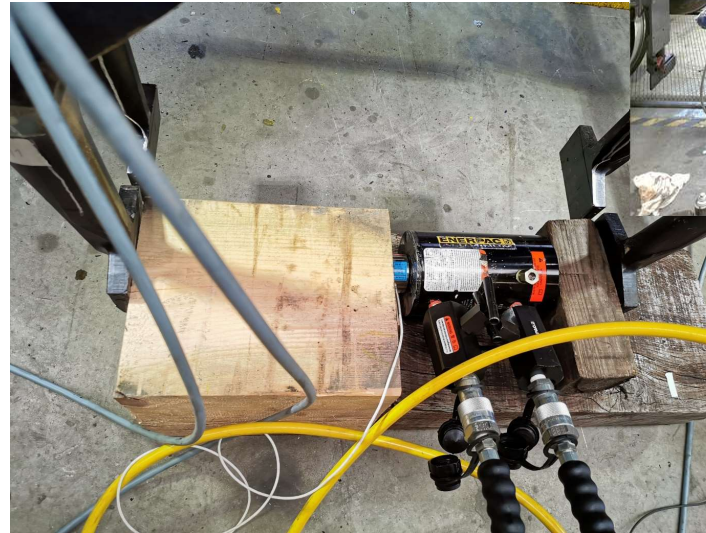
SENSOR SETUP used on TCP-Machine 09-4x4 4S Dynamic

TAMP – From Research to Product

Basic-Research as foundation

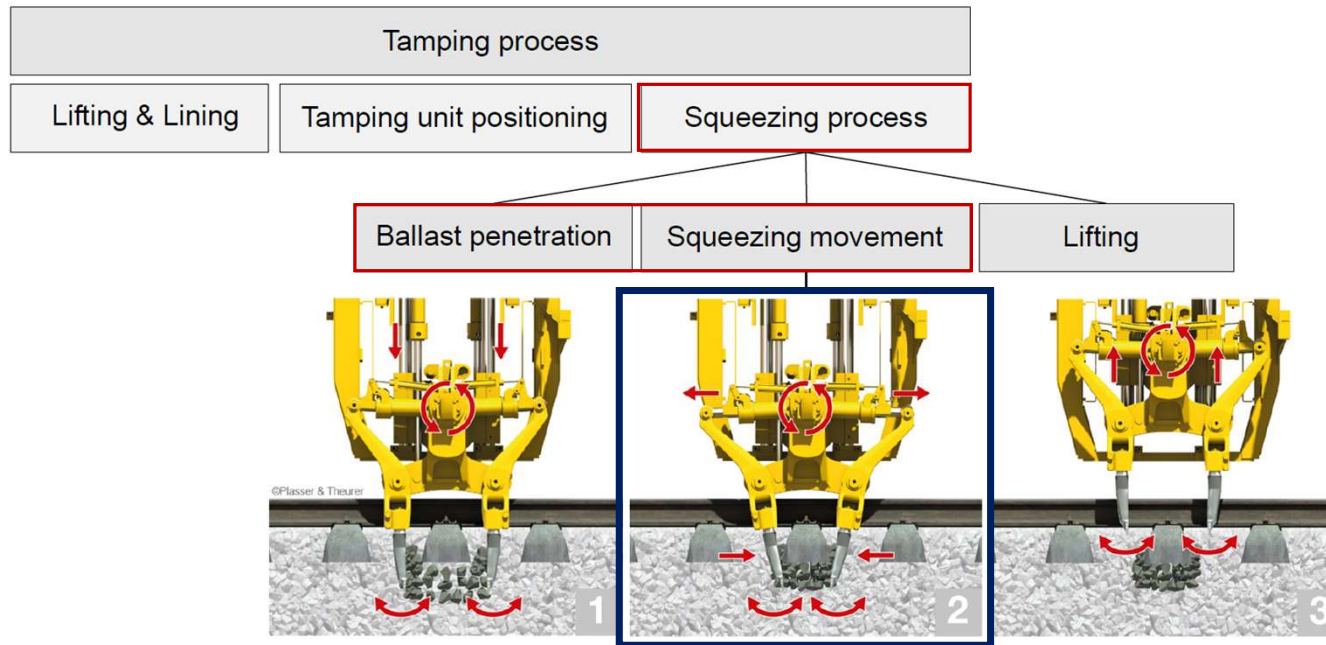
SMART-Tine

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TAMP – Recorded data

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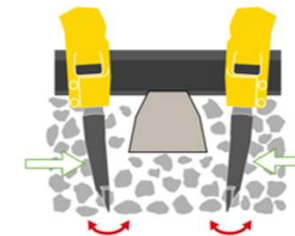


