Can you imagine what a foundation has to withstand?

SHM.Foundation® – monitoring system for towers and foundations of offshore wind turbines (WT)
Why does monitoring foundations make sense?

In the case of offshore wind farms, the authorities regularly require that selected foundation structures be monitored by a monitoring system. In Germany, the Federal Maritime and Hydrographic Agency (BSH) explicitly prescribes condition monitoring of foundation structures. In addition, the BSH also requires regular periodic inspections to be carried out. Diving operations at foundation structures and foundations are risky and costly. Only the reduction of these inspections to an absolutely necessary level can lead to the optimization of operating costs.

Professional long-term monitoring – reduce your costs by optimizing recurring inspections and the life cycle analysis

Wölfel has decades of experience in the fields of structure and data analysis. Working on several dozen projects annually, we have acquired great expertise in them. Not the recording of sensor data alone is useful for operators, but its analysis is what enables you to precisely record structural risks at the foundation and to react appropriately in any given situation. The safe and economic operation of a wind farm is the focus of both manufacturers and operators. Your wind farm should feed into the grid as continuously and efficiently as possible, incur the lowest possible costs for maintenance and operation and meet the requirements of the authorities.
Our monitoring helps you achieve these goals. Our focus is on the detailed analysis of maximum and fatigue loads, the wind and wave loads as well as the structural condition and the resulting remaining service life.

With our expertise, we support you in drafting and adapting inspection plans in order to create added value through permanent structural monitoring.

**Web portal MIC.Foundation**

Via our web portal MIC.Foundation, you have live access to events at any time and will receive automatic alarms if defined threshold values are exceeded.
SHM.Foundation – An individually configurable system for monitoring offshore wind turbines (WTG)

The monitoring system SHM.Foundation allows you

- to permanently monitor structural behavior and stresses to create a “service life file” for each individual turbine
- to prepare the necessary documentation for the authorities for the verification of the load-bearing capacity
- to optimize the performance of your wind park with tailored vibration monitoring and life cycle extending operating practices
- to adapt concepts for recurring inspections and to minimize expenses and risks
- to evaluate new operating practices or features – such as PowerBoost or High-Wind-Ride-Trough – with regard to stress and service life consumption
- to monitor irregularities when erecting load-bearing structures

CMS in wind farm – Online data pre-processing (fully automated)

Uninterruptible Raw-Data Acquisition

- Storage of about 5-10% of all raw data for post-processing; chosen at the end of each day

Online-Data-Preprocessing

- Storage of all preprocessed data for post-processing
- Alerting in case of limit values exceeded

Offline post-processing and annual reporting (monitoring expert)

Processing of key parameters

- Comparison to design assumptions
- Check for structural changes
- Annual report

Wind farm operator

Operators Scada System

- In case of issues: decision [operator; monitoring expert] about further proceeding

Plausibility Check (operator and monitoring expert)

- Fault repair / sensor replacement / …

Assessment of monitoring results; comparison with results of the periodic inspections

- Decision about further proceeding (farm owner; operator)

Inspection on site

- Assessment by structural designer/expert

Decision about further proceeding (farm owner; operator)

Operation phase: Annual status meeting

BSH
Configuration of SHM.Foundation

The configuration of SHM.Foundation is project specific – it is specifically tailored to your requirements. Both the necessary hardware for data acquisition and the software for data analysis are available in our modular building block concept, so that the functions you require can be implemented quickly and efficiently.

SHM.Foundation – Our services

- Customer care for the definition of monitoring strategies
- Design of the monitoring system and accompaniment in the approval process through the authorities
- System integration in IT networks and connection to the interfaces for data exchange with wind turbine controls and Scada systems
- Installation and commissioning of measurement systems by experienced Wölfel engineers – on and offshore
- Operation on monitoring systems with automated system monitoring and alarm triggering
- Data connection to our web portal MIC.Wind to display key indicators and alarms
- Long-term monitoring and data evaluation by highly qualified personnel
- Periodic documentation of the analysis results
Select the monitoring functions you need from our module library:

- Analysis of impacting wind and wave loads and comparison with design assumptions

- Determination of internal forces and recording of maximum and fatigue loads

- Vibration monitoring according to ISO 10816-21 / VDI 3834

- Inclination monitoring under consideration of external influences

- Analysis of eigenfrequency and damping ratios

- Compensation of operating and ambient conditions

- Calculation of life cycle consumption and remaining service life

- Design Validation
Our offshore references

Wölfel in the North Sea

Wölfel in the Baltic Sea
Vibrations, structural mechanics and acoustics – that is the world of Wölfel. In this world, we are the experts. It is our home. More than 100 employees are doing their best to the satisfaction of our customers every day. For over four decades, we have been supporting you worldwide with engineering services and products for analysis, prognosis and the solution of vibration and sound-induced tasks.

Are vibrations really everywhere? Yes! That’s why we need such a wide variety of solutions! Whether it is an engineering service, a product or software – there is a special Wölfel solution for every vibration or noise problem.

For example the

- simulation-supported design of industrial plants and power plants against earthquakes
- measurement of the sound emission of wind turbines
- universal measuring systems for noise and vibrations
- noise protection assessments and pollutant forecasts
- dynamic passenger simulations in automobiles and aircraft
- and many other industry-specific Wölfel solutions...