**bachmann.**

# Structural Health Monitoring

More than just investment security.

# Playing the Long Game

*Your structure is built to last. We provide top-level protection to minimize operational risk.*

Bachmann draws on decades of experience in wind turbine automation. With thousands of DNV-certified monitoring systems worldwide, and customized Structural Health Monitoring (SHM) solutions, we deliver a tailor-made service according to your unique requirements, either pre-build or as a retrofit.

As offshore wind targets become increasingly ambitious, providers must overcome enormous technological, logistical and financial challenges in the race to deliver secure new installations. SHM helps address these challenges through permanent monitoring of structural aging and fatigue – of both the tower and foundations. The information generated can then be used to implement a predictive approach to maintenance; extending the operational lifetime of your installation and dramatically reducing the Levelized Cost of Energy (LCOE).

## We provide:

- Tailored project engineering & SHM system design
- Complete hardware & software packages
- Support with various sensor setups, including FE model based load detection, based on acceleration measurement
- Integration of 3rd party hardware
- Project realization & project management
- Automated data generation & post-processing, correctly formatted for external review
- Data analysis & reporting from our remote monitoring center

## What we monitor:

Based on strain and acceleration sensor data, with the help of a digital twin, we continuously monitor:

- Structural resonances
- Changes in eigenfrequencies
- Tower and foundation fatigue
- Extreme loads
- Main load direction
- Environmental conditions
- Other specific parameters

**b.guard**
Condition Monitoring System
Planning. Detecting. Preventing.

*The better the condition, the stronger the performance*

**Permanent monitoring**
Continuous monitoring of structural fatigue and damage status that meets all current requirements for operating permit issue and extension.

**Consistent foresight**
Strategic, predictive maintenance to reduce OPEX and minimize downtime.

**Proven ability**
Make your installation compliant with relevant offshore requirements, including those of the German Federal Maritime and Hydrographic Agency (BSH).

**Results tracking**
Data provision and data analysis for independent asset assessment and conclusive reporting.

**Quick reactions**
Early failure detection for faster maintenance responses and preventative action.

## Minimize LCOE

**Optimal operations management**
Targeted SHM enables operators to identify high-risk operating conditions and minimize structural damage by reducing or avoiding operation during such conditions.

**Predictive maintenance**
SHM provides operators with advanced warning about impending structural failures, enabling a predictive approach to maintenance with minimal and well-planned downtime.

**Lower OPEX**
Reactive maintenance actions have a direct and incalculable impact on earnings. SHM enables well-planned offshore maintenance activities, accounting for environmental and logistical conditions, thus resulting in significant cost savings in the short, medium, and long term.

**Lifetime extension**
The right SHM design can determine actual loads, compared with designed loads, for each turbine in the park. This provides a basis for possible operating license extension, allowing the operation to continue beyond the originally planned lifetime.

**Retrofitting for long-term operation**
SHM retrofits for legacy turbines can extend operating lifetimes and preserves park capacity, getting more out of the entire installation.

## Full compliance

Operating permits for offshore wind turbines depend increasingly on compliance with legal requirements and standards for comprehensive structural monitoring. With our SHM, we ensure the implementation of the correct requirements for your individual project.

## Drive the future

**Strategic operation**
Based on SHM data, operators can actively choose to increase the efficiency of energy production or maximize turbine lifetimes, considering both commercial and technical drivers.

**Stronger players**
SHM data can be used to optimize the design of next-generation wind turbines. Critical areas and features can be strengthened and improved to deliver even better results far into the future.

## Cantilever Sensor – perfect for structural monitoring

Cantilever sensors offer a long-term, robust, and reliable alternative to conventional strain gauges. They are easy to apply and enable integral measurement over a longer reference distance. This makes them ideally suited for the direct detection of representative loads over the entire structure.

## Total sensor package

Comprehensive SHM requires surprisingly few sensors. We provide every type of relevent sensor for reliable structural monitoring:

Accelerometer

Inclinometer

Strain Gauges

Atmospheric Sensors

Grout Performance

Corrosion Probes

»*Offshore Structural Health Monitoring from Bachmann, part of our holistic Condition Monitoring solutions package, delivers exactly the long-term security, operational optimization and lifetime extension that appeals to both investors and operators alike.*«

# bachmann.

**www.bachmann.info**