~240 parameters
sample rate 1000 Hz

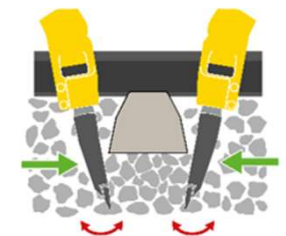
~600,000 data points per sleeper
(single squeezing process)

- Positioning (lifting and leveling) the track
- **Filling the ballast into the void under the sleeper**
- **Ballast compaction under the sleeper** → creating a durable bearing

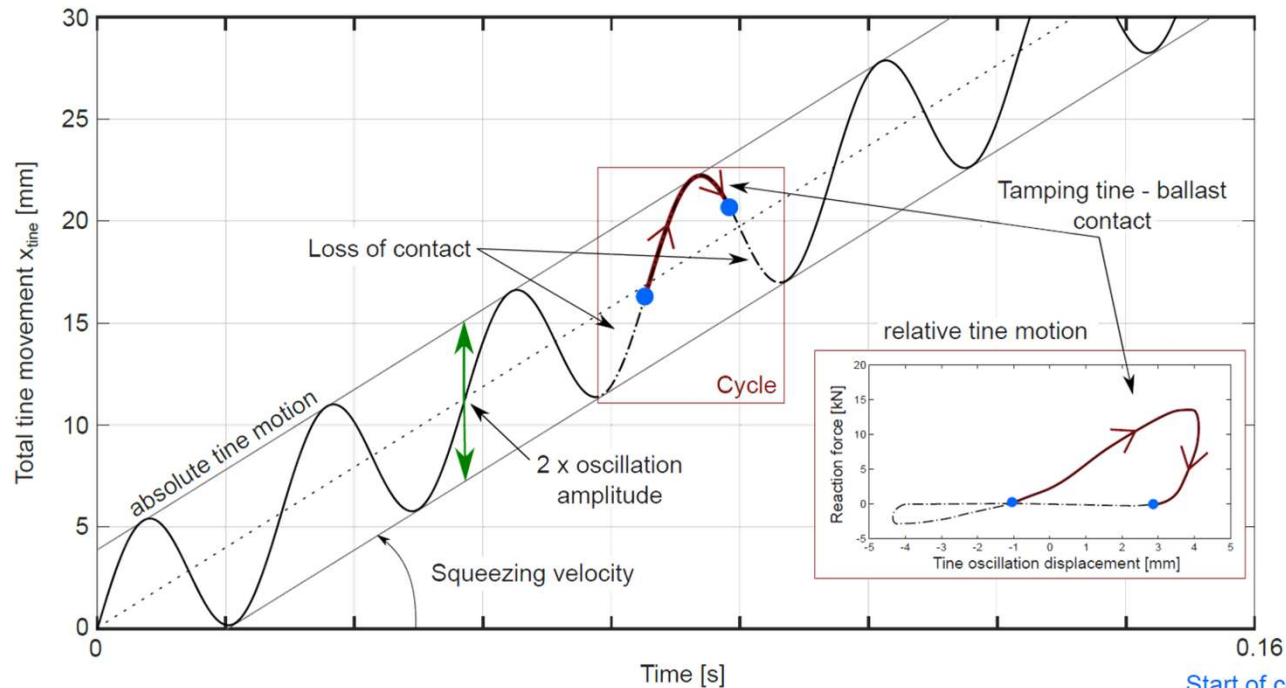
Phase 1: Filling



Phase 2: Compaction



TAMP – Data processing



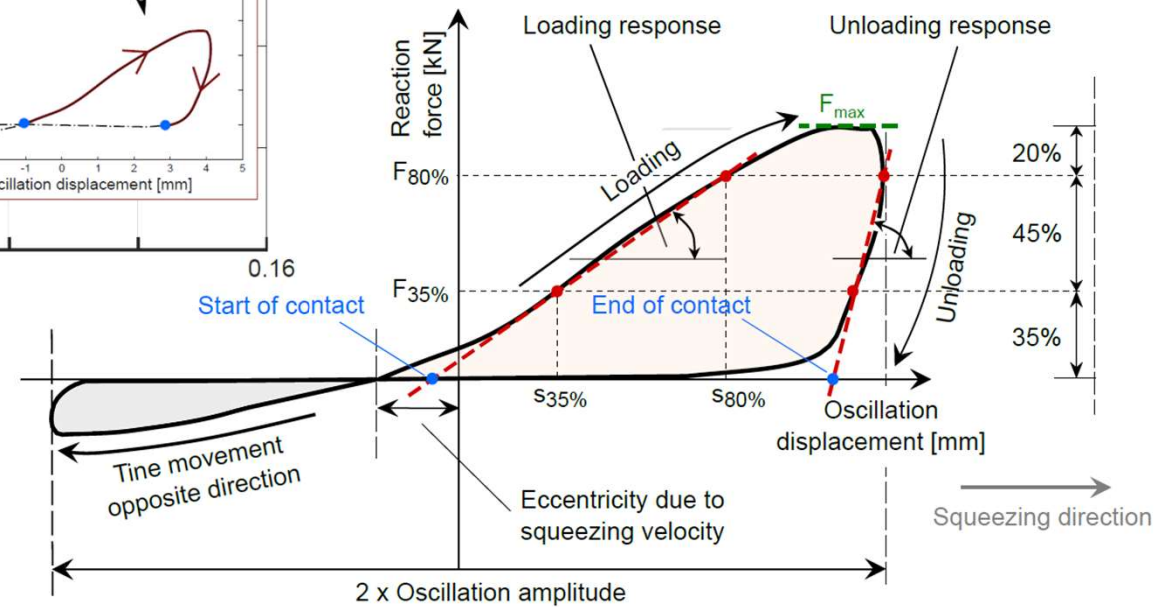
Insight into seven selected tamping characteristics

