

# ROME G M20 G

## ROME G M 20 G

Laser based measurement of the rotor geometry



### Method of measurement

Dynamic Geometry Measurement (DGM) is a method for the verification of the aerodynamic condition and the aero-elastic behavior of a wind turbine rotor and the turbine itself.

DGM is a laser-based simultaneous distance measuring method at two profile-sections of the blades. Measurements are taken during turbine operation in order to be able to assess the asymmetries of the rotor and their negative impact on system loads by evaluating the axial movement of the tower.

For this purpose one laser sensor scans the blades and the tower movement at the level of maximum profile chord and the other sensor scans at the tip area.

With DGM the rotor star is measured and assessed observing the overall behavior of the station under real operating conditions.

# Measurement parameters



## Angular differences at root section

The deviation of blades from the mean value are shown with an accuracy of  $\pm 0.2^\circ$

## Angular differences at tip section

The deviation of blades from the mean value are shown with an accuracy of  $\pm 0.5^\circ$

## Twist angle

The twist of blade profiles at two reference radii are shown with an accuracy of  $\pm 0.7^\circ$

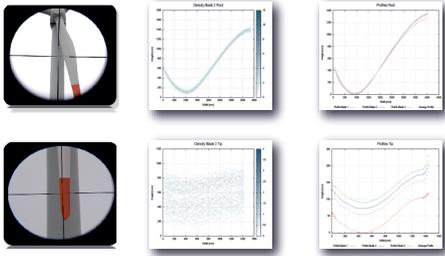
## Tower clearance

The synchronous run of blade tips on the circular path is measured with an accuracy of  $\pm 10\text{mm}$

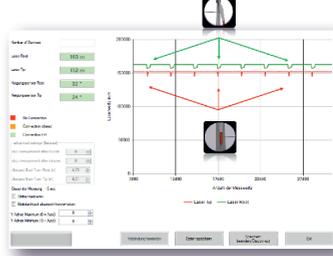
## Oscillation amplitude nacelle

Axial tower movements are measured at nacelle level with an accuracy of  $\pm 10\text{mm}$

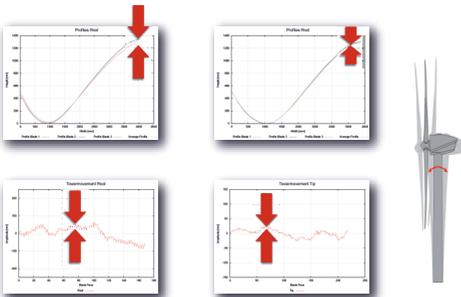
## Data processing



## Data recording

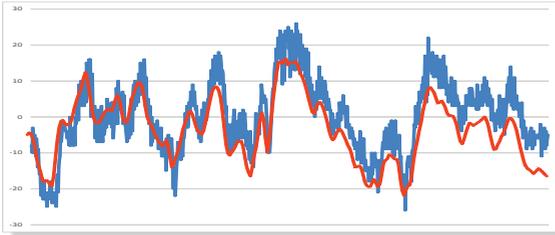


## Analysis of data on site



- The results are immediately available on site after data recording and analysis
- Measuring process is fast thus allowing to measure whole wind farms within a short time

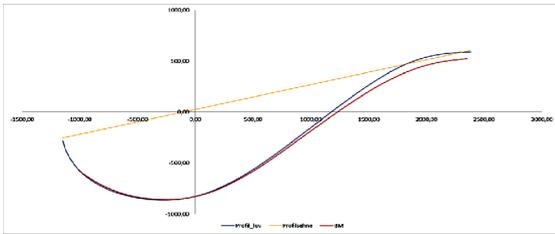
## Tower movement vs. rotational speed



In this graph you see the axial tower movement and rotational speed. The oscillation behaviour of the tower is an indicator of its stiffness and clamping.

**With annual measurements you can also detect changes in the behaviour of the tower and the foundation.**

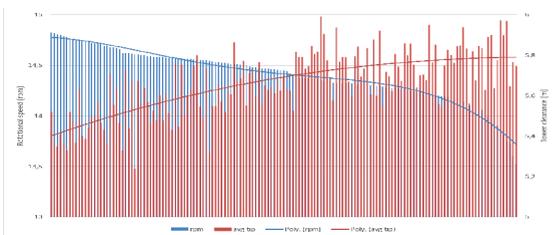
## Absolute blade angle



With information about the blade geometry you can also determine the absolute blade angles.

**Correctly adjusted blades are essential for an optimal yield.**

## Tower clearance vs. speed



In the graph above the tower clearance vs. speed is sorted by speed. In other words, the deflection of the rotor blades is shown as a function of the load.

**With annual measurements you can detect changes in the behaviour of the rotor blades.**

## Technologies under development

- Laser distance measurement from the nacelle
- Load classification
- Yaw compensation

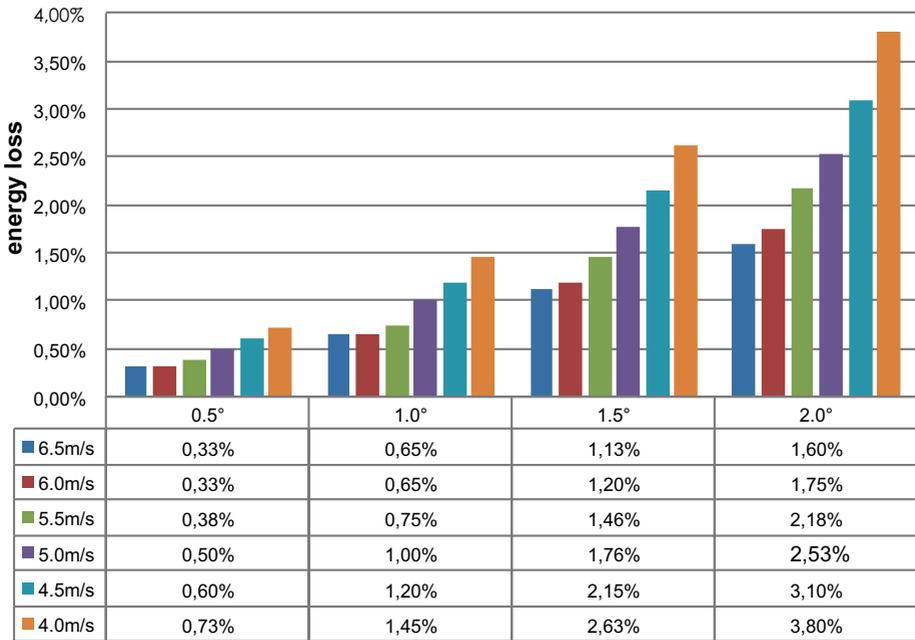
The measuring process with ROMEQ is carried out on turbine in operation:

- No yield losses during measurement
- Measurement takes place under real conditions
- Fast measuring process - whole wind farms within a short time
- Results are immediately available

A well balanced rotor results in:

- Better performance
- Higher availability
- Longer service-life of all components

**calculated energy loss vs. pitch angle differences vs. avg. windspeed**



Please contact us for an offer for the measurement and optimization of your plants or if you have any questions on this subject.

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