

> Monitoring and diagnosis of wind turbines

> When and why?

- Monitoring while in operation
- Avoid breakdowns
- Before maintenance stoppage
- Abnormal vibrations
- New wind turbine

> The results

- Diagnosis of faults in the kinematic chain
- Early detection of faults
- Scheduling mechanical work
- Complete diagnosis of the shaft line
- Reception signature



> Problem

The kinematic complexity of the multiplier, the very big differences in rotation speed from one shaft line to another, the masking effects induced by the meshings, the strong interactions of the operating conditions (wind speed, output power, braking torque) requiring a specific vibratory monitoring technique.

> Early detection of faults

The main aim is to avoid breakdowns during the operating period. In order to do so, not only do recognised faults have to be detected : broken tooth, considerable wear and tear, spalled bearing etc., but above all emerging faults have to be detected so as to have the time to plan maintenance operations. This means extracting the more or less masked symptoms of these faults from the signals by means of advanced analyses.

> A methodology and tools dedicated to wind turbines

The instantaneous evolution in the power as well as the speed will be used to select the operating periods which are stable and conducive to acquiring signals.

The simultaneous recording of vibrations and process parameters makes it possible to determine the load case of the measurement carried out in order to apply the associated set of indicators and thresholds.

> A monitoring and remote diagnosis system

A fixed station monitoring system automatically manages the selective acquisition of signals and compares the levels of the indicators at the alert thresholds according the load cases. The evolution curves of these indicators reflect the evolution of the faults detected. The raw signals on the outlet side of the sensors are acquired on request and post-treated in order to carry out a detailed remote diagnosis of the fault.

> The complementary analysis of the generator's current

The measuring and analysis of the modulations of amplitude and frequency of the current generated are complementary to the vibratory analysis. They help to reveal the faults generating torque or speed fluctuations: set of adjustment keys, coupling fault, angle allowances or fault on the generator's rotor. This technique can be used with the various generator technologies.



DYNAE

- > Vibratory analysis
- > Electrical analysis
- > infrared thermography
- > Instrumentation and sensors
- > Software
- > Training

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Our offer in the field of wind turbines

> Instrumentation for monitoring faults

Engineering, supplying and installing on-line monitoring system.

Supplying and putting in place offset sensors for ground-based measuring.

Making available a CTMO[®], time signal collector allowing a simple measurement to be made by an operator and an analysis by an expert in a rear base.

> Monitoring

Services involving the monitoring of a wind farm by means of continuous or periodic measurements.

For continuous measurements, this means that the shaft lines are equipped with on-line systems with the possibility of consulting the data remotely.

For periodic measurements, it is necessary for sensors to be put in place with a terminal block at the foot of the mast.

> One-off diagnosis

In the event of an alarm or a problem on a wind turbine, we propose to put in place a temporary Systeo[®] system which allows us to carry out a remote diagnosis and to monitor the evolution of the fault for the required time.

> New uses

Vibration monitoring in accordance with the 10.816.21 standard

Using specific sensors for low frequencies.

Identifying the mast's natural frequencies.

> Training

The « bearing diagnoses », « diagnosis by current analysis » and « gearing diagnosis » training courses are particularly targeted for experts in charge of monitoring wind turbines (cf. our training programme).