Oscillation amplitude and related **reaction force**

Ballast response during both loading and unloading

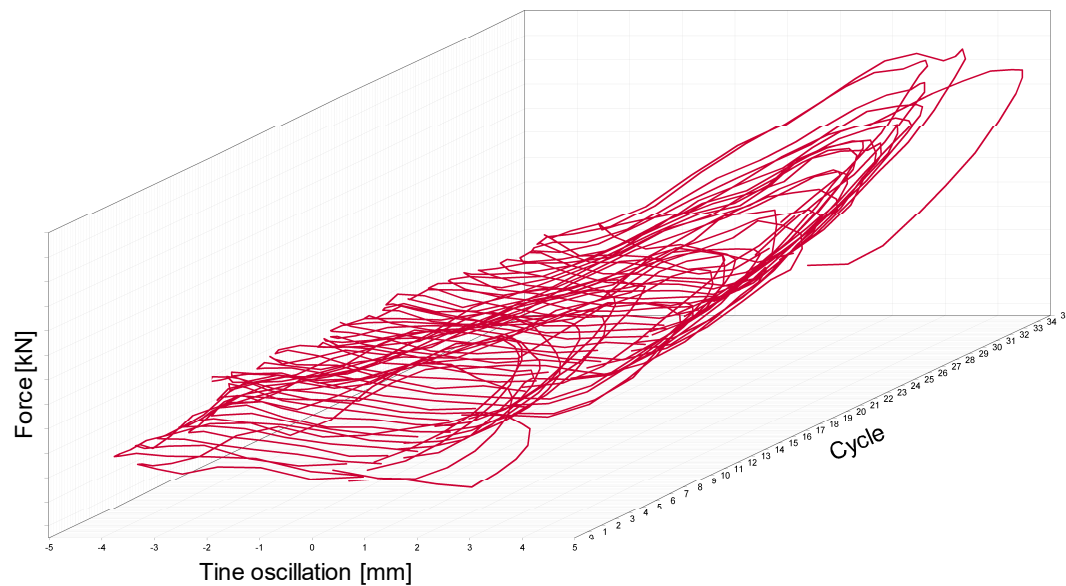
Energy transferred into the ballast

Points of tamping tine - **ballast contact begin and end**

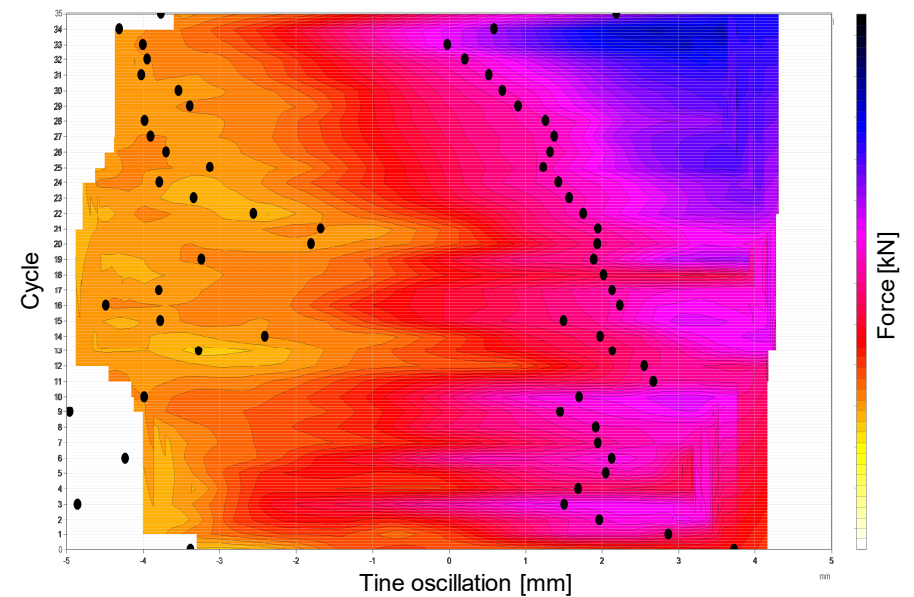


