Staffposition
Research & Development
(R&D)

Head
Ing. Wolfgang ZOTTLE
ÖBB-Infrastructure AG-Research and Development (R&D) is a strategic element of the corporate management of ÖBB-Infrastructure AG for in-house handling of research projects to position and strengthen our modern and environment-friendly railway as a motor for innovation.

R&D co-operates with partners of the ÖBB-group as well as partners from industry and science. R&D supports all parts of ÖBB-Infrastructure AG within the management and processing of R&D projects.
Our main tasks

- strategical research for the „ÖBB-Infrastructure AG“
- networking of industry, economy and universities to develop ideas and possible solution statements
- inspection of international, national and/or regional research projects for our customers
- support in processing research projects (research funding)

The most important task of the staff R&D is to transform the know how of railway technology in an organisational unit, to postion and strengthen our modern railway as an innovation driver.
The R&D of the „ÖBB-Infrastruktur AG“ does application-oriented research.
With the help of the industry-network ideas are sucessfully turned into reality.
We implement international, national and regional research projects together with and for our customers.
R & D leads to innovation management for application-oriented and results-effective research to develop the infrastructure and interfaces, with 15 employees and a budget of about € 5 million.

Currently about 50 projects are from different sectors of infrastructure, for example,

- Geodaten
- Laserscan
- Wiener Bogen
- Lärmschutz
- Brücken-klappverfahren
- DEST Rail
- Energie
- Argos®
- Gleislage-Charakterisierung
- RSS
- Elastizität im Gleis
- KLIWA
- Ballige Schiene
- Tunnelausbruch
- GAL-Galileo
Research funding - Objective

- Keep the feed rate of approximately 22% (DB and SBB 9-11%) despite an increase of investment projects
- Each research project will be subject to a test potential funding
- Funded projects are priori, and include intense communication with FFG, Federal Ministry and EU, as well as other national and international funding bodies

The indirect support for R & D projects is at present pa € 800,000, -, as well as direct funding predominantly from the FFG of about € 150,000, -

By participating in consortia, we are working projects worth a total of 93 million €, which means direct information and more know-how
Example: Research Project

> duration 2009-2010
> aim: more safety at level crossings
> method: new technologies for better understanding what happens on the road
> conclusion:
  - generate portal effect
  - generate clearness
  - add light signals on road sign mast to increase visibility
Example: Research Project

The project „airborne laser scanning and aerial image data identification of railway infrastructure systems“ develops innovative methods to enable the automated recording of information about railway infrastructure.

ÖBB operates a rail network with a total length of around 5700 km.
Methods of proving the safety against derailment.

- The general meaning is that the limit value for existing safety criteria $Y/Q \leq 0.8$ could be increased.

- Fright wagons and other vehicles exceed the actual limit value of $Y/Q$.

- The actual limit value is accepted for dry rail and flange.

- The slip $Y/Q$ depends from friction coefficient of the inner rail.

**Vertical wheel force** $[Q]$  
**Lateral wheel force** $[Y]$  
**Contact point** $[y]$  
**Angle of Attack**
Adapting ÖBB rail infrastructure to climate change

Main research questions within the project

(1) What are the climate change impacts on rail infrastructure?
- Literature review
- Synthesis report
- Workshop with internal ÖBB experts
- Identification and prioritisation of possible climate change impacts on rail infrastructure

(2) How vulnerable is the ÖBB infrastructure?
- Analysis of ÖBB damage database
- Link to meteorological parameters
- Workshop with internal ÖBB experts and external experts
- Focus on natural hazards
- Discussion of results from vulnerability assessment

(3) What adaptation options are necessary and possible?
- Literature review
- Interviews with internal ÖBB experts
- Workshop with internal ÖBB experts and external experts
- Presentation and discussion of possible adaptation options

Final results → recommendations of possible adaptation options
The Viennese Transition Curve
A revolutionary Austrian development for track alignment design

It is a new method for defining an optimised and sustainable alignment geometry for railway lines. The chosen route and its layout are extremely long-lived engineering products, which have a substantial impact on infrastructure spending across centuries.

