EMPURON **EXPERT WIND**

Diagnoses and Analyses of the Components of Wind Turbines

Optimized and efficient operation of wind turbines

EMPURON WIND EXPERT allows with new analysis methods not only the improved diagnosis of the wind turbine , but is also a forecasting tool with methods of artificial intelligence, which enables to perform condition-based and predictive monitoring and scheduling of maintenance procedures. Operator of wind turbines are capable to identify potential errors and damages of the components of a wind turbine at an early stage, and are able to react and avoid repairs or even downtime and the cost involved. A special attention is given to bearings, gears and rotor blades.

With **EMPURON WIND EXPERT** thus always all major operating data of the wind turbine are available, and provide a sustainable and cost-effective operation and optimization of profit.

Monitoring and Reporting

EMPURON EXPERT WIND receives the data from the plant via standard interfaces and stores them in the powerful **EMPURON Data Warehouse**. Thereto no additional installations are required. Using the calculation engine **EMPURON CE,** as well as a powerful reporting module, the values are evaluated in a user-defined and time-controlled way. Via an internet portal, all relevant data, evaluations and perturbations can be displayed and checked. For limit violations, an alarm message is emitted eg by SMS or email from the alarm center **EMPURON AC**.

Thus, the state of the wind turbine is documented and traceable at all times and the troubleshooting of malfunctions is supported.

On-Condition Monitoring Tool ACENTISS

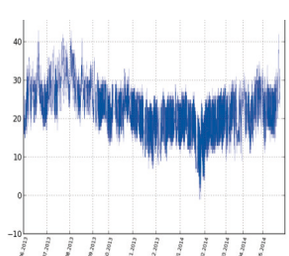
The standard signals (SCADA data) of each individual wind turbine are stored at Acentiss and used as input for a model-based simulation. By means of this computer simulation (eg bearing of the drive chain) components of the wind turbine are analyzed and monitored. Further on trend analysis on the state of the system components within the observed period are created. Earnings forecast for the management, and evaluation of failure scenarios of individual plant components are provided on this base.

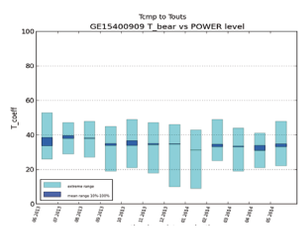
Thus the operator has the ability to perform an optimized maintenance management for the monitored wind farm.

Performance characteristics and standard functions:

The standard functions of the system and the data base allow:

- Remote monitoring and controlling of the supervized components of the wind turbines, in special:
  - bearing
  - gear
  - rotor blades
- Statistics
- Data and event history analysis
- Data archiving
- Comprehensive state and fault information of the plant available via Internet





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Advantages for operators

- **Minimization of down-times of monitored plants**
- **Cost reduction of service-calls**
- **Optimized revenue by efficient and sustainable management**
- **Optimized and extended wind park management**
- **Improved adaptation to future electricity market mechanisms**

Easy analysis and clear presentations using SCADA surveys

Using **EMPURON SCADA** there is the capability to display process data graphically with **EMPURON EXPERT WIND**. The comprehensive reporting features allow freedom of scope and offer the display of every desired information - for the maintenance of the wind turbine as well as for services.

EMPURON Expert Wind thereby ensures the entire representation of all energy generation data, the states of the individual system components and work processes.

EMPURON Neural Network for diagnosis and prognosis

For an efficient and sustainable operation of wind turbines, most accurate forecasts are of decisive importance. This includes not only a weather forecast for the expected return. To minimize downtimes and technical disturbances it is also important to know, when a technical disturbance will be looming and which lifetime of the several components can be expected.

By means of artificial intelligence based on a neural network **EMPURON EXPERT WIND** is able to make predictions of high accuracy. In this case, the neural network is first trained with data from the past, and minimizes in thousands of iterations the difference between the forecast and the actual value. The weighting of each parameter changes dynamically and becomes more and more accurate. In addition, the actual data are analyzed. Thus trends and impending failures can be detected early.

This prognoses and trend analyzes can be generated for weather as well as for the components of the plant, like gears, bearings and rotor blades. Thus you know earlier when disruptions are to be expected, and therefore supports planning service activities in time and at the preferred time for you. Based on this solid and multi-year data base with convincing evaluations, additional savings are possible when setting rates with insurance companies.

Liferay with Acentiss analyses and monitoring data