High Speed Technologies
for Nordic Conditions

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What do we want?

Gröna Tåget will make it more attractive to travel by train through:

- Shorter travel times
- Lower costs, enabling cheaper fares
- An attractive, functional passenger environment with a high level of comfort for all
- Higher capacity
- High environmental performance
- Reliable in nordic winter conditions
More value for infrastructure owner –
Track-friendly self-steering bogie

- Track forces typically 60 % of limits
- Certified for 250 km/h and 1.2 m/s² (180 mm cant deficiency)
- Has been favourably tested at 303 km/h on a track just meeting requirements for 200 km/h
- Based on 25 years of experience with track-friendly self-steering bogie

- Type tested
- Reliability tested
- Revenue service ongoing for now 500 000 km
More value for travellers: Active Suspension

1) Keep carbody in centred position in curves
   → Wider carbody possible
   → Better cross wind stability
   ⇒ Better ride comfort by avoiding bump stop contact
   ⇒ Possible to run at high speeds in curves

2) Better ride comfort
   ⇒ Same ride comfort at 250 km/h as without active lateral suspension at 200 km/h
More value for environment and performance: Permanent Magnet Motor Drive

- Higher efficiency and power-to-mass-ratio
- Reduced energy consumption
- Simplified cooling

✔ Type tested
✔ Reliability tested
✔ Revenue service done for 505 000 km
More value for reliability: Design for winter conditions

- Systematic approach from start of design
- Low temperature
- Humidity and Condensation
- Snow, different conditions
- Melting and freezing
- Ballast projection (pick-up)
- De-icing needed regularly
More value for environment and performance: Aerodynamic optimisation

- Reduction of drag saves energy and traction power
- Drag and Cross-Wind Optimisation
More value for environment and performance: Aerodynamic optimisation

- Parameterized model defines the variables and boundary conditions
- Computer optimisation by using the parameterized model
- Goal function is reduce drag while keeping the cross wind safety
More value for environment and performance: Aerodynamic optimization

- Thousands of “virtual wind tunnel tests” in the computer used to find the very best shape
- Main result shows 20 – 30 % lower drag and 10 – 15 % lower energy consumption
- Installed power can be reduced with lower cost
- Lower energy cost for operators
Why did it work?

Multiple partners and multi interests in a R&D project!

- Create a common understanding and objectives
- Create a team relation
- Make win-win setup (understand all the agendas)
- Share information and experience
- Develop a communication plan and explore that
- Involve Management in right levels and in right times
- Create flexibility in leadership and navigate between structure and creativity
- and handle challenges …
Unique relation with industry - university

- Employ PhD educated in industry
- Strong involvement in R&D Programmes
- Personal relations

- Senior researchers, PhD and Master thesis students for R&D programmes
Unique project set-up creates new values

Thank you for your attention!