
Vibration monitoring of turbogroups

An essential tool in your predictive maintenance strategy

- Damage prevention
- Maintenance optimization
- Availability & Reliability increase





LVMS, Laborelec's solution for vibration monitoring of turbogroups, is an essential tool in a predictive maintenance strategy.

Laborelec vibration monitoring system

Cost savings achieved throughout total life cycle

What precisely happened with your turbogroup just before, during and after the alarm sounded or the machine tripped? LVMS will tell you. It continuously measures your machine's vibrations for a precise analysis of its true condition. It is arguably the most valuable tool for operation, maintenance or asset managers throughout the total life cycle of their turbogroups.

Lvms at a glance: quick, easy and compact

LVMS is Laborelec's solution for vibration monitoring of large turbogroups. It facilitates condition assessment and the information it delivers guides your people and remote experts in situations where time constraints are important. LVMS has been adapted over the years to evolve into a compact and robust system, easy to install and to maintain.

Optimize your maintenance

The easily accessible historical database offers all the information needed for a complete vibration analysis to help you plan your maintenance interventions. Using LVMS will help you identify the machine elements that need special attention, but also avoid unnecessary interventions on machine components that are operating correctly. After the overhaul, an on-line expert support guarantees a close survey during the restart.

Increase the availability and reliability during normal operation

LVMS is more than a simple warning tool. Its intelligent alarming system allows you to detect any deviations before they develop into severe damage. Beyond this early warning functionality, its specialized visualization and analysis diagrams also provide information about the possible causes of the observed problem. This increases the reliability of your installation and reduces the costs that come with unplanned outages.

