

Prevention of Track Buckling and Rail Fracture by Non-destructive Testing of the Neutral Temperature in cw-Rails



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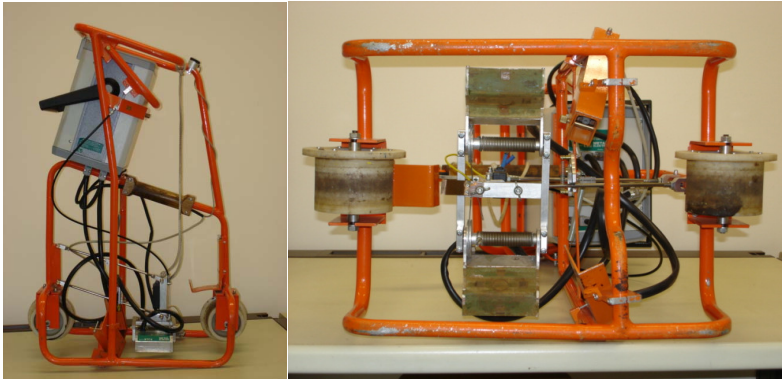
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Content

- **Measuring service – non-destructive SFT determination**
- **RailScan – Method and technique**
- **Inspection examples - Experiences**



Neutral temperature determination



RailScan



Stress memory units

Geometrical measuring techniques and devices



Track geometry



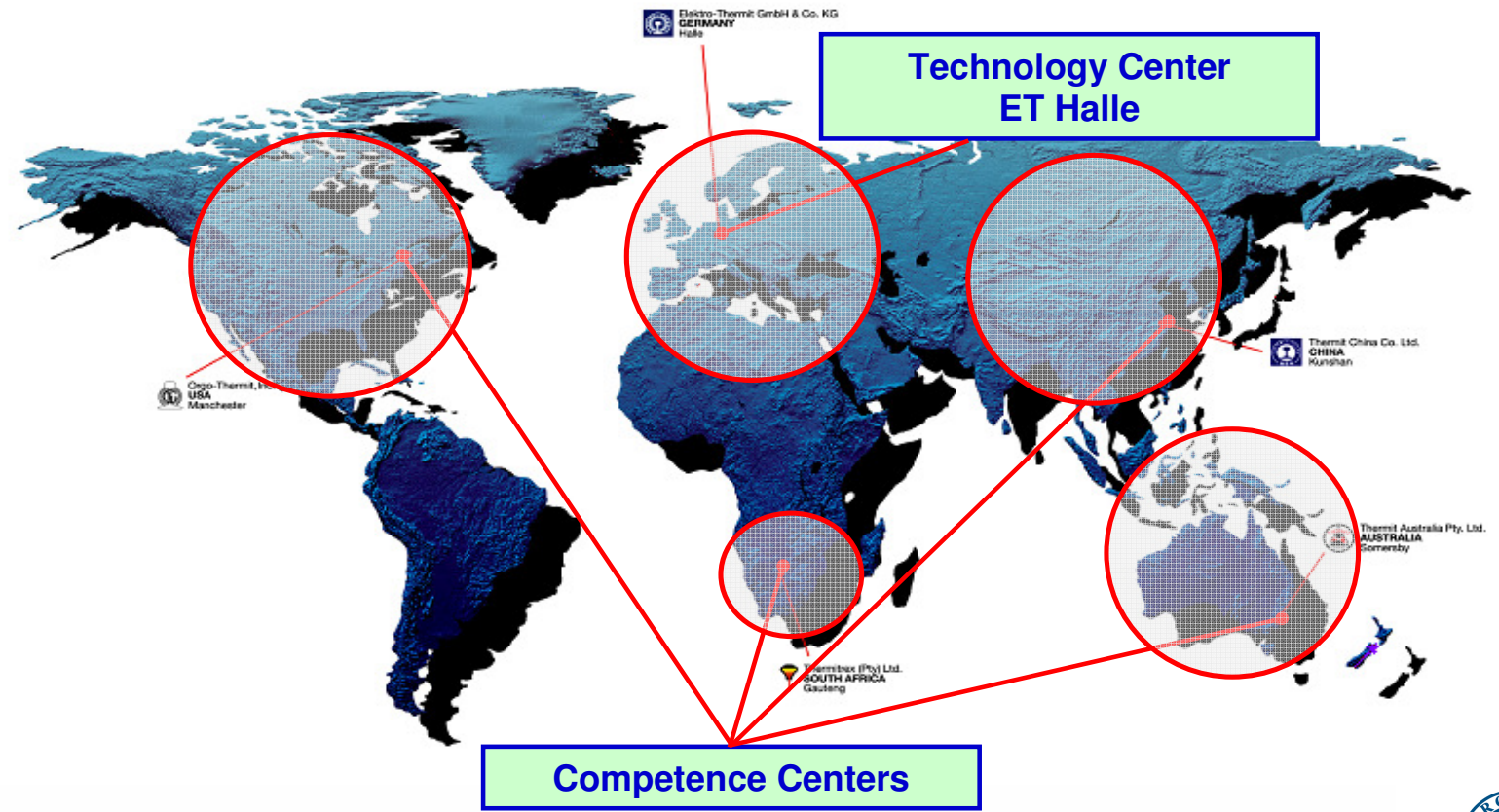
