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WTG Rotor Balancing
Extending Lifetime of wind turbines

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What is rotor imbalance ?

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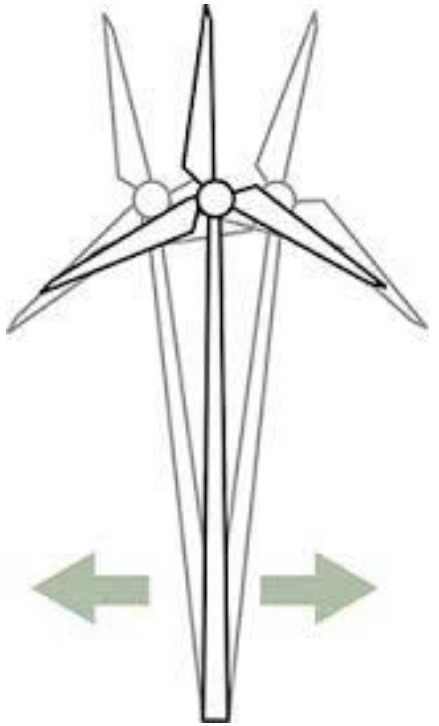
The rotor imbalance is the result of :

- Mass Imbalance, when the center of gravity of the rotor is not aligned with the center of rotation, and
- Aerodynamic Imbalance, when the blades angle of attack are not correcty aligned, creating an uneven distribution of the wind load on the blades.



This imbalance causes the entire turbine to vibrate and decreases the lifetime of its main components.

Effects of the rotor imbalance

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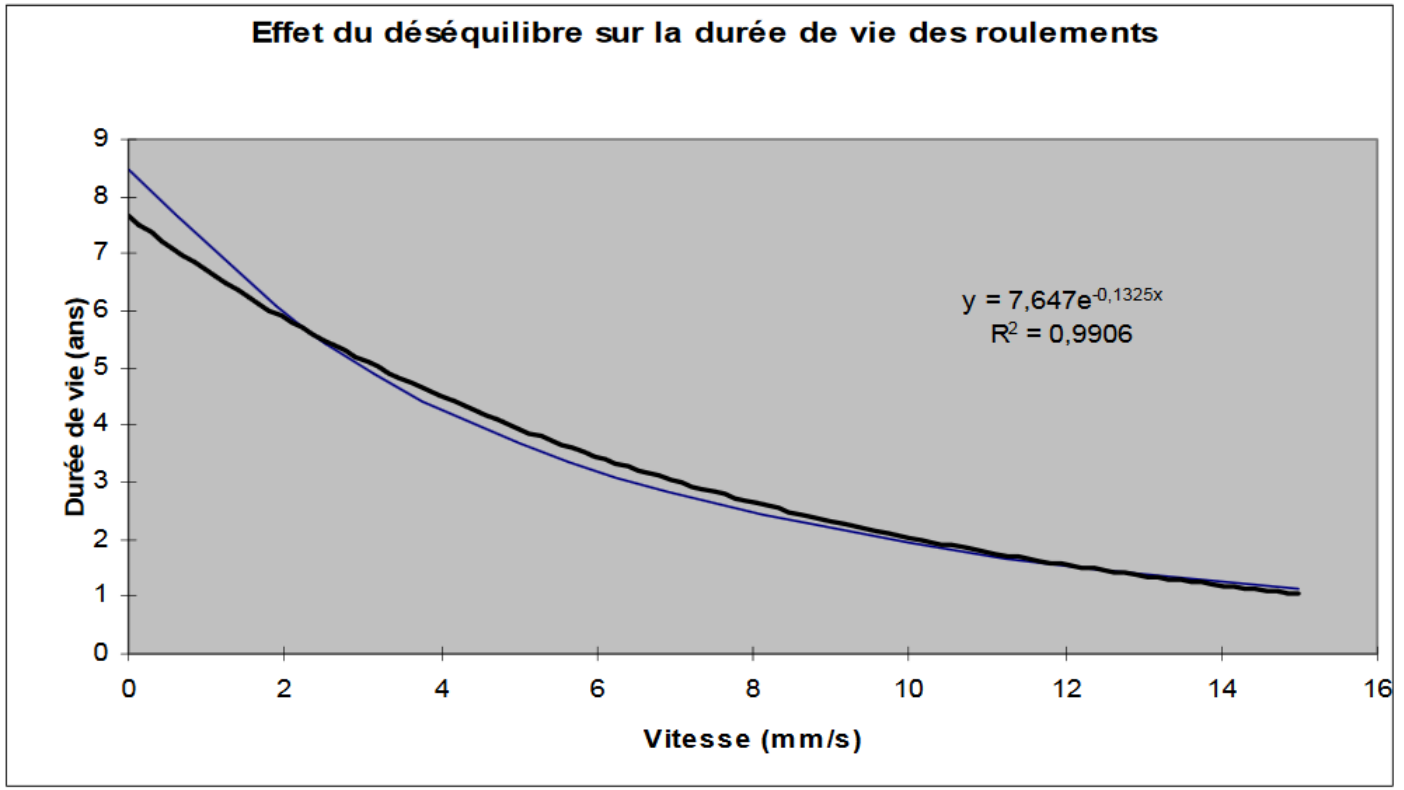
- Vibration
- Noise
- Decrease of bearings lifetime
- Reduced machine lifetime
- Increased maintenances costs



Curve of the bearing lifetime in years depending on the vibration speed due to imbalance in mm/s. From Thesis….