Detailed graphical and
statistical analysis
on a cycle level

WATERFALL DIAGRAM



HEAT-MAP DIAGRAM

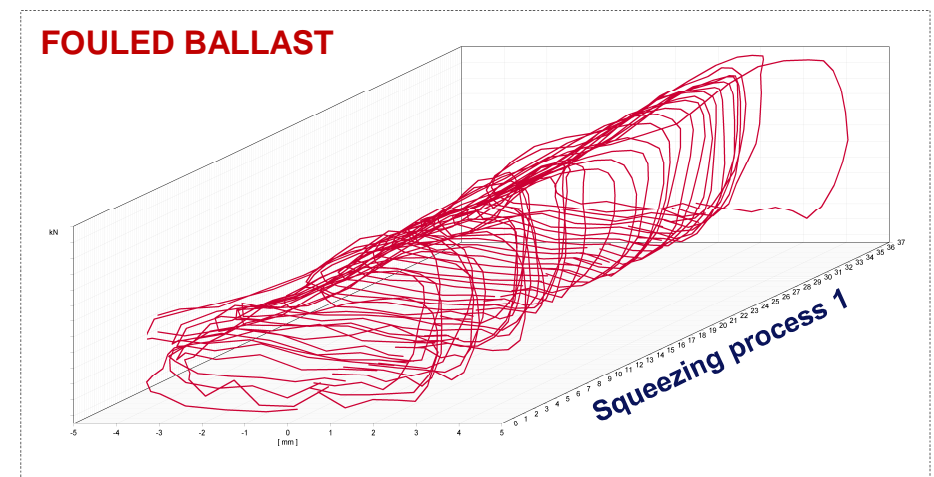
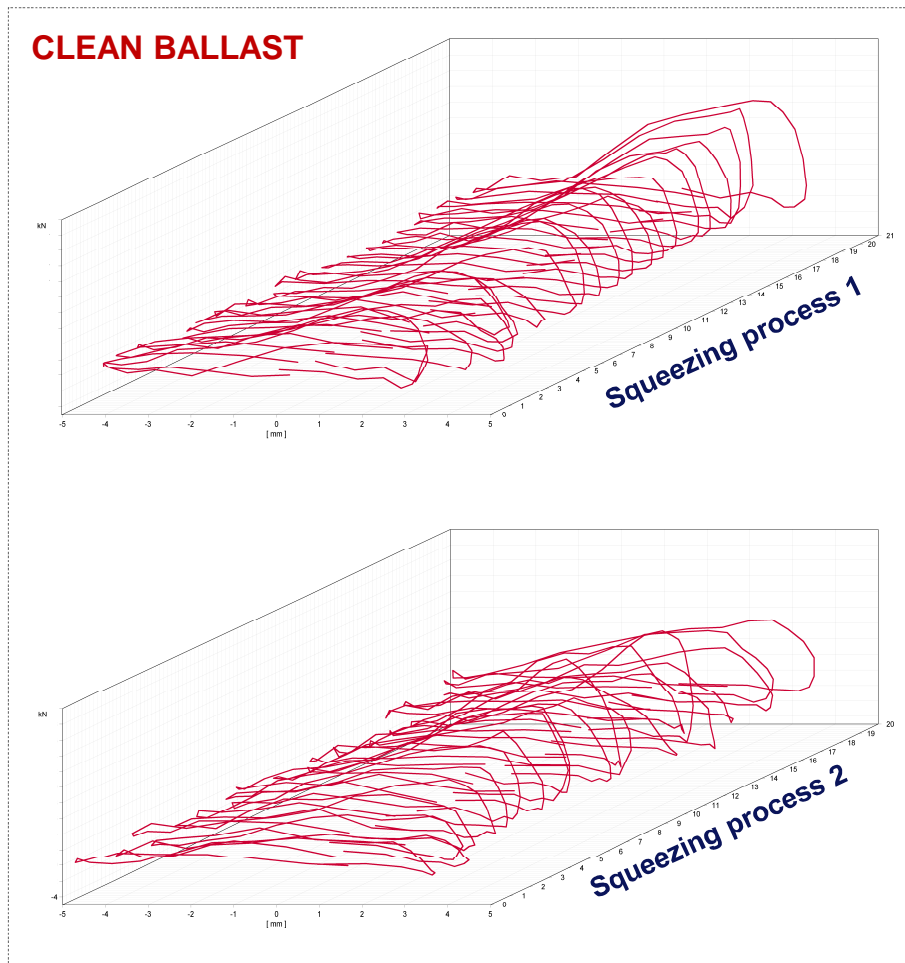


TAMP – Results

*results of a statistical
analysis of data recorded
by the Dynamic Tamping
Express 09-4X E³