Rail straightness



Rail displacements



Worldwide inspection services



Consequence of mechanical stress on the measuring signal

Rail: Stressless

$$\sigma_1 = 0$$

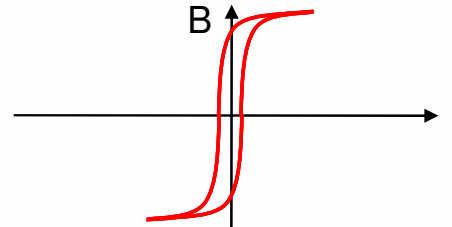
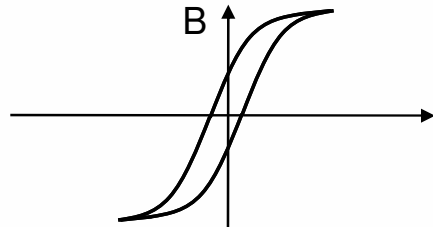
Tensile stress

$$\sigma_2 > 0$$

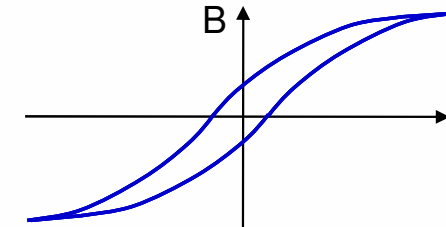
Compression stress

$$\sigma_3 < 0$$

Hysteresis loop:

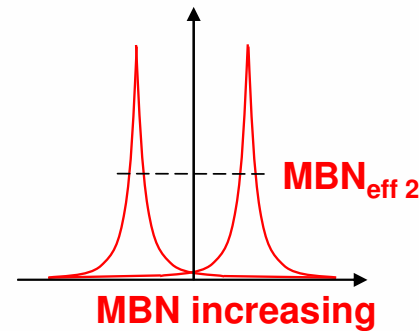
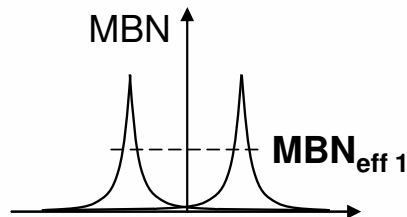


Permeability increased

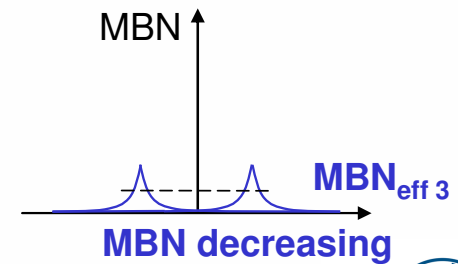


Permeability decreased

MBN:



