Track technology & mechanics

Consequences of track modifications – experiences from theory and field measurements, and estimates of savings

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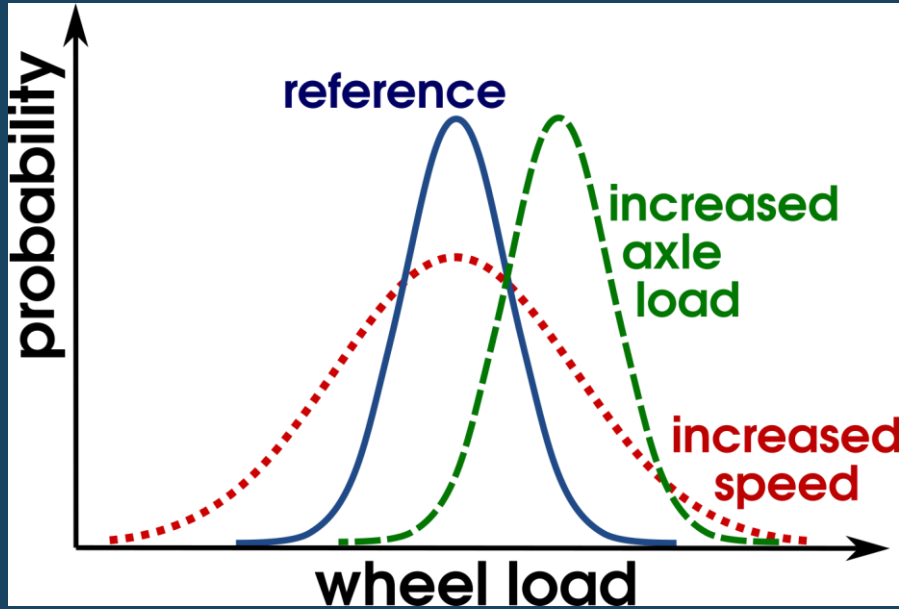
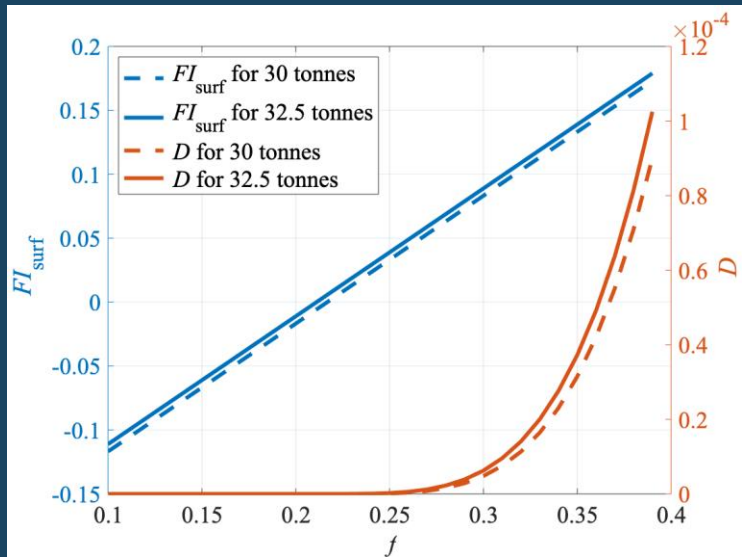
Changing conditions and assessing resulting consequences

- Track modifications
  - Altered track structure
    - renovation
    - redesign
  - Altered load conditions
    - increased load and/or speed
    - new vehicles
- Consequences
  - Cost
  - Deterioration
  - Environment



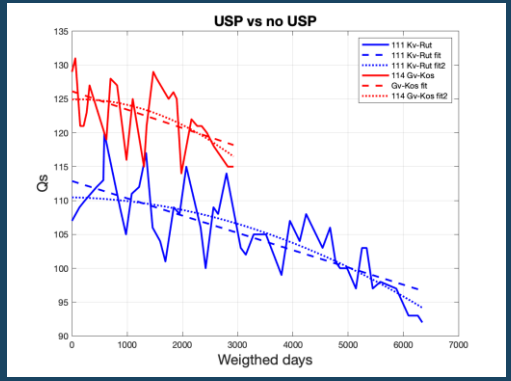
Example: Theoretical assessment of influence