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WATERFALL DIAGRAM



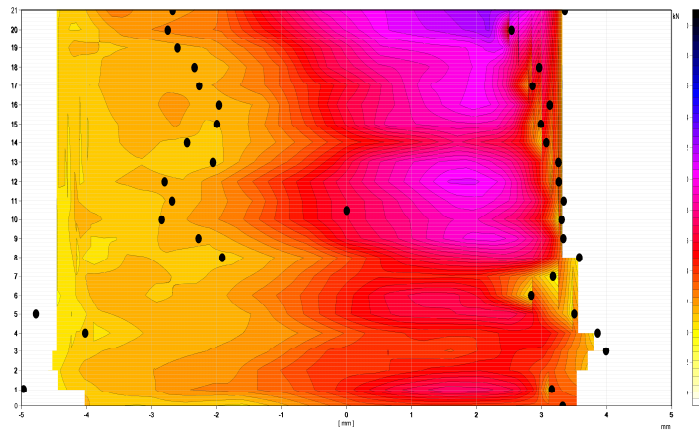
TAMP – Results

HEAT MAP

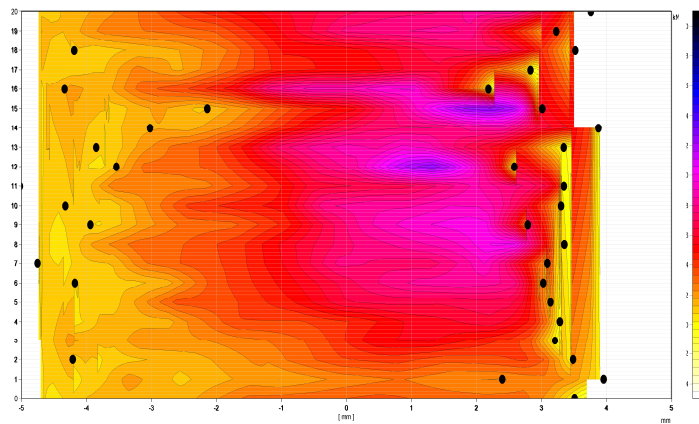
*results of a statistical analysis of data recorded by the Dynamic Tamping Express 09-4X E³