MBN increasing



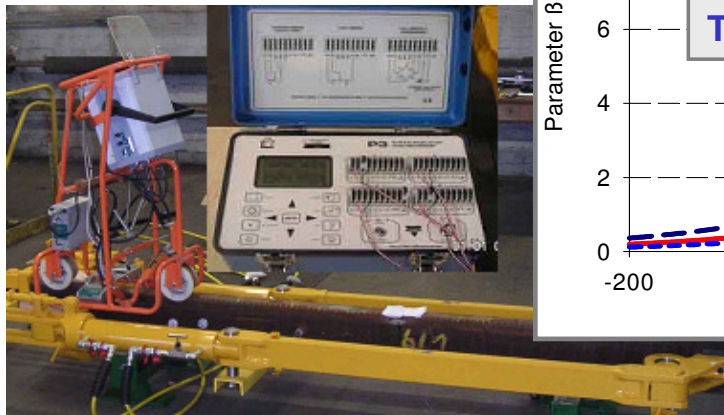
MBN decreasing

Villari- effect and Magnetic Barkhausen Noise

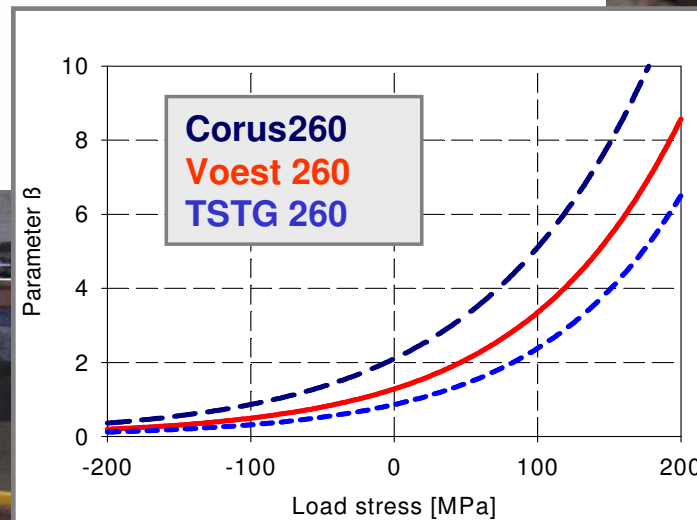


New Developments

- ✓ Calibration in test rig
- ✓ Measurement at only 1 rail temperature
- ✓ Higher accuracy
- ✓ Exclusion of errors



