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Development and Validation of Dynamic Models on Multiple Scales for Research on Rolling Bearings

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Dynamic Simulation

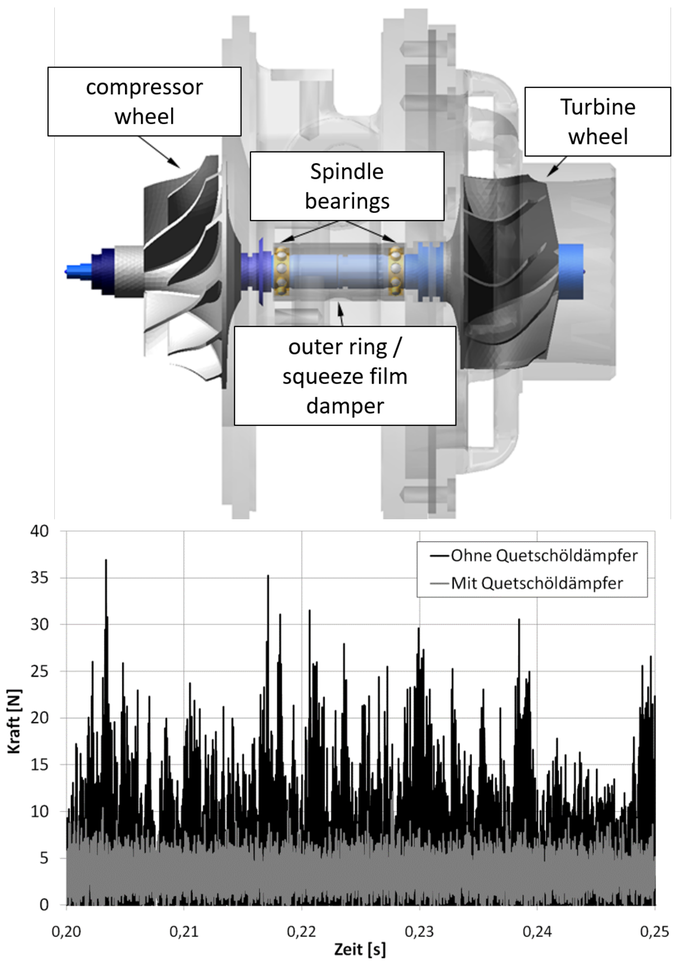

Fig. 5: Detailed MBS models of spindel bearings in a system model of a turbo charger used to optimize vibration behaviour.

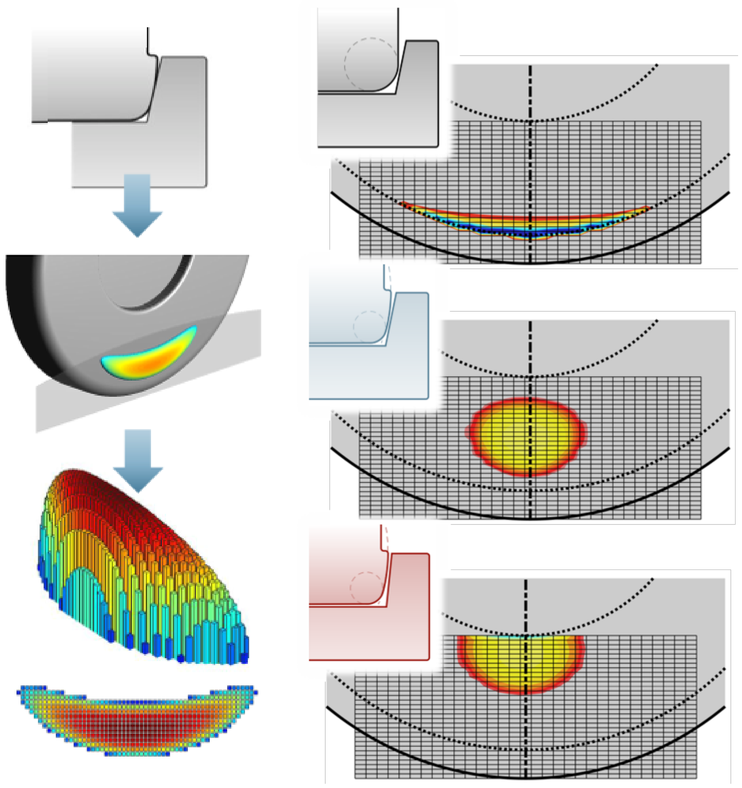

Fig. 6: Detailed MBS models of sindel bearings in a system model of a turbo charger used to optimize vibration behaviour [4]