Blade angle’s adjustment

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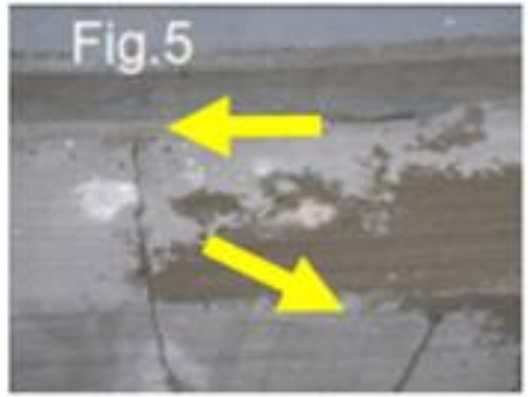
Blade angle’s adjustement objective: eliminate rotor aerodynamic imbalance

- ✓ Yield enhancement
- ✓ Bearing and drive train fatigue reduction
- ✓ Low frequency vibrations reduction
- ✓ Respect design certification for number of load cycles of tower
- ✓ RespectType-certification tolerances



Low frequency vibration-> Monitoring the reduction of the dynamics imbalance

Aerodynamic imbalance measurement

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Photometry measurement of blade angles.

- Use of a high definition camera
- Measurement of the relative and absolute angle deviation
- Uncertainty : +/- 0,1°

Low frequency vibration

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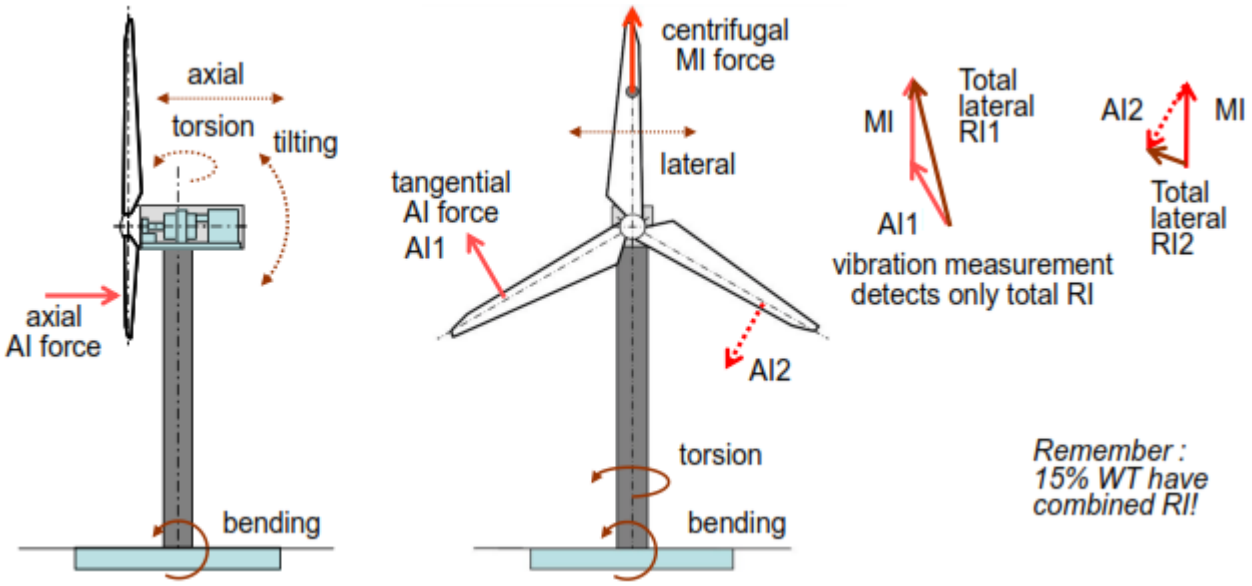
The imbalance causes low frequency oscillations in the nacelle.

The setting of the blade angle suppresses the Aerodynamic Imbalance and reveals the Mass Imbalance of the rotor.

It is measured through low frequency accelerometers.



Benefits of vibration analysis

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Maintenance saving : Give a view about the actual state of the machine in real-time and prediction of the preventive maintenance.

Less accident : Prediction of anomalous comportments allow maintenance before failure occurs.

Cost saving : Reduce the amount of operations needed for a more optimized maintenance cost.

Thanks for your attention

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