

ROTOR DYNAMIC ANALYSIS OF SHAFT LINES

Tackling the more complex vibration issues

AN ADDITIONAL ANALYSIS AND TROUBLESHOOTING SERVICE

Vibration measurements and continuous monitoring are standard tools for the follow-up and analysis of the dynamic behaviour of rotating machinery. However, some issues are difficult to detect and assess purely through measurement-based analyses – for example, design-related issues or vibration problems occurring in non-accessible shaft areas. Laborelec consequently offers an additional analysis and troubleshooting service based on rotor dynamic models.

EXPERT KNOWLEDGE FOR THE MORE CHALLENGING PROBLEMS

Laborelec has the tools and the know-how to build realistic rotor dynamic models of large shaft lines for power generation. We use these models to find the root causes of lingering vibration issues, simulate complex balancing proposals, and validate shaft line retrofits.

> Model-based root cause analysis can solve lingering problems

While continuous monitoring and ad hoc measurement campaigns are the most important tools for troubleshooting vibration problems, these methods sometimes fail to properly address certain issues. In these cases, rotor dynamic simulations can help identify the root causes of the problems and thus pave the way to effective solutions.

> Dealing with the more difficult balancing issues

Rotor dynamic models enable our experts to simulate the effects of a proposed balancing on the equipment, even where it is not physically possible to measure vibrations. This is very helpful in complex cases and in situations where the installation of balance masses is difficult and/or labour-intensive.

ROTOR DYNAMIC MODELLING (RDM) VALUE CHAIN



Laborelec covers every step in the RDM value chain, from the original vibration measurements to RDM construction and root cause analysis.

> Validating retrofit proposals

The models also enable Laborelec to evaluate a shaft line retrofit by assessing its impact on bearings and the shaft's lateral and torsional critical speeds. By using rotor dynamic models, Laborelec can verify the validity of the assertions made in the manufacturer's proposal.

INTERNATIONAL REFERENCES

- > Modelling several steam and gas turbine shaft lines for troubleshooting vibration problems
- > Balancing a generator in a shaft line with a SGT-2000E gas turbine
- > Studying the alignment changes in a single shaft design based on a 9FA gas turbine

Reliable solutions thanks to meticulously validated models

Rotor dynamic models will only provide useful information if they are thoroughly checked against real-life machine behaviour. Laborelec has the expertise needed to quickly create models of large power generating shaft lines and validate them.

CONSTRUCTING REALISTIC MODELS

The input required for a rotor dynamic model is the geometric data of the shaft line, such as the dimensions of the rotors and bearings and the inertia moments of all rotating components. When this information is provided in sufficient detail, our experts can create a corresponding model in a very limited time.

COMPARING MODELS TO REAL-LIFE BEHAVIOUR

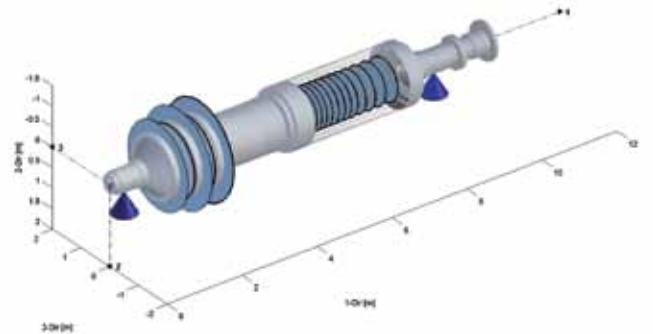
Laborelec then verifies and fine-tunes the model by checking its behaviour against historical data on the given shaft line or of a similar unit. Our experts retrieve this information from our vast Laborelec Vibration Monitoring System (LVMS) database, which contains vibration data from around 100 continuously monitored machines. If we have no data on the given shaft line, we conduct specific validation measurement campaigns. Through this process, we are able to ensure that the model is realistic and reliable.

ANALYSES AND SIMULATIONS

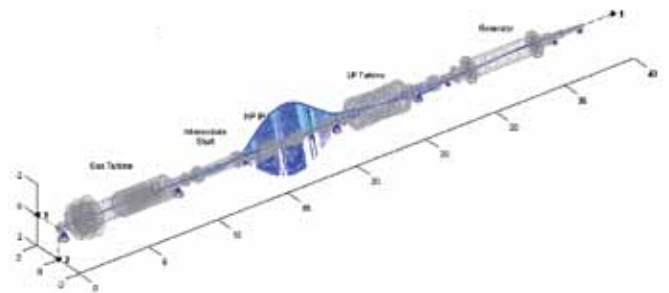
We use the model to analyze the characteristics of the fluid film bearings, calculate damped eigenvalues, assess dynamic responses to imbalances or other forces, and simulate the effect of modifications on critical speeds. In this way, we provide an in-depth analysis of the vibration behaviour of the entire shaft line.

This comprehensive analysis is essential in:

- > Finding the root causes of complex problems
- > Supporting plant owners and operators by providing the necessary technical evidence for productive discussions with the equipment manufacturer



Our experts use historical vibration data to validate the rotor dynamic model of the shaft line.



Model-based in-depth analysis of the shaft line's vibration behaviour can help identify the root cause of a complex problem.

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