MAINTENANCE STRATEGY

CORRECTIVE

PREVENTIVE

PERIODIC

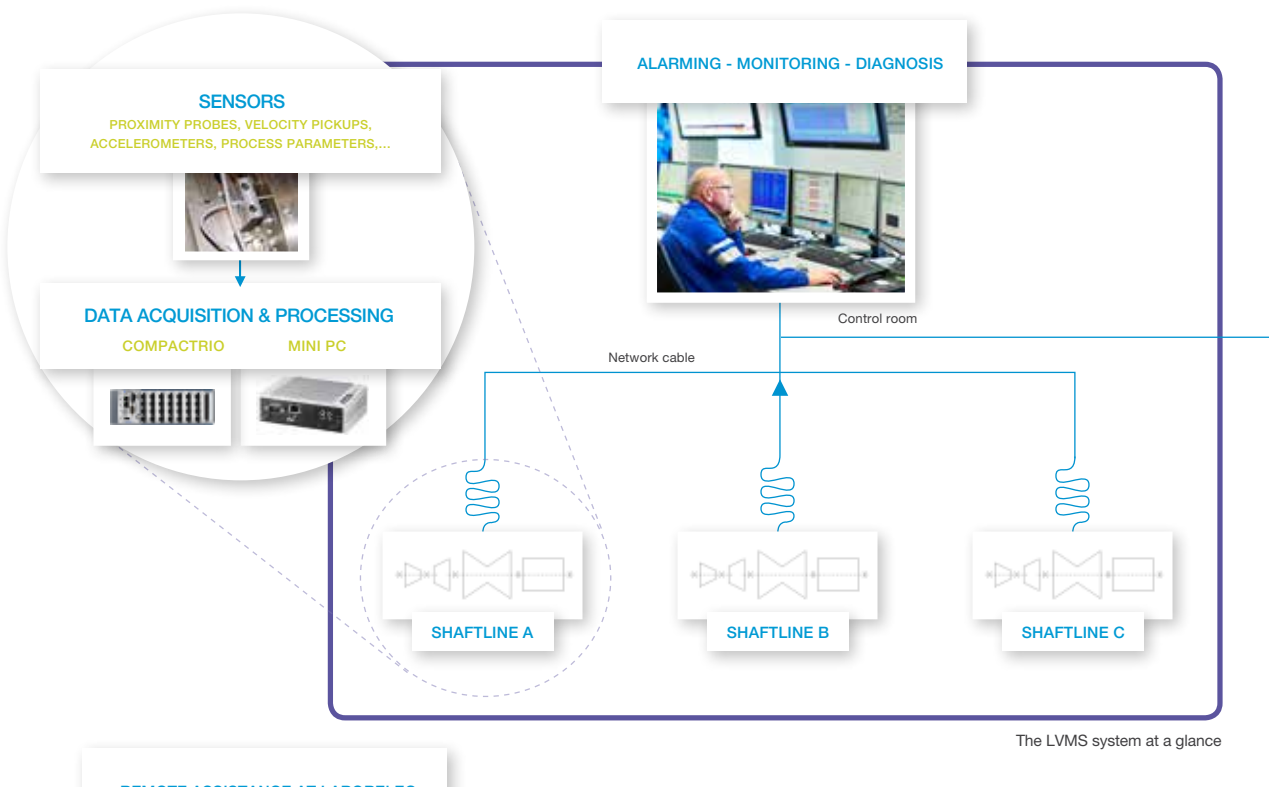
PREDICTIVE





Laborelec vibration monitoring system

A system made to measure



REMOTE ASSISTANCE AT LABORELEC

LVMS TODAY

1000 MACHINE-YEARS OF MONITORING EXPERIENCE

The data acquisition and alarming algorithms and the user interface of LVMS are based on 30 years of experience with continuous vibration monitoring in the field. Throughout the years, new features were added and improvements were made based on actual needs from as well vibration experts as operation staff. This evolution has led to a system that combines a fast access to accurate analysis with a versatile user interface and an alarming strategy focused on the needs of the operator.



1985 - 1987
Development
HP platform

1997 - 1999
LVMS 1

2004 - 2006
LVMS 3
Enhanced stability
Data Interfacing

2012 - 2014
LVMS 4

1988 - 1991
Roll-out
HP platform



2000 - 2002
LVMS 2
Extended features



2008 - 2009
Data Import Tool

Availability and reliability increased

Smooth operation without unplanned shutdown

An important task in day-to-day power plant operations is ensuring a high availability while safeguarding machine dynamics. LVMS helps you detect any important changes in vibration behaviour before they cause a machine safety mechanism to trip or result in damage. With LVMS, false alarms are history. Your analysis effort is always effective and you can often keep your turbogroup running safely with only minor adaptations. You can then properly prepare for a permanent solution of the issue at the next planned stop. This LVMS early warning system and swift analysis saves you a considerable amount of money.

Investigating genuine alarms reduces stress and saves unneeded expenses

LVMS has an intelligent alarm system that prevents a warning being given when it is not strictly necessary, for instance, when a sensor is defective. This also keeps operators sharp: they know that every LVMS alarm requires swift action.

Early corrective measures prevent expensive future damage

Genuine alarm signals are given before suspicious vibration behaviour can cause any serious damage. Moreover, the system is self-learning, reducing the operator intervention needed in configuring alarms, while ensuring close monitoring of the vibration behaviour.

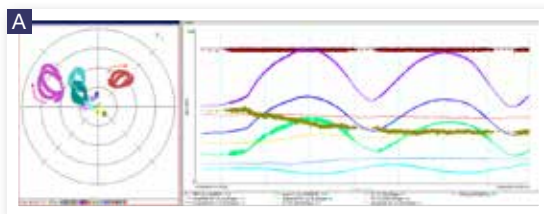
Quickly identifying the real cause of vibrations keeps the machine up and running

In many cases, you can adjust the machine operation to avoid harmful vibrations, keeping the machine fully operational until the next planned stop. In other words, LVMS helps you avoid unplanned stops and related penalties.



Typical polar diagram and amplitude diagram showing a rubbing phenomenon

The polar diagram (A) shows a continuous significant variation in both phase and amplitude of the first harmonic component of the vibration signal. The amplitude diagram confirms the conclusion of slow, periodic changes in vibrations, with a time constant of 3 to 4 hours. This is a typical diagram resulting from a rubbing phenomenon. Laborelec located this in the hydrogen seal of the generator. No particular intervention was deemed necessary. The phenomenon was kept under control by changing the seal oil parameters, and a dedicated alarm setting guaranteed a close monitoring. The phenomenon disappeared after the next planned stop.





Improved maintenance planning

Careful preparation for a minimum downtime

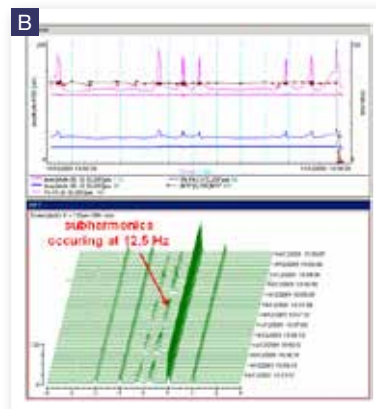
Minimum downtime during an overhaul is only possible when you prepare for every minute detail. LVMS helps you with that. By performing a thorough analysis of all vibration signals beforehand, you know exactly where special attention needs to be paid, and what part of the machine will most likely need to be inspected. After the overhaul, LVMS is also the ideal tool to verify that every part of your installation is back to optimal operational specs. You can confidently start-up your machine safely and in the shortest possible time frame.

