PO.ID 259

Observer structures in advanced power electronics for load analysis and power control

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The Challenge

- Damage in Drive Train (Gear Box)
- Drive Train Oscillations
- Expensive CMS Equipment
- Life Time Consumption

The Method

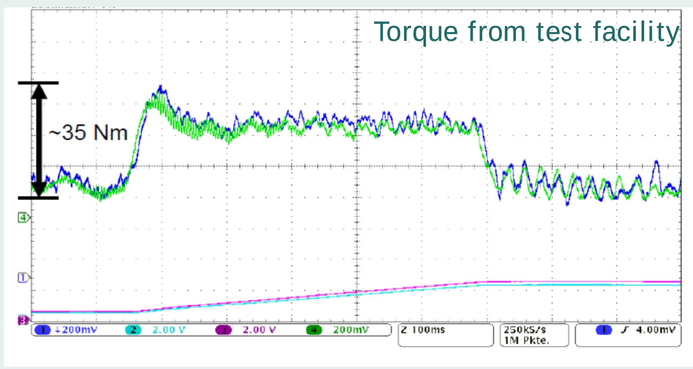
- Sensorless Observer
- Test facility
- Aeroelastic Simulation

The Results

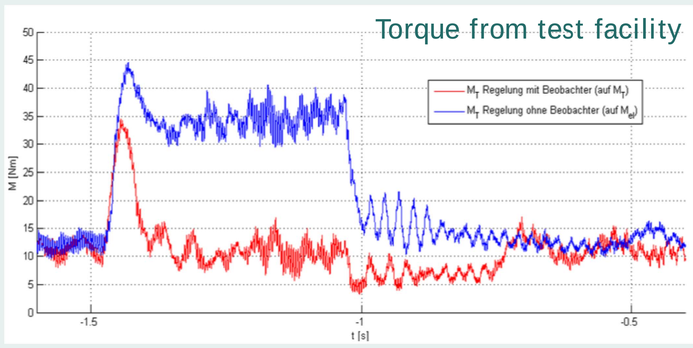
- Measured and “observed” torsional load coincide on test stand and simulation
- Smooth torque transfer through active damping
- Prediction of damage load

The Benefit

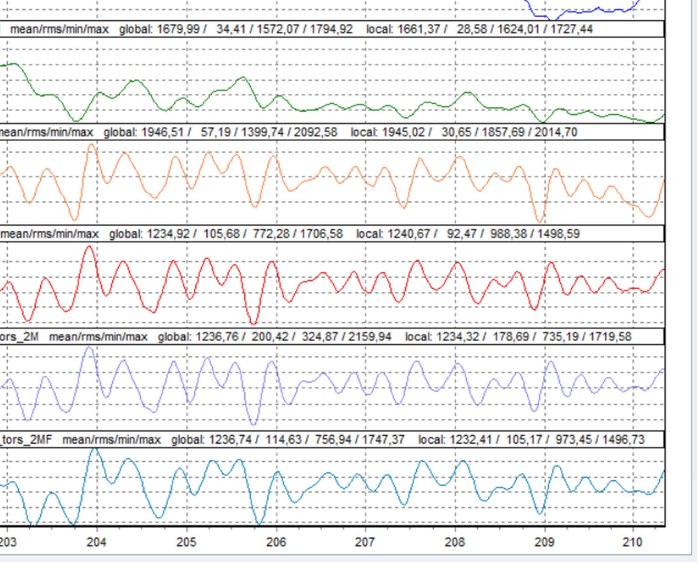
- Sensorless CMS Software
- Customer Tailored Modeling
- Damage prediction
- Active Drive Train Damping



The observer estimate (blue) follows the measured torque (green) from the torque sensing flange. Even the step of 35 Nm is reproduced.



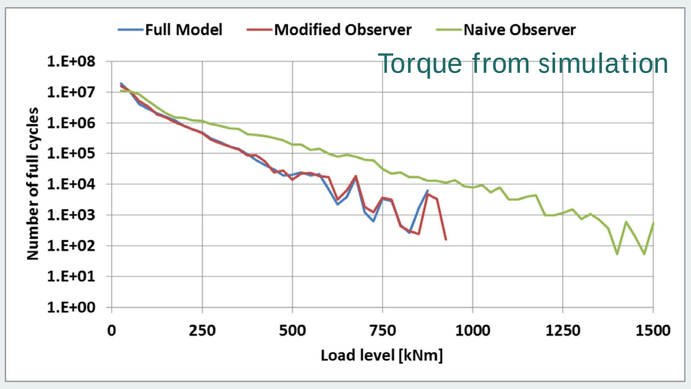
Modified control. Blue line represents load from normal control, red line utilized the torque signal from observer as a torque demand. The observer driven torque demand leads to reduced load on drive train.



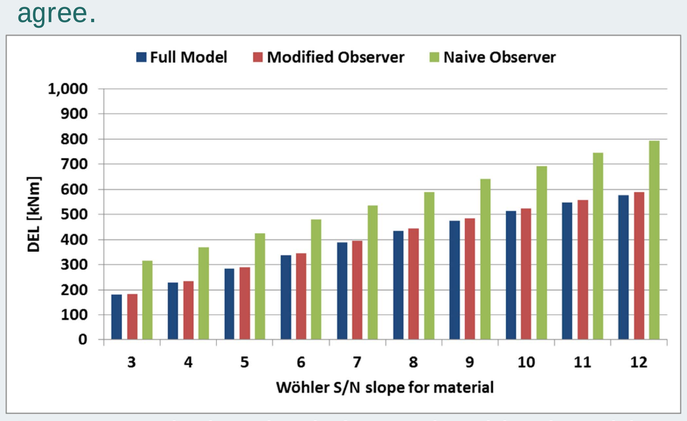
Load duration distribution for one year and average wind speed of 8 m/s. Full model and Modified Observer coincide.

Detail of simulated time series as a function of time in s.

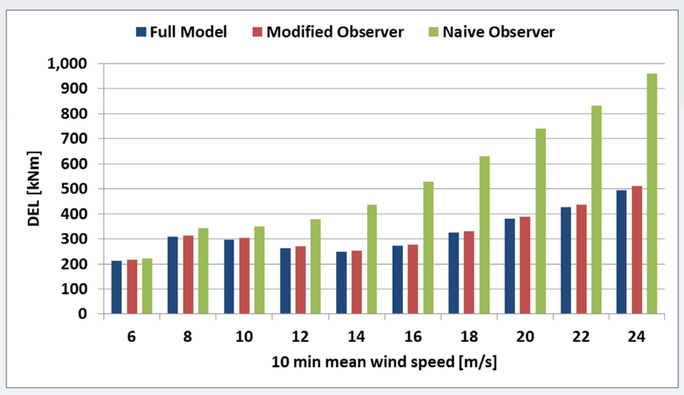
Test facility at the IALB U Bremen



RFC load spectrum of torsional load for full model (blue), naïve Observer (green), and modified observer (red). Full model and Modified Observer agree.



Damage equivalent loads for torsional load on drive train for various model, extrapolation to one year.



Accumulated damage equivalent load (DEL) for S/N slope m=5 during 10 min for wind bins of 2 m/s width. No Weibull distribution engaged.

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