Performance of the calibration

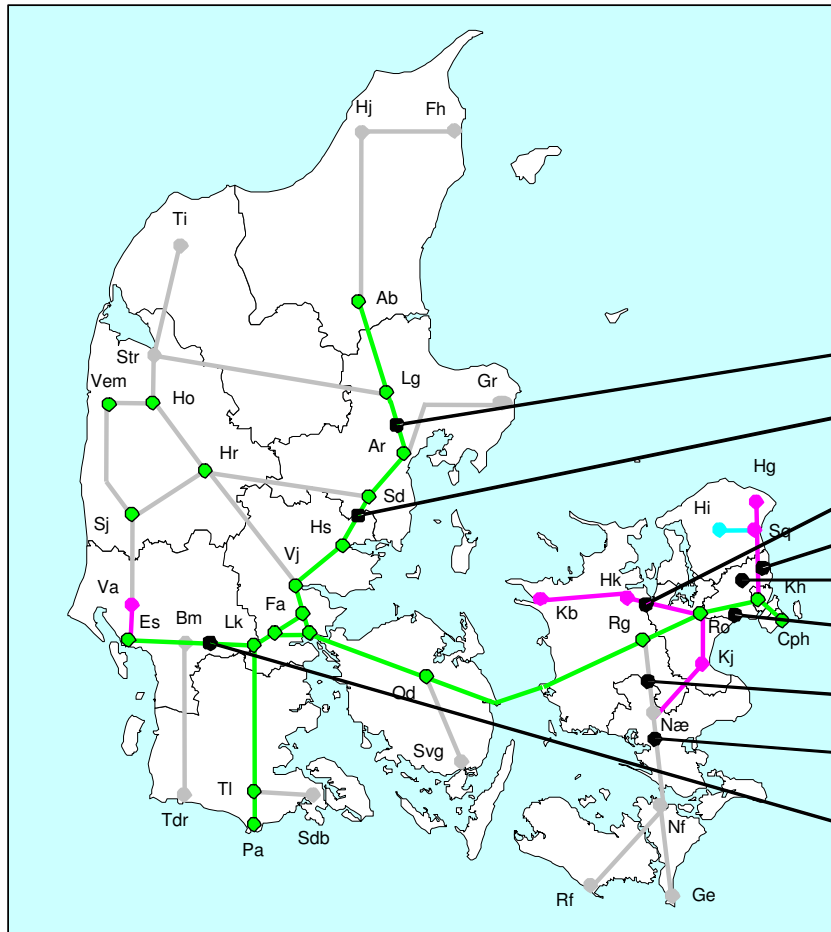


Individual
Calibration curves



Nd- Measurement
at cw-rail



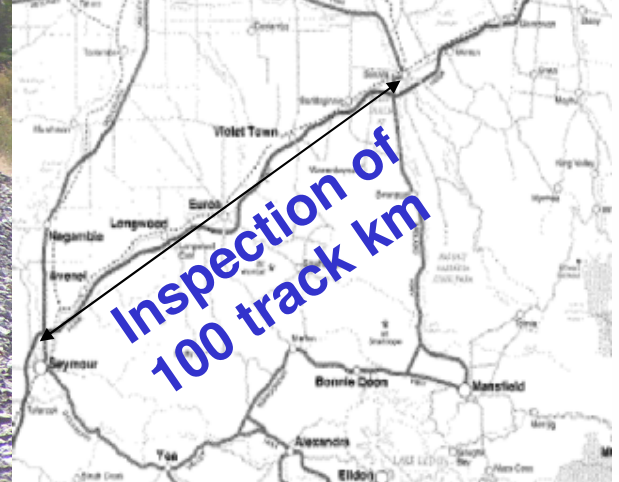


Measuring sites

- 8a TIB-str 24 Ar-Ab, Højre spor
- 7a TIB-str 23 Fa-Ar, Venstre spor
- 4a TIB-str 05 Ro-Kb, Venstre spor
- 2. Hellerup – Gentofte
- 1. Ringbanen Flintholm – Danshøj
- 3. Køgebanen S-tog: Kh - Ishøj
- 5a TIB-str 02 Rg-Rf, Højre spor
- 6a TIB-str 02 Rg-Rf, Venstre spor
- 9. TIB strk. 29 Lunderskov – Esbjerg
2. Hovedspor