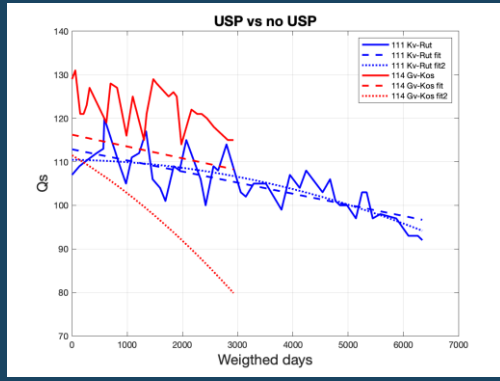
- Rolling contact fatigue at increased load
  - 30+ tonnes axle load
  - main influence from increased $f = F_{lat}/F_{vert}$
- Verification
  - small effects on rail due to one test train
  - on wheels estimated increase in fatigue damage of around 40–45%
  - in tests 32% more wheels with rolling contact fatigue
- Savings
  - balancing investments & costs
  - prerequisite for implementing change

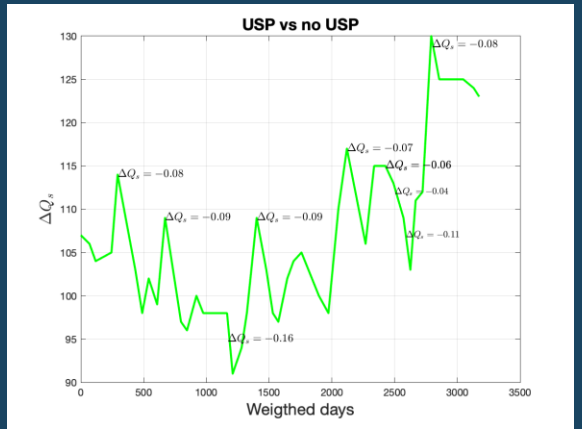


Example: Operational experience of USP

- Influence on track geometry
  - quantified by the track quality number
  - comparison of two sections of the iron ore line
  - accounting for tonnage and age by transformations
  - no significant long- or short-term effects
- Savings
  - about 200’ SEK/km
  - NOTE! Conclusions not general for all lines and sections