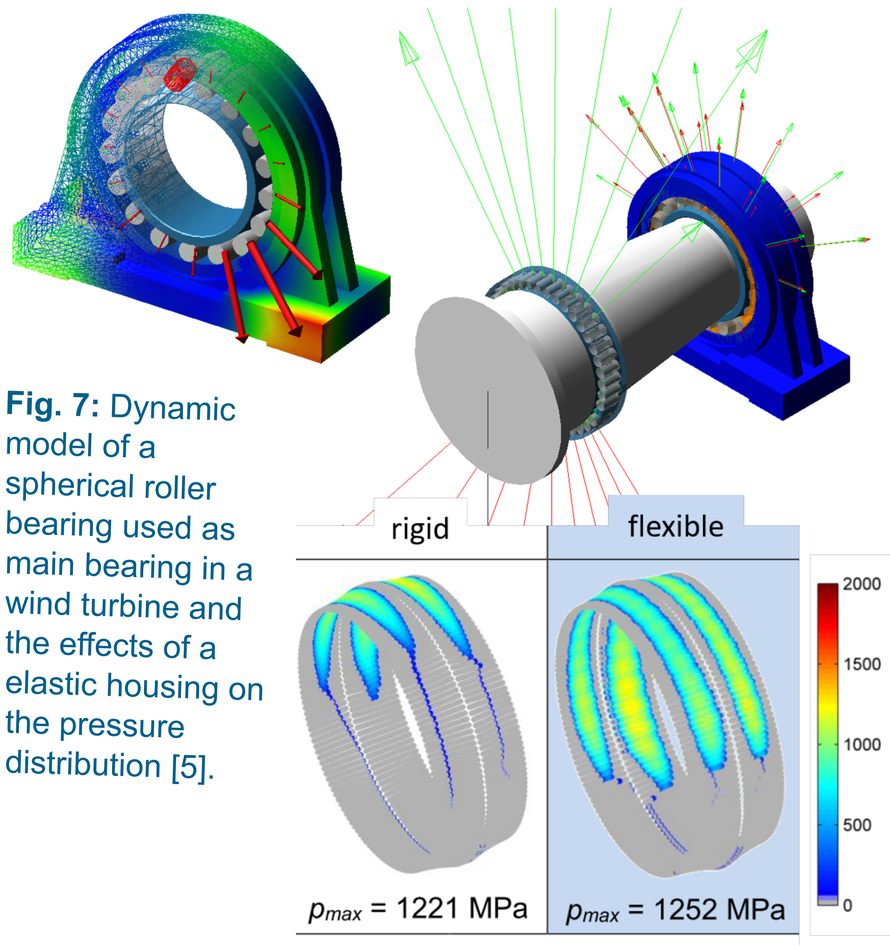

Fig. 7: Dynamic model of a spherical roller bearing used as main bearing in a wind turbine and the effects of a elastic housing on the pressure distribution [5].

LaMBDA is a **validated** and established simulation tool. It has been used in numerous FVA research projects and validated with measurements. [1-3]

- **High quality** locally resolved **contact models** for pressure and friction calculation
- Allows consideration of **elastic bodies** (rings, cages)
- self-developed calculation routines for contact point finding and calculation of nomal and friction force
- Uses commercial MBS Systems (Simpack, ADAMS)
- Makes it easy to integrate complex bearing models into an overall system

