

Non-destructive inspection of low-pressure steam turbine blades

Detecting and sizing cracks without dismantling

Low-pressure steam turbine blades are susceptible to cracks

Some types of low-pressure steam turbine blades are very susceptible to cracking, especially in the upper serrations of the dovetail root. Some manufacturers recognise the problem and advise their customers to perform non-destructive testing to identify the affected blades before the cracks lead to ruptures.

Effective inspection tool

ENGIE Laborelec has developed an effective in-service inspection method based on two different NDT techniques (ultrasound phased array and eddy current) which ensures accurate detection and sizing of cracks which appear in critical areas of the dovetails. The inspection involves a probe with customised wedges tuned to match the distinct geometry of each dovetail type.



Advantages

RAPID – Up to five times quicker than dismantling

It takes just two days to check the dovetails of an entire rotor wheel. This is three to five times faster than when the blades are dismantled from the rotor wheel, leading to a considerable reduction in downtime.

COST-EFFECTIVE – Only cracked dovetails need to be replaced

Manufacturers recommend the dismantling of all blades whenever inspection reveals cracking. ENGIE Laborelec's NDT method makes it easy to differentiate between a scratch and a crack, and thus can discern where replacement is absolutely necessary and where it can be avoided.

ACCURATE – Quality of inspection results assured

Because ENGIE Laborelec tailors the NDT probe wedges to the exact geometry of the dovetail, the inspection is more accurate and it becomes possible to detect and size even the slightest crack before it develops.

“Laborelec’s NDT methodology means that their experts can inspect steam turbine blades for cracks even within the narrow timeframe of an overhaul. We don’t need to dismantle the blades from the machine any more, saving us ten extra days of work.”

Alain Wilputte, Project Leader, ENGIE European Maintenance Services.

Focus on safety, efficiency, and the longer term

Inspection is efficiently and accurately carried out by seasoned experts in NDT who have the knowledge and experience to correctly interpret the results.

PREPARE – What does the customer have to do?

Before any inspection, the steam turbine must be shut down, disconnected, cooled off, and prepared for inspection. These actions are vital to ensure the safety of the inspection team.

INSPECT – Inside the rotor casing, without dismantling

Inspecting the last-stage blades does not depend on the rotor being lifted from the machine or the casing being removed from the steam turbine. The NDT experts can assess critical areas by examining the visible and accessible parts of the blade foil and roots.

ADVISE – Practical on the spot advice

Laborelec inspection methodology means easy detection and sizing of cracks in the critical area of the first two serrations of the dovetail. NDT experts can therefore immediately notify the customer of potential issues in each inspected dovetail and provide daily reports on inspection results.

REPORT – Benchmarking for the longer term

Following inspection campaigns each customer receives a detailed report containing all the results for each blade inspected. These data can be used as a benchmark for any future review or re-evaluation.

Combining phased array and eddy current testing

The Laborelec inspection method for low-pressure steam turbine blades combines two distinct NDT inspection techniques:

- Phased array is an ultrasonic inspection technique which very accurately detects and characterises cracks within materials
- Eddy current testing is the most effective method for detecting and sizing smaller surface cracks



Our method makes it possible to carry out the inspection without dismantling of the rotor.



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Five reasons to choose ENGIE Laborelec

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- Unique combination of contract research and operational assistance
- Independent advice based on certified laboratory and field analysis worldwide
- More than 50 years of experience