ermes

ELECTROTECHNICS AND MECHANICS OF STRUCTURES

R&D EXPERTISE AT THE SERVICE OF INDUSTRY

FIELD EXPERTISE | **TESTING AND MEASUREMENTS** | **NUMERICAL SIMULATIONS** | **PROTOTYPED PRODUCT** | **MARKET-READY PRODUCT**

OPERATIONS & MAINTENANCE SUPPORT

Controlling turbine blade vibrations

YOUR STAKES

- **Map the vibration level of turbine blades to identify associated risks**
- **Implement proven solutions to reduce vibration level**
- **Control the risk of fin damage in the presence of cracking**

OUR OFFER

The offer consists in:

- Analyze the vibration level of the turbine blades
- Assess the risk of crack propagation
- Look for solutions to reduce detected vibration levels

The offer can be detailed as follows:

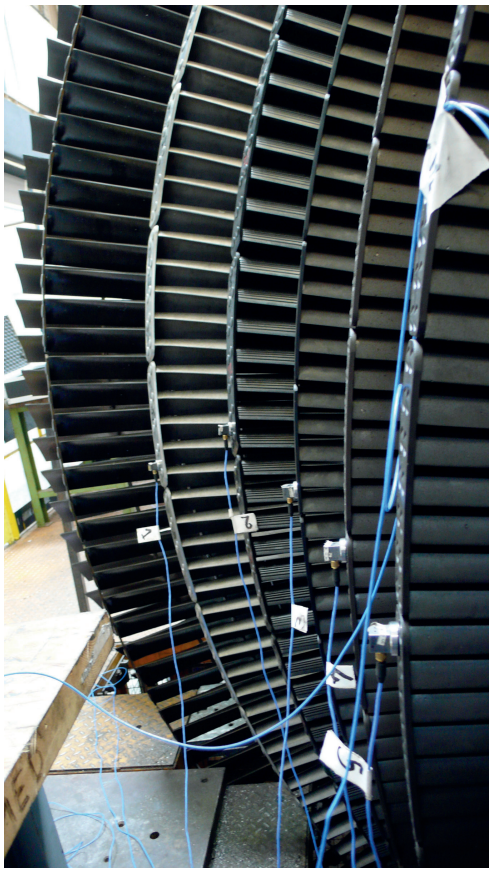
- Methodological advice and expert opinion
- On-site vibration measurements
- Advanced studies on the basis of numerical simulation: reparability, harmfulness of defects (maintenance error, cracking, etc....)
- Construction of customized de-tuning solutions to reduce vibration level

A unique expertise in turbine systems

- Our experience as operator of many power generation units of different power ratings has enabled us to gain a good understanding of the risks associated with vibration phenomena occurring on all types of turbines and in all operating fields.
- We rely on advanced experimental means (BVM instrumentation), high-performance numerical simulation tools developed by EDF Group R&D (Code_Aster) and proven solutions tested on EDF's power generation fleet
- The implementation of BVM instrumentation is fully mastered by our team of experts, thanks to the industrial experience feedback from our clients.

SECTORS OF APPLICATION

- Electricity power plants operating finned turbines



Instrumentation of a wheel

Terminal fins

Controlling turbine blade vibrations

KEY FIGURES:

- Order of magnitude of the gains on the vibration level of the fins: 6
- Non-linear calculation time for fin start: between 7 and 36 hours
- Years of experience acquired by EDF R&D in this field: 15 years

OUR ASSETS

EXPERIMENTAL RESOURCES

- Monitoring by the installation of an instrumentation allowing the measurement of the vibrations of the fins based on the fine measurement of the passage times (Blade Vibration Monitoring - BVM). The BVM measurements were developed on our test benches and then on our thermal electricity production sites.

DIGITAL RESOURCES

- IT development skills allowing for total mastery industry standards and codes.
- Fin stress assessment using finite element simulation.

OPERATING SUPPORT

- Disconnection of fins leading to the reduction of the flutter coupling at the origin of the vibrations, thus, inducing significant stresses at the foot of the fin.

AN INTEGRATED PACKAGE

- Expertise in the BVM technique and in both digital and experimental disconnection techniques, acquired through the installation of several EDF Group generating stations.

code_aster

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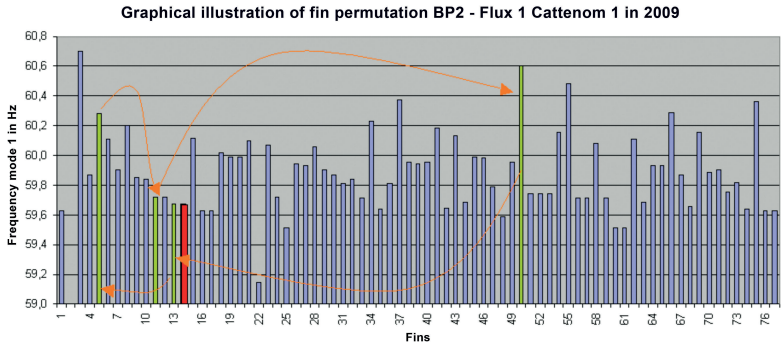
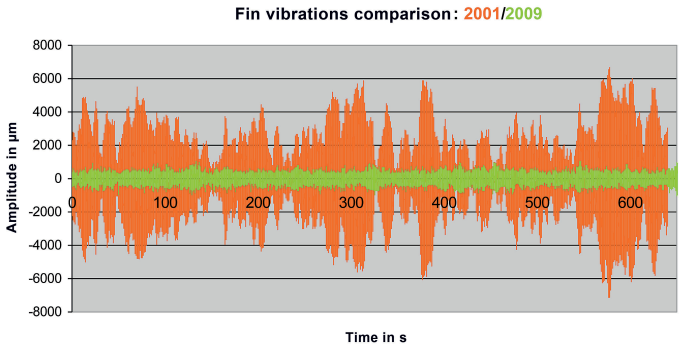
EXPERIENCE OPEN SIMULATION



Dissonance



Vibration signal reduction

SATISFIED CLIENTS

- Solution under development on the nuclear generating fleet after industrialization by GE according to EDF R&D specifications.

A RICH HISTORY

- The implementation of a solution for dissonance in the nuclear fleet is the result of many years of experience. After a phase of diagnostics on the origin of cracks at the base of turbine fins, validation on a nuclear industrial site made it possible to specify an efficient industrial solution.

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