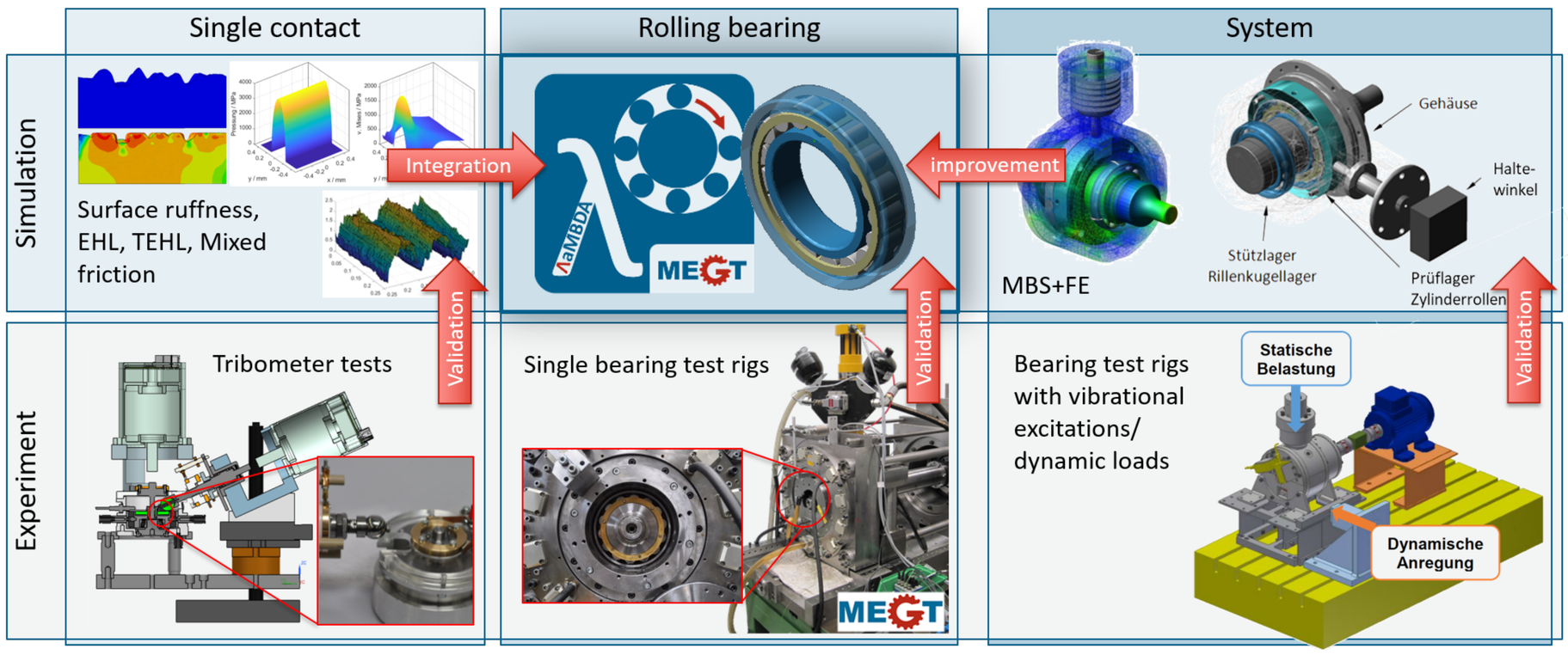

Fig. 8: Model development strategy for the dynamics simulation of rolling bearings including highly accurate contact models up to the integrated system simulation of entire gearboxes and test rigs

Experimental Testing

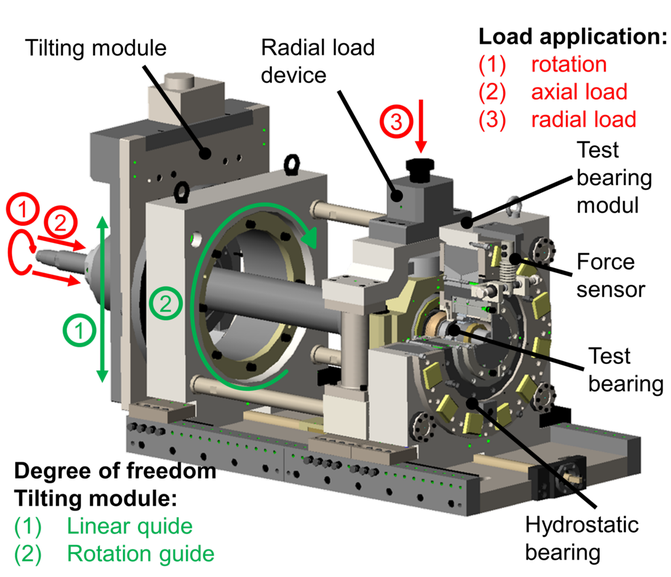

Fig. 9: Single bearing test rig for measurement of friction torque and kinematics of roller and cage [6].

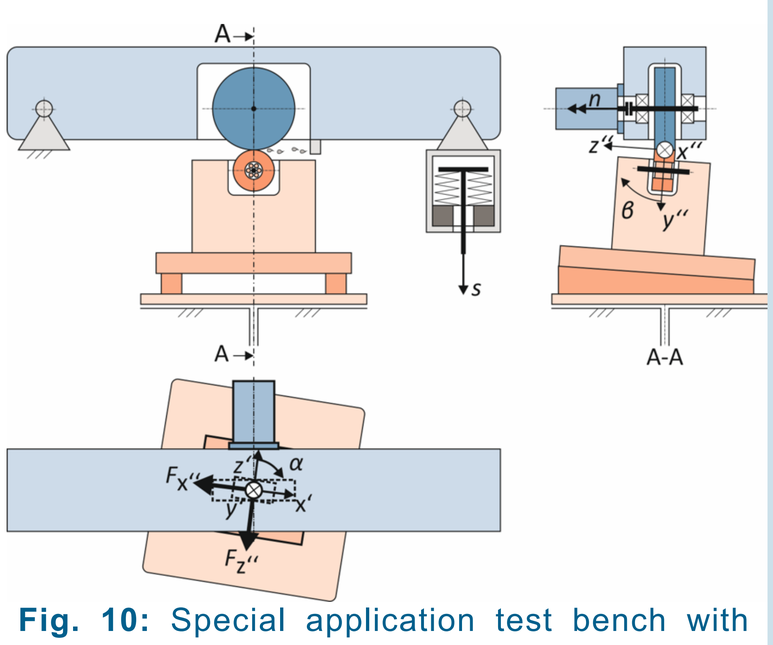

Fig. 10: Special application test bench with automated load applying, speed control and skewing adjustment for outer ring driven bearings.

Other test rigs used are standard test rig for fatigue life investigations on roller bearings under variation of speed, load, lubricaiton and temperature. Specialized test rigs for investigations on hydraulic losses, the influence of vibration on cage dynamic or friction torque measurement under high loads up to 80kN radial and 50kN axial load complete the test field.

References

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[4] **Sauer, B.; Kiekbusch, T.**: Dynamic Simulation of the Interaction between Raceway and Rib Contact of Cylindrical Roller Bearings. STLE Annual Meeting, Atlanta, USA, 21.-25. Mai 2017

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[6] **Aul, V.; Kiekbusch, T.; Marquart, M.; Sauer, B.**: Experimentelle und simulative Ermittlung von Reibmomenten in Wälzlagern. 51. Tribologie-Fachtagung GfT 27.-29.09.2010

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