RailScan project Danmark



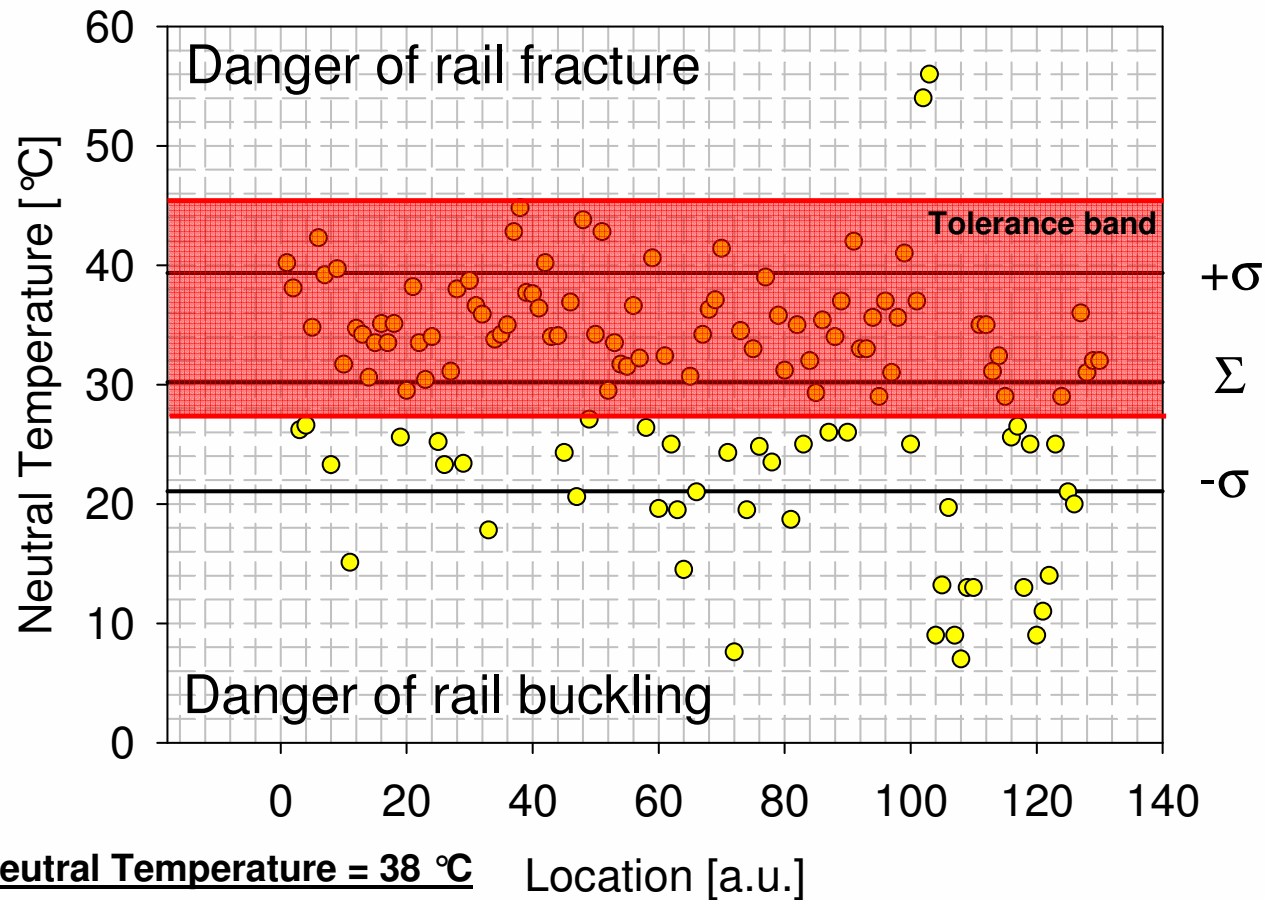


**RailScan SFT inspection measurements -Australia
ARTC Line Melbourne to Albury, March 2006**



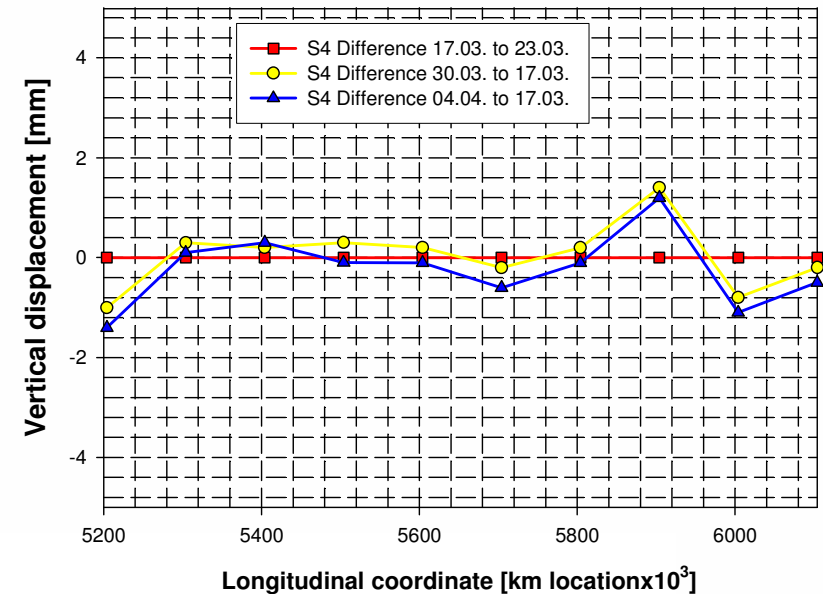
Neutral temperature results ARTC Line Melbourne-Albury

130 Neutral temperature measurements with RailScan



France 2006/2007 - RailScan SFT inspections on 574 km/h speed record line - LGV EST Paris-Straßbourg before line opening



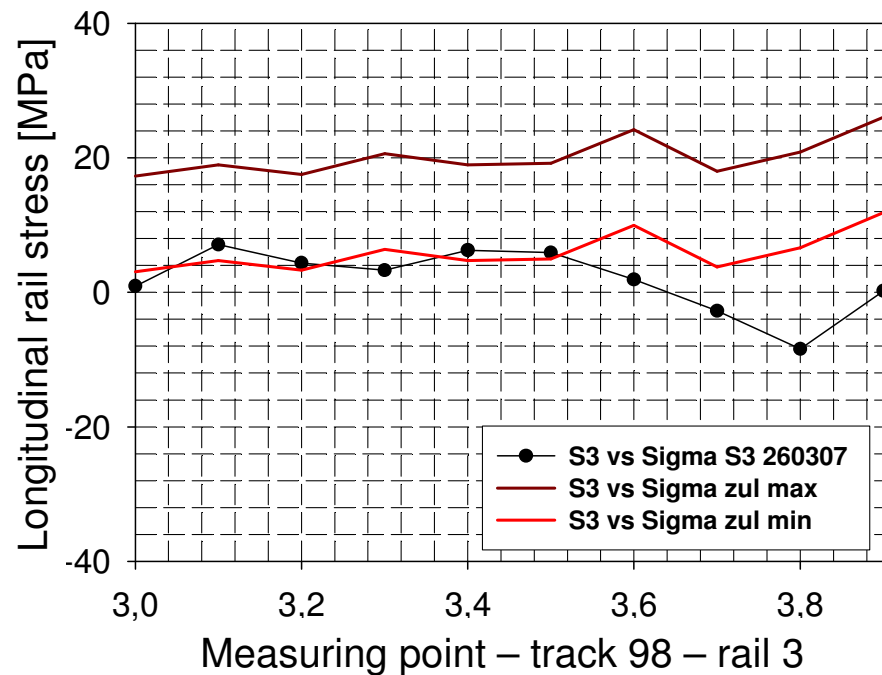


- Control of correct and accurate neutralization
- Observation of longitudinal rail stresses

