



# IN-SERVICE INSPECTIONS



## MINIMISING DOWN-TIME FOR **WIND TURBINES**

One of the major concerns in investing in wind farm projects is related to turbine availability, which represents the risk of lower energy yields from the wind turbines due to standstill and repair periods. Thus, reliability of the wind turbines is essential for a wind farm to perform effectively and profitably.

A minor failure of a critical component of the wind turbine can cause undesirable down-time and loss of revenue. Operation and maintenance of wind turbines is costly. One of the approaches to reduce O&M costs is to carry out a full Commissioning Inspection followed by regular In-Service Inspections to detect failures of critical components as early as possible. With the increasing number of installed wind turbines and major failures of critical components, the necessity of In-Service Inspections cannot be neglected. Some components, although designed to last the duration of the turbine lifetime, fail earlier than anticipated, and cause unscheduled down-time which adversely affects turbine availability and the overall success of the wind farm project. SGS's In-Service Inspections involve a series of activities in which the various components of a wind turbine are regularly inspected and monitored throughout their entire operational lifetime. Using a system of diverse

inspection and analysis methods ensures that any unexpected degradation from normal conditions is detected as early as possible in order to prevent consequential damage to the wind turbines.

SGS strongly believes that In-Service Inspections considerably reduce wind turbine down-time, which in return facilitates the economical operation of the wind farm, providing sustainable operational costs with anticipated return on investment. In-Service Inspections are indispensable in order to

- Detect defects as early as possible
- Monitor the condition of the operating wind farm
- Assist in the planning and optimisation of maintenance schedule

SGS' In-Service Inspection are carried out in accordance with IEC 61400 and the "Guidelines for condition-based inspections of wind turbines" published by the BWE Expert Consulting Committee.





## SGS CAN SUPPLY YOU WITH EXPERTISE

SGS's diversified In-Service Inspection services include Commissioning Survey

- Final Acceptance Inspections
- Periodic In-Service Inspections
- Pre- and End-of-Warranty Inspections
- Functional and Safety Test
- A variety of specialised inspection techniques

For these services SGS offers the following modular activities

### TOWER AND FOUNDATION

Visual Inspections of the tower and foundation give an impression of the general condition of the wind turbine. These inspections also assess the built-in parts of the foundation and the tension anchor, grounding devices, the tower itself incl. Doors and the tower-installed equipment like the ladder assembly, fall protection, safety plates, platforms and railing. Thus, SGS can identify damages, cracks, corrosion as well as in particular damages at the sealing joint and water drain.

### VIBRATION MEASUREMENT OF THE DRIVE TRAIN

SGS carries out Vibration Measurement by installing sensors (using magnets or glue) on the main bearing, gearbox, and generator.

Measurements are taken while the turbine is in operation in order to detect potential failures on bearings and toothing. Furthermore, the Vibration Measurement enables to pin-point the

defect or damage on the specific component, and to detect a misalignment of the drive train between the generator and gearbox.

### THERMOGRAPHIC INSPECTION

SGS undertakes thermographic inspection which is the non-destructive testing of parts, materials or systems through the imaging of the thermal patterns at the object's surface. Such inspections are performed to monitor the thermal conditions of electrical parts such as the electrical cabinets and transformer stations or to investigate the generators.

Thermography can also be used to perform blade inspections. In order to use this method for blade inspections, the blade must have a warm surface temperature. This type of inspection is mostly undertaken in a workshop environment.

