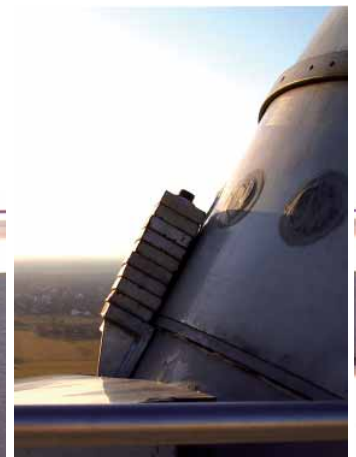




APPLICATION

Field balancing of wind turbines



▲ Balancing weights mounted on the rotor blade

Permissible evaluation speed in mm/s – as per VDI 3834. ▼



Reducing vibrations

Improving balance conditions

Increasing system availability

Fig. 1 - Front: Field balancing with VIBXPERT®. The accelerometer and the speed sensor – attached to a magnetic holder – are visible on the main bearing.

Field balancing of rotor blades

After successfully testing its balancing measuring equipment on a wind turbine, the PRÜFTECHNIK Machinery Service is now expanding its service spectrum to include the field balancing of rotor blades. The service is performed using a mobile VIBXPERT® analyzer with a balancing program that has been adapted to the low rotating speeds of wind turbines. The sensor system consists of a speed sensor and a highly sensitive accelerometer that produces measurement results at speeds as low as 0.1 Hz.

Lightning damage on rotor blade

The field test was performed on a wind turbine damaged by lightning. A rotor blade was cracked along a length of 5 meters and had to be repaired as a replacement blade was not available. The resulting imbalance needed to be corrected by field balancing. After only four balancing runs, the wind turbine was balanced well enough that the tower's natural frequency was not excited when running at the resonance rpm. Each measurement took 5 to 10 minutes.

Surprisingly precise calculation of balancing weights

"I myself was surprised at the precision with which VIBXPERT® with its new software calculated the necessary balancing weights," reported Dr. Becker, who coordinated adaptation of the hardware and software to the balancing conditions on wind turbines and tested it in a field trial. PRÜFTECHNIK initiated this development because several wind turbines exhibited strong low frequency vibrations during telemonitoring. While aerodynamic imbalance can be reduced by correcting the blade angle, mass imbalance can now be reduced by means of field balancing using PRÜFTECHNIK measurement equipment.

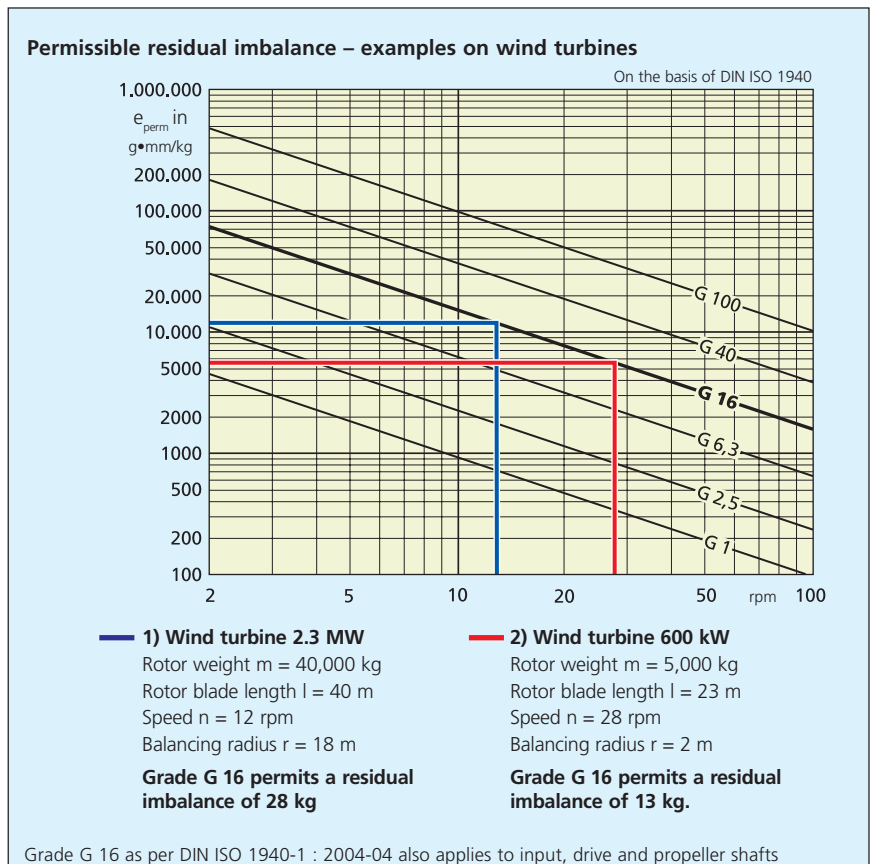


Fig. 2 - Permissible specific residual imbalance as a function of the balancing grade G and the operating speed n.

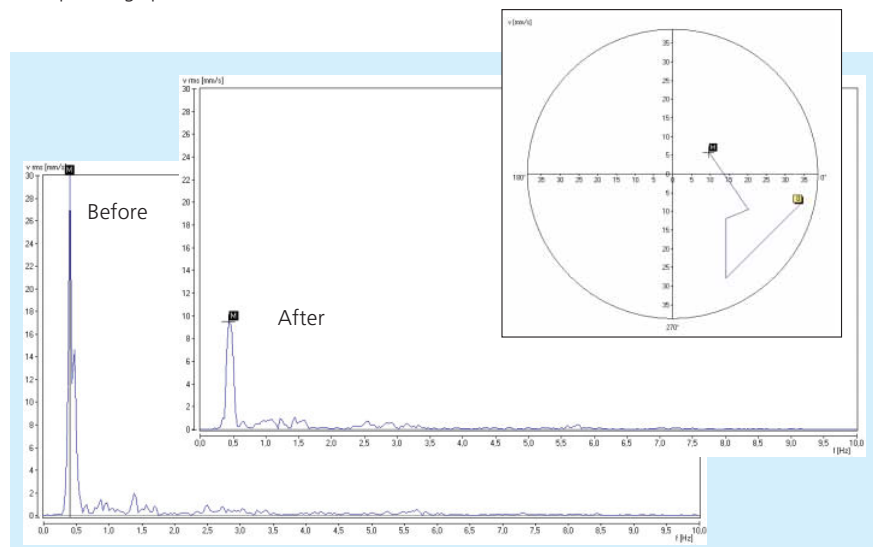


Fig. 3 - Frequency spectra before/after balancing, and balancing diagram.

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