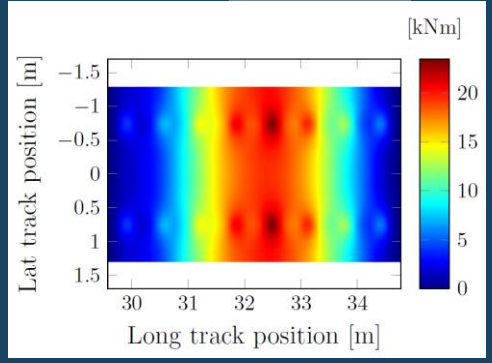


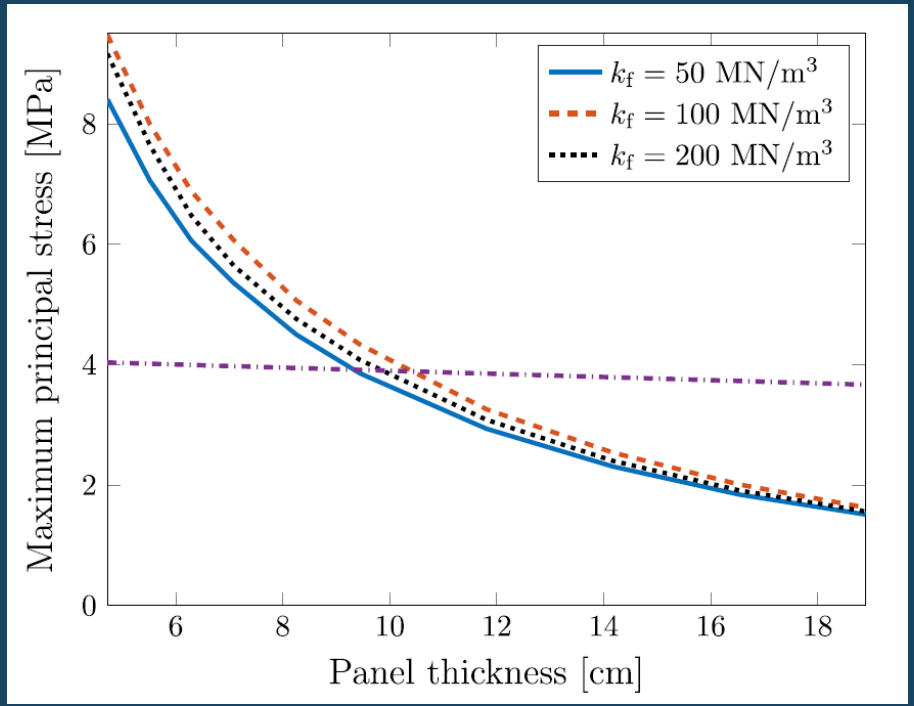




Example:
Optimisation of slab track design

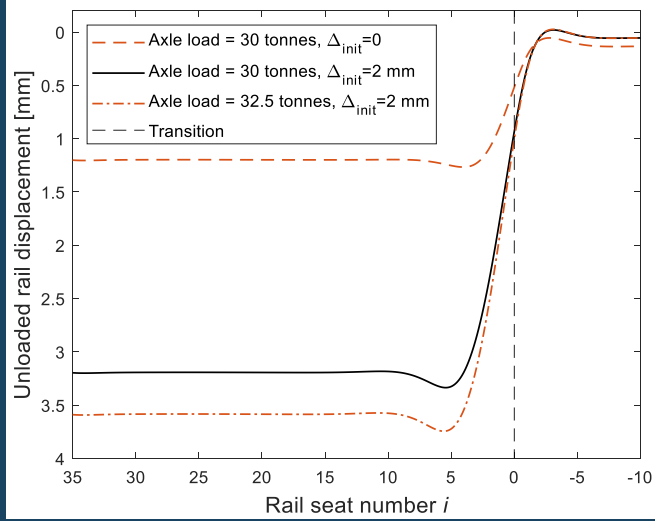
- Current standards may be overly conservative
  - higher LCC
  - environmental impact
- Simulations to address innovative requirements in terms of
  - structural integrity & robustness
  - life cycle cost
  - environmental impact
- Savings
  - reduced material consumption etc
  - possibility for virtual homologation





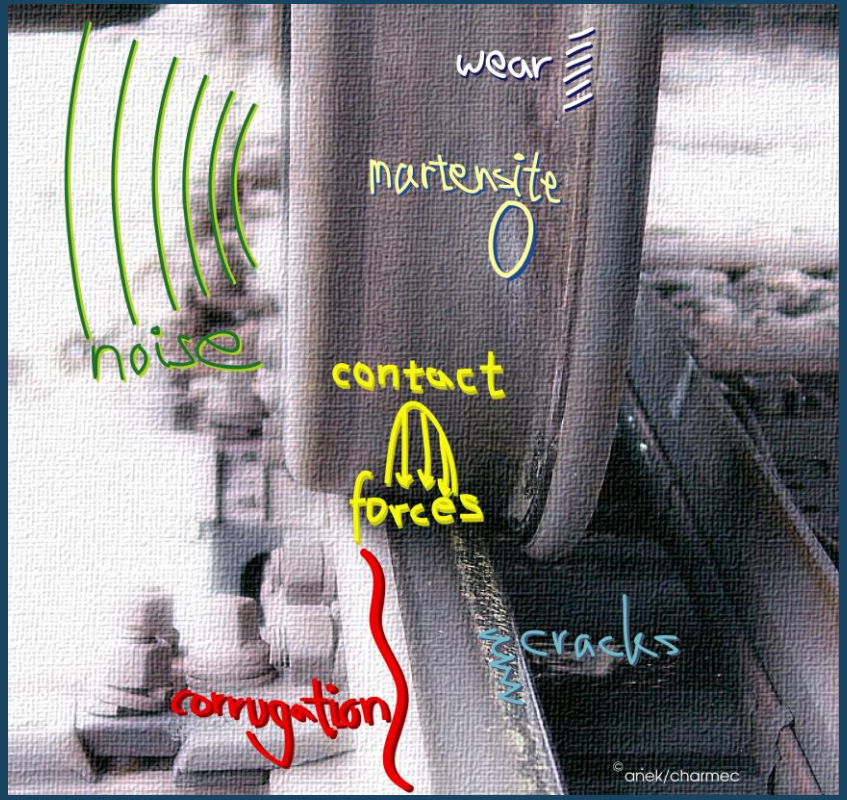
Example:
Design of transition zones

- Transition zone between two track forms
- Long-term monitoring of sleeper settlements
- Calibrated simulations
- Evaluation of influences of
  - track levelling errors
  - under sleeper pads
  - increased axle load or speed
- Savings
  - reduced material consumption etc
  - possibility for virtual homologation



Concluding remarks

- Results based on long-term research to develop knowledge and tools
- Important to have the link from more fundamental research to implementation and back
- Savings just for these three examples exceed the total costs of CHARMEC's research



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