Offshore Success

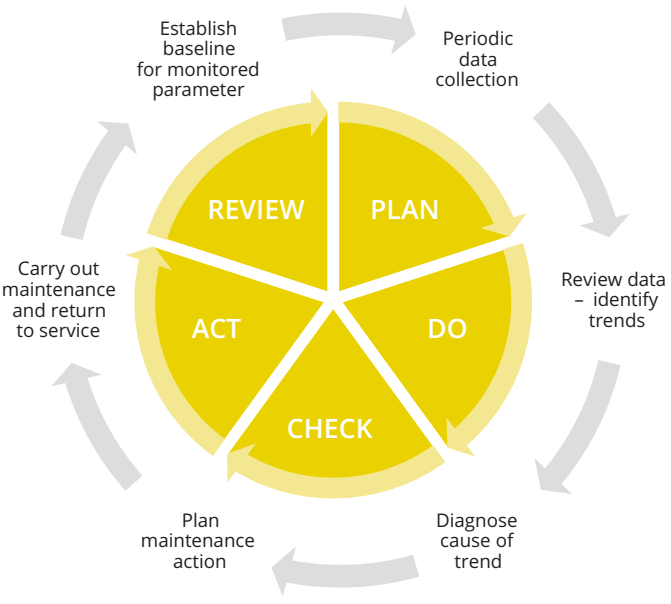
Relies On Strategic Maintenance

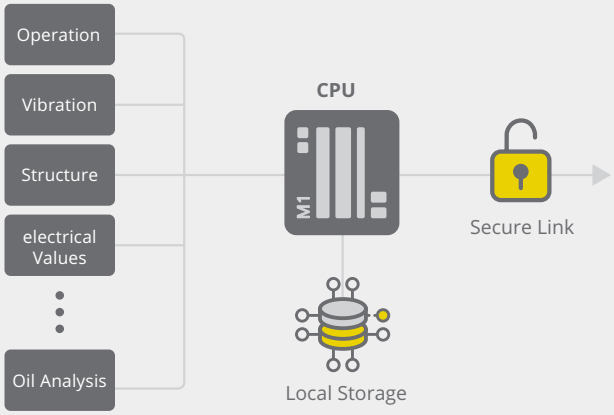
When it comes to wind turbine maintenance, owners' goals can generally be summarized as follows: predict faults early to reduce unplanned downtime, increase overall profitability, and extend the lifecycle of the turbine. Fault prediction, the most essential element of the predictive maintenance process, is facilitated by smart Condition Monitoring Systems (CMS).

CMS enables wind park owners to implement a knowledge-based maintenance strategy; optimized through a careful combination of reactive, preventive, and predictive maintenance.

An appropriate combination of the three approaches depends both on the affected part and the criticality of the fault. It also requires the ongoing acquisition and analysis of vast amounts of relevant data. For predictive maintenance, data is collected by specialist CMS hardware. Analysis of raw data converts it first into information, and then into knowledge upon which predictive maintenance decisions are based.

The collection of CMS data in wind power takes place via internet-enabled measurement systems within a circular maintenance process (figure 1). This process begins with the establishment of a baseline, whereby CMS data is periodically collected and reviewed for any deviations from the baseline. Should changes or alarms occur, then appropriate maintenance can be planned and carried out. The final step is then to reestablish a new baseline following maintenance actions.





INTEGRATED MONITORING SYSTEM

- *All required data transferred through a single interface*
- *Reduced complexity*
- *All data available to operators*
- *Information securely transferred – cyber security*
- *Reduces subsystems and costs*
- *Local data acquisition and storage in case of loss of communications*

Due to access restrictions, the cost of repairing a wind turbine is often significant. When turbines are located offshore, those costs are amplified. Offshore maintenance requires complex logistics to access the turbine, as well as safe weather conditions for the offshore transfer of the maintenance team.

To reduce these costs, turbine owners must be able to plan and combine maintenance actions. Early detection of an emerging fault through intelligent Condition Monitoring is an important part of the solution. At least as crucial for logistics is the correct classification of damage class, to begin the necessary planning in good time. Against a background of potentially long delivery times for certain spare parts – main bearings, for example, currently take up to 8 months – this necessity becomes particularly clear. Early warning signs become visible through a combination of IoT-enabled hardware and monitoring software.

When it comes to hardware, a variety of sensors collect and collate data to a local CMS edge device, which performs an initial analysis before transmitting data to the server or cloud. This integrated approach ensures that data collection is completely synchronized, avoiding the need for multiple connections. Any bottlenecks in the data transmission process are thereby removed, which also improves cyber security. Transmitting data via one secure link, as opposed to a multitude of individual systems, offers turbine owners a safer alternative. In short, the Bachmann CMS can also be used as a secure gateway for other subsystems (e.g. particle counters, etc.) and just one secure communication link must be monitored. At the same time, this significantly reduces the complexity of plant monitoring.

Once the edge devices have delivered data and results to the cloud server, it can be further processed. The data is then used by analysts to search for trends and anomalies, and to inform maintenance teams of any required action. Results are shared in the cloud server, making them accessible online from any authorized device. Maintenance teams are then better able to plan repairs, including ordering the correct parts and setting an optimized time schedule.

There are multiple benefits of employing IoT measuring devices. First, any control-relevant CMS data is shared locally with the turbine control system, streamlining the application of collected data. Second, IT overheads remain low due to fewer connections and less external data.

As well as improvements to cyber security, all data becomes available in one place, providing a holistic overview of not only individual turbine performance, but the performance of every turbine in the fleet. Results are available anywhere, anytime, which enhances communication between analysts and maintenance teams.

Many wind park owners choose to outsource CMS processes, particularly data analysis, due to the economies of scale available. Through certified Condition Monitoring centers, dedicated teams of trained specialists are available. With a constantly growing database from many turbines, these specialists can derive in-depth knowledge faster and more accurately than any individual park owner examining the performance and condition of single turbines. In simple terms, this means turbine faults are detected and dealt with earlier, before they become significant and cause major damage.

Condition Monitoring is a constantly developing process; prediction accuracy increases as more knowledge is accumulated. The growing fields of offshore and floating wind (FOWT) offer a world of untapped data that will further improve maintenance strategies, deliver more accurate predictions, and help prolong the life of wind turbines. For example, an optimized concept for ongoing maintenance of offshore wind turbines – based on CMS, among other things –offers enormous cost reduction potential for all offshore projects, which still remains to be leveraged.

FIND OUT MORE

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