Aim:
- greater comfort of the passenger
- lower forces and wear of permanent way
- less maintenance
- cost savings (as part of scheduled maintenance)

Applying the best methods is virtually a must to avoid any unnecessary extra cost for current and future generations.
Thank you for your attention
Slab Track Austria
System ÖBB-PORR, an Austrian Know-How Transfer

Porr Bau GmbH / Infrastruktur

Angela Kuo / Railway Division

28 March 2012, Ankara
Decision-making of slab track system in Austria

Entscheidungsfindung FF-System in Österreich

- Construction (space requirements, ...)
  Konstruktion (Platzbedarf, ...)
- Method (sensitivity of laying, ...)
  Verfahren (Sensibilität der Verlegung, ...)
- Quality (track set, acoustics, ...)
  Qualität (Gleislage, Akustik, ...)
- Economy
  Wirtschaftlichkeit

System ÖBB–PORR is the STANDARD SYSTEM in Austria

Elastisch gelagerte Gleistragplatte ÖBB – PORR REGELSISTEM in Österreich
Track Base Plate

Gleistragplatte
Operating characteristics of elastic separation layer

Wirkungsweise Elastische Trennschicht
Description of the system
Systembeschreibung

- Low construction height
  Geringe Konstruktionshöhe

- High degree of prefabrication
  Hoher Vorfertigungsgrad

Cross-section beside pouring aperture
Querschnitt neben Vergussöffnung

Gleisachse
Tunnelachse
Vergussbeton
Gleistragplatte
Schotterauffüllung

±0,18
-0,60
SOK ±0,00

86.0 86.0
1.730 1.730

1.680

74.0

45.5

0.32
Construction process

Bauablauf
**Track alignment quality**

*Qualitätssicherung Gleislage*

**Frequency distribution of deviations**

Häufigkeitsverteilung der Abweichungen

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<th>Deviation Abweichung</th>
<th>Position Lage</th>
<th>Height Höhe</th>
<th>Cant Überhöhung</th>
<th>Track Gauge Spurweite</th>
<th>Position of Creep Wandersehne Lage</th>
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**High precision of track position**

hohe Gleislagegenauigkeit

Wagram connection - 638 measurement points, value as %
Track alignment quality

Qualitätssicherung Gleislage

Slab Track System ÖBB-PORR
High speed tests

Test von Hochgeschwindigkeiten

High-speed tests:
\[ V \geq 300 \text{ km/h} \]

Test von Hochgeschwindigkeiten:
\[ V \geq 300 \text{ km/h} \]
Zulassung für 350 km/h
Highly-modular formwork

hoch-modularer Schalungen

Dimensions variable according to the project’s requirements

Dimensionen variable gemäß Anforderung des Projekts
Highly-modular formwork

*hoch-modularer Schalungen*

**Standard 5.16 m**

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**GRUNDTYPEN WEGEN GRUNDRISSGEOMETRIE:**

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Prinzipskizze (nicht maßstäblich):

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2.4 m

- **Radien - GTP**
Precision of Track Base Plate

Genauigkeit der Gleistragplatte

+/- 0,3 mm tolerance for precast

+/- 0,3 mm Toleranz für Fertigteil
Track equipment
Gleisaurüstung

- Accessible noise absorbers
- Guard rails
- Buffer stops
- Track magnets
- Power rails

Schnitt A-A
- Schallabsorber
- Führungsschiene
- Adapterplatte
- Ausgleichsplatte
- Elastomere Ausgleichsplatten
- Gewindestange
- Grundplatte
- Ankerstange
- Stromschienenträger REHAU höhenverstellbar

Schnitt B-B
- Gleismagnet
- Fahrsperre
- Adapterplatte
- Ausgleichsplatte
- Elastomere Ausgleichsplatten

Schnitt C-C
- Beschichtete Bewehrung z.B. mit AGROVAN 209 in FTGS-Bereichen
Revisions within the track

Gleisachse Aussparungen

Large openings

Große Aussparung
Mass-spring-systems
Masse-Feder-Systemen

- **Point bearing support**
- **Elastomeric layers 6 & 3 mm**
- **Mass-spring system**