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CLEAN BALLAST

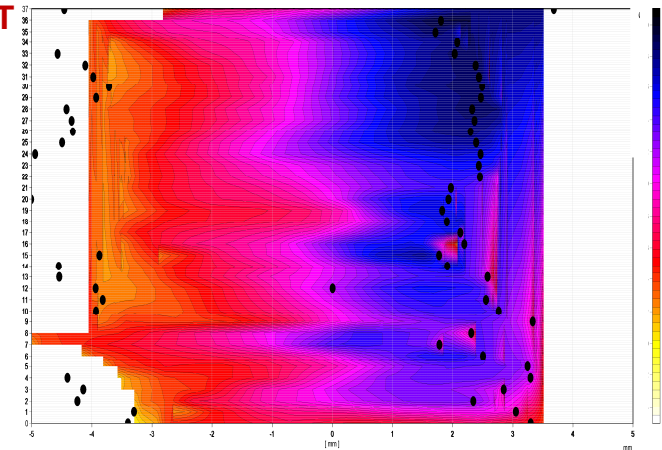


Squeezing process 1



Squeezing process 2

FOULED BALLAST



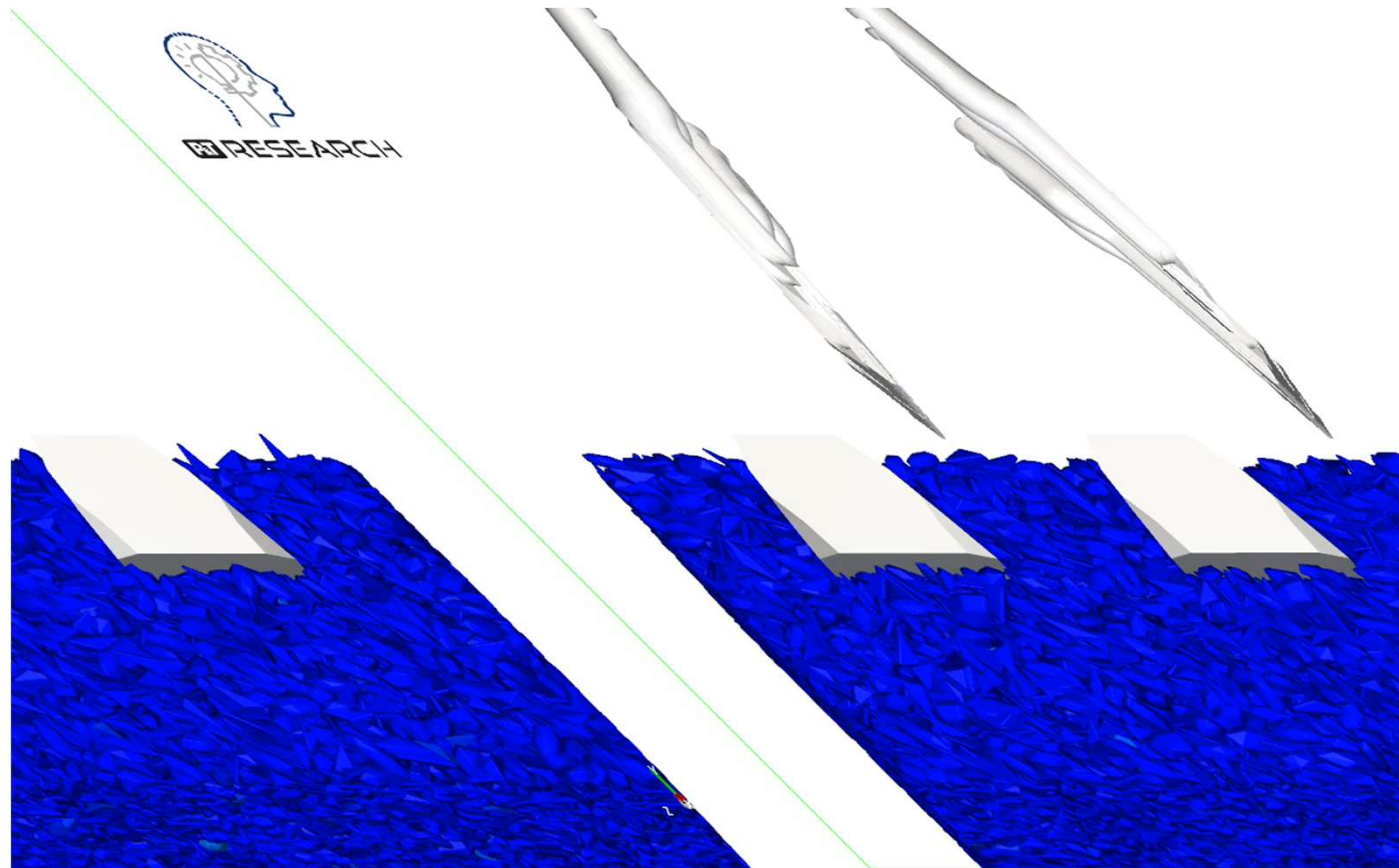
Squeezing process 1



TAMP – From Research to Product

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Ballast Rearrangement Analysis



Vision

Track tamping machine – In situ measurements

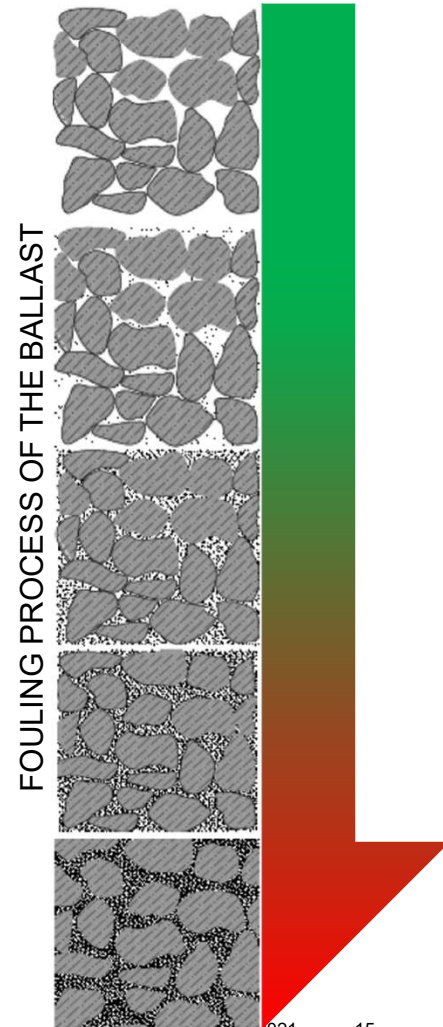


Evaluation of compaction effort and
determination of ballast condition



Development of an automation system for
tamping tailored the respective ballast condition

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Discover the future of track construction and maintenance

Plasser & Theurer's Research and Development Department is building the future of track construction and maintenance already today.

We invite you to browse through P&T Research to get insight into current research projects and to discover our latest research findings. Witness how we develop leading-edge technologies and get to know our research and development experts who are passionate about their work. Find out more

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