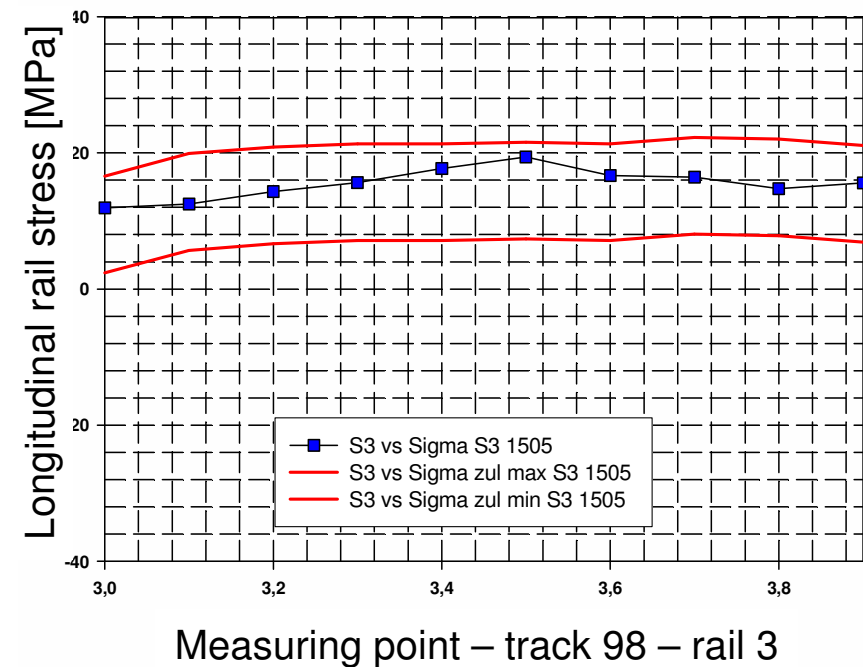
Inspections in Germany - Leipzig



Before restressing

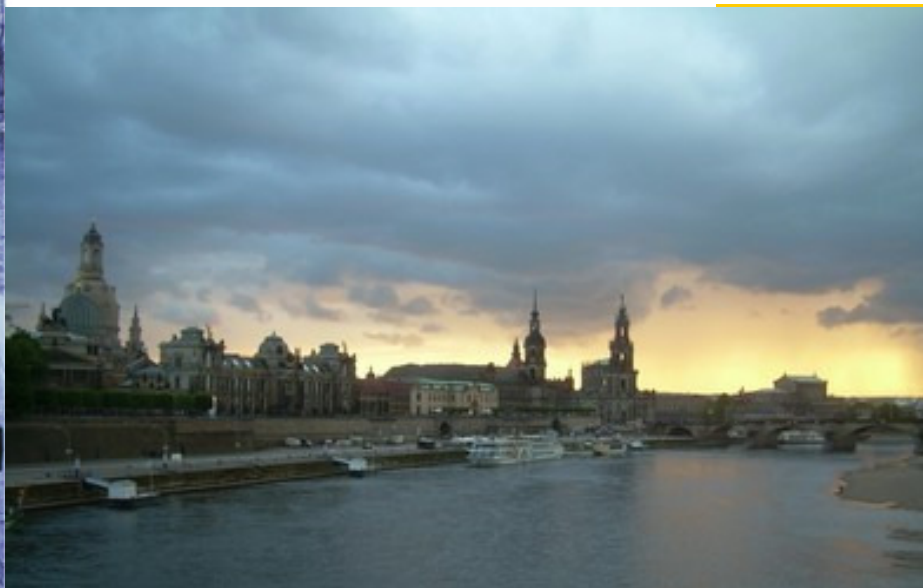


After restressing



Long. stress measurements on bridges Germany - Leipzig





Aim:

- Detection of locations of critical neutral temperatures
- Control of neutralization

Inspections in Germany - Dresden



Conclusion

- RailScan measurements lead to reliable results
- Inspection measurements show a high potential to verify/optimize maintenance strategies