- **Track Base Plate (TBP)**
- **Elastomeric mat + TBP**
- **MS trough + point bearing support + TBP**
- **MS trough + bearing mat support + TBP**

- **Befestigung**
- **Vergussbeton**

- **6 und 3 mm elastische Trennsch.**

- **Mass-spring systems**
- **Masse-Feder-Systemen**
Derailment and repair

Unfall und Reparatur
Derailment and repair

Photos of derailment damage

- Slab track  Feste Fahrbahn
- Ballast track  Schotter
- Turnout  Weichen
Repair and replacement
Reparatur und Austausch
Level adjustment (large settlement)

*Niveauregulierung*
Slab track projects
Feste Fahrbahn Projekte

Austria – Melk

- 8 km of slab track
  8 km FF
- 800 m mass spring system
  800 m MFS
- Tunnel
  im Tunnel
- Bridge
  auf Brücke
- Earthwork
  auf freier Strecke
Slab track projects

Feste Fahrhahn Projekte

Austria – Arlberg Tunnel

- 20.8 km of slab track
  20,8 km FF
- Double track old tunnel
  2-Gleisigen Tunnel
- 3.5m between track centrelines
  3,5m zwischen Gleisachse
- Widening tunnel clearance
  Verbreitung des Lichtraumprofils
- Installation water supply line
  Installation von Wasserleitung
- Track accessible for emergency road vehicles
  Befahrbarkeit für Rettungsfahrzeug
Slab track projects
Feste Fahrbahn Projekte

Germany - Berlin Lehrte station
East-West connection

- 25 bridges
  auf 25 Brücken
- 5.6 km of slab track
  5,6 km FF
- Mass-spring-system
  mit MFS
- 4 Turnouts in slab track
  4 Weichen in FF
- 6 bridge expansion joint construction
  6 SAV in FF
- 50 transitional construction
  50 FÜK
Slab track projects
Feste Fahrbahn Projekte

Germany - Berlin Lehrte
Station North-South connection

- In tunnel
  Im Tunnel
- 20 km of slab track
  20 km FF
- 13 km of light, medium & heavy mass-spring-systems
  13 km leichte, mittlere uns schwere MFS
- 49 turnouts in slab track
  49 Weichen in FF
Slab track projects
Feste Fahrbahn Projekte

Mass-spring systems with point bearing supports
Einzelgelagerte Masse-Feder-Systeme

Reinforced concrete trough
Stahlbeton Massetrog

Elastic single bearings
elastische Einzellager
Slab track projects

Austria – Vienna-St. Pölten
High Speed Connection

- 73 km of slab track
  73 km FF
- Mass-spring-systems
  MFS
- Earthwork
  Freier Strecke
- Bridges
  Auf Brücken
- Tunnels
  im Tunnel
- In construction until 2012
  Bau bis end 2012
Slab track projects
Feste Fahrbahn Projekte

Germany - High Speed Line VDE 8.2 Erfurt – Leipzig / Halle
90km x 2 (180km slab track)
DE – HGS VDE 8,2 Erfurt – Leipzig / Halle 90km x 2 (180km FF)

67 % earthwork 60,5 (121 km)
67 % freier Strecke 60,5 (121 km)
(577 m) (1,012 m)

17% in tunnels 16,5 (31 km)
17% im Tunnel 16,5 (31 km)
(248 m) (2,668 m)

16% on bridges 14,5 (29 km)
16% auf Brücken 14,5 (29 km)
(297 m)
Low maintenance
wartungsarm

Structural-born noise
and vibration control
Körperschallreduktion

High track precision
hohe Gleislagegenauigkeit

High degree of prefabrication
hoher Vorfertigungsgrad

High early strength of SCC
hohe Frühfestigkeit des SCC

Great driving comfort
Hoher Fahrkomfort

Repair plan
Reparaturkonzept

Settlement adjustments
possible
Setzungsregulierung möglich

Small construction
width and height
geringe Bauhöhe u. Baubreite

Fast installation
hohe Verlegeleistung

Large openings possible
große Aussparungen

Even surfaced concrete quality
Sichtbetonqualität

Little reworking
geringe Nacharbeiten

High added value
hohe Wertschöpfung
Bringing a vision to reality!