

## Assessing the vibration behaviour of generator stator end-windings

Generator stator end-windings are submitted in operation to a combination of complex electromagnetic and mechanic forces. These forces recurrently lead to the early ageing of the end-windings through the appearance of white dusting and greasing detected by inspections during overhaul. The vibration behaviour of the end-windings is regularly depicted as one of the main contributors to the root cause. Therefore Laborelec offers a complete methodology specifically developed for the vibration assessment of generator stator end-windings. This methodology is universal for all machine types and is independent from the generator manufacturer.

Laborelec has the tools and the know-how to fully assess the vibration behaviour of generator stator end-windings. The methodology applied by Laborelec consists of three phases that can be used independently.

### > Assessment of the structural health

Following up the progression of damage by visual and boroscopic inspection is the most tangible way to evaluate its importance and is an essential input for the next two phases.

### > Assessment of the vibration sensitivity

As a first step to evaluate the contribution of vibrations to the general behaviour of the end-windings, an assessment of the vibration sensitivity of the structure by means of offline impact testing during overhaul is recommended. A resonant condition leading to expected amplified vibration amplitudes in operation can then be diagnosed. The experimental modal analysis of the end-winding basket reveals the importance of the global end-winding basket vibrations while local resonant vibrations can be diagnosed by local impact tests.



The reciprocity test included in the impact test procedure gives a first evaluation of the end winding basket coherent response. The impact testing contributes to the root cause analysis. Moreover it is an input for the strategic monitoring decision and it drives the choice of the best-suited locations to install vibration sensors for permanent online monitoring.

#### > Assessment of the vibration behaviour

The online vibration monitoring gives an insight of the vibration levels at the chosen locations. Combining the vibration measurements with the critical operating parameters of the generator (e.g. the rotor keyphasor, the active and reactive loads, the rotor and stator currents, temperature measurements) deepens the vibration analysis and helps identifying an unexpected vibration behaviour. Therefore Laborelec uses a common platform (the Laborelec Vibration Monitoring System) to monitor both shaftline bearing vibrations and generator stator end-windings vibrations in a cost-efficient way.

Based on various experiences, Laborelec can also provide assistance in special cases such as:

- > Evaluating and validating retrofit proposals from the generator manufacturer
- > Reviewing historical test results and challenging initial conclusions

International references:

- > Offline impact testing performed in Europe and Middle-East on generators from various manufacturers
- > Several generators monitored permanently in Europe from various manufacturers

## Five reasons for you to choose Laborelec

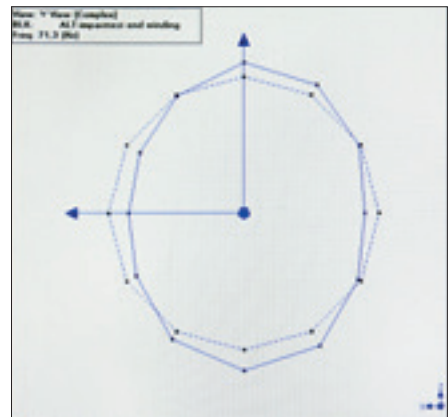
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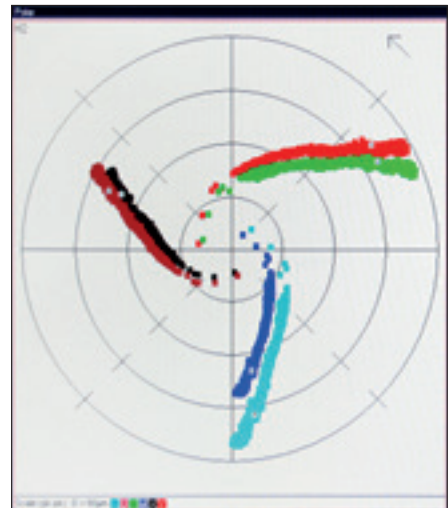
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Modal analysis



Online vibration monitoring