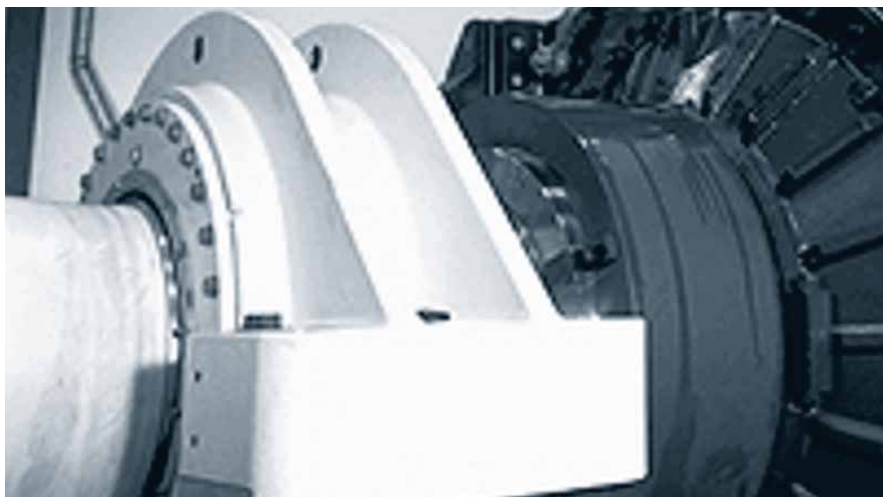
### OIL ANALYSIS

Regular monitoring of the chemical and physical changes in a lubricant, taken from the wind turbine gearbox, generator or hydraulic system, can provide an early warning of potential failures.

Oil is in contact with all the component parts within the system; hence, the diagnostician can identify the degree of oil degradation, contamination, and component wear that will have an impact on the operation and service life of your equipment.

SGS is able to provide

- Sampling of oil and lubricants using a customised sampling kit
- An extensive range of laboratory tests to cover all requirements
- Expert diagnosis of wind turbine components and lubricant conditions
- A range of modern reporting Solutions





## OUR AIM IS TO ACHIEVE **100% SUCCESS**

### **ENDOSCOPE INSPECTION**

In addition to other inspection techniques, a video-endoscope inspection of the accessible gearbox toothings and bearings may be carried out.

This inspection method enables the damaged parts to be visually inspected in order to determine the existing condition of the components and validate the results of the vibration measurement and/or oil analysis.

### **BLADE INSPECTION**

Monitoring of the condition of the rotor blades has become increasingly important. Hidden defects and damage to rotor blades that cannot be detected by visual inspection can be identified by using Non-Destructive Testing (NDT) inspection techniques such as Thermography.

Defects that can be detected in this manner include delaminations, adhesive defect, laminate thickness variations and resin-poor areas. These inspections can be performed either at the site of manufacture or on the wind farm site. New and reliable inspection techniques have become necessary as the importance of the rotor blades for availability of the turbine has been amplified.

### **MEASUREMENT OF THE LIGHTNING PROTECTION SYSTEM**

The assessment of the Lightning Protection System is focused on the functioning and the general condition of the system. SGS can identify damages by measuring the full length of the lightning conductor from the rotor blades over the hub and drive train, down the tower and foundation and into the ground.

SGS inspectors are familiar with adequate access techniques and can provide all necessary personal protection and safety equipment.

### **ROTOR IMBALANCE AND BLADE PITCH ANGLE MEASUREMENT**

Imbalance of the rotor can be divided into two categories. The first is the mass imbalance caused by a repair or a difference in dimensions caused during manufacturing; i.e. tolerances or inaccuracies. The second imbalance effect is the aerodynamic imbalance caused by the misalignment of the rotor blade pitch.

The main effects of imbalance are, firstly, to prevent a higher cut-in wind speed, which would result in a lower energy yield. Secondly, the imbalance will transfer through the drive chain, damaging a variety of components including the gearbox, generator and main bearings.

The correct mass rotor balance and pitch angle are important to prevent the following

- Damage of important components
- Higher repair costs
- Reduced service life
- Poor availability
- Decreased power output

To avoid these issues an inspection of the rotor balance and pitch angle is highly recommended.



## SGS TAKES **WIND ENERGY EXPERTISE** TO NEW HEIGHTS



### INDUSTRIAL ROPE ACCESS

Industrial Rope Access inspection provides a cost-effective alternative to traditional rotor blade access methods. Industrial Rope Access is a proven method of achieving a safe working environment at heights or in difficult access areas.

The main features of SGS Industrial Rope Access operation are as follow

- SGS is accredited by an International association for Rope-Assisted Work Techniques.
- Rope access inspectors work from two ropes: a working rope and a back-up safety rope, while constantly attached to both ropes. Each rope has a separate anchorage point. In the unlikely event that the working rope becomes damaged or unusable, the safety rope prevents a fall.
- Rope access inspectors always work in a team of at least one rope access supervisor and one rope access technician ensuring direct eye-to-eye and earshot contact to ensure that prompt rescue is possible if required.

- All SGS rope access technicians receive extensive training and independent assessment and undergo annual re-training in accordance with the associations requirements.
- All SGS rope access training and operational work is conducted in compliance with the associations guidelines.
- All rope access equipment is regularly inspected and well maintained.

### CONTACT

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WHEN YOU NEED TO BE SURE

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