DetailEd analyses help focus on the essentials during overhaul

A detailed vibration analysis permits you to determine beforehand what elements of the machine train need attention during an overhaul, as well as those that are running satisfactory. This makes LVMS a powerful support tool for optimizing your predictive maintenance planning.

Historical signature analysis speeds up fault detection

Comparing the LVMS data after an overhaul with the signature from the period prior to the overhaul allows a complete analysis of the post-overhaul behaviour. This will provide you with essential information to evaluate the impact of executed maintenance actions, or improve troubleshooting of newly occurring problems.

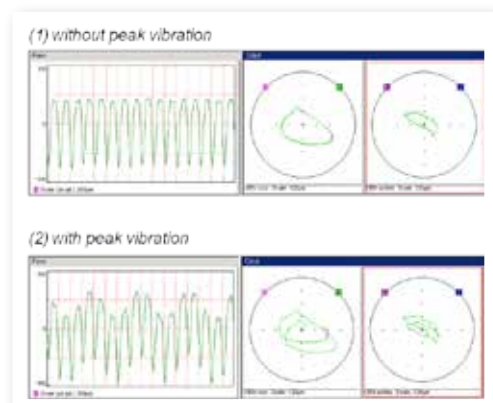


Reducing field balancing time to a minimum

LVMS offers the expert user an online access to all data that are necessary for field balancing your turbogroup after a major overhaul. When a fine tuning is required, this can be done afterwards, during a next planned shutdown, based on the data available from the online monitoring of the last operation period.

Remote support during restart

During a restart after an overhaul a steam turbine unit tripped due to high vibrations. The time signals and spectra shown in figure B indicated the presence of a partial rub condition. Based on a remote analysis, the information given by the plant on executed maintenance actions and our experience with a similar unit, the rub location was identified in less than 2 hours. The unit was returned to the grid after a small corrective action. This intervention saved the plant several days of unplanned shutdown and additional inspection costs in the restarting period after the overhaul.





Our service offering at a glance

From targeted opinion to all-in formulas

LVMS can be adapted to the specific needs of any industrial facility. Thanks to its flexibility and modular structure it can be as limited or as comprehensive as you choose. Laborelec experts therefore also use it as a standard tool in their field interventions.

All-in formula

Most operators want their turbogroup to be permanently monitored, with every alarm signal analysed. That is why they call upon Laborelec. We give advice on the most appropriate instrumentation for vibration monitoring for your assets. We implement LVMS in a project approach together with your teams. Afterwards we also propose a mutual assistance agreement. This means your LVMS equipment remains up to date and completely reliable as your needs evolve and also facilitates a 24/7 support to your operation staff.

Temporary lvms installation

You can choose a temporary LVMS installation. This limited formula connects LVMS to your existing vibration monitoring system to acquire measurement data. This formula can be particularly useful in the analysis of acute incidents, for evaluating the vibration behaviour before and after important maintenance intervention or for field balancing. You can decide whether you want Laborelec to analyze the measurement results or do it yourself, thanks to the easy data export possibilities.

Incident analysis

Analysing an occasional vibration incident is not a sinecure. You may want to take advantage of Laborelec's years of expertise to do the job for you. This results in a comprehensive investigation and reporting with advice on the most appropriate corrective measures, and independent from your OEM or service provider.

Training

Laborelec provides thorough training sessions in the use of LVMS and the correct interpretation of vibration data. We train your operators and maintenance personnel when you buy the software. We also provide specialized training for personnel that wants to acquire more in-depth knowledge in vibration analysis, using real case studies.

Permanent helpdesk

You can negotiate a custom helpdesk agreement with Laborelec, categorizing possible support needs and agreeing on the required response time for each category. Our helpdesk can be available for you every hour of the day, every day of the year.

Assistance agreement

Besides all services for maintaining the correct functions of hardware and software, our assistance can also include regular reporting about the vibration behavior of your machine. This includes an advice on an optimal setting of alarms and a list of evolutions that require a specific follow-up or intervention.



5 More questions

You might still have about LVMS

Is the remote feature really an advantage?

Yes. When it comes to taking decisions in critical or unusual situations, getting the opinion of a vibration expert can be of prime importance. In these cases, the on-line remote feature of LVMS makes it possible for Laborelec experts to put their experience in troubleshooting of large turbogroups at your disposal, regardless of the moment at which you need assistance or of your location on the globe.

Will my technical staff find its way with LVMS?

Yes. LVMS makes instantaneous analysis easy and reliable. The system's interface has been optimized over the years to make it intuitive and user-friendly. Furthermore, Laborelec will provide the appropriate training to your staff, during and after installation of LVMS.

My turbogroup is already instrumented. Is it possible to install LVMS on top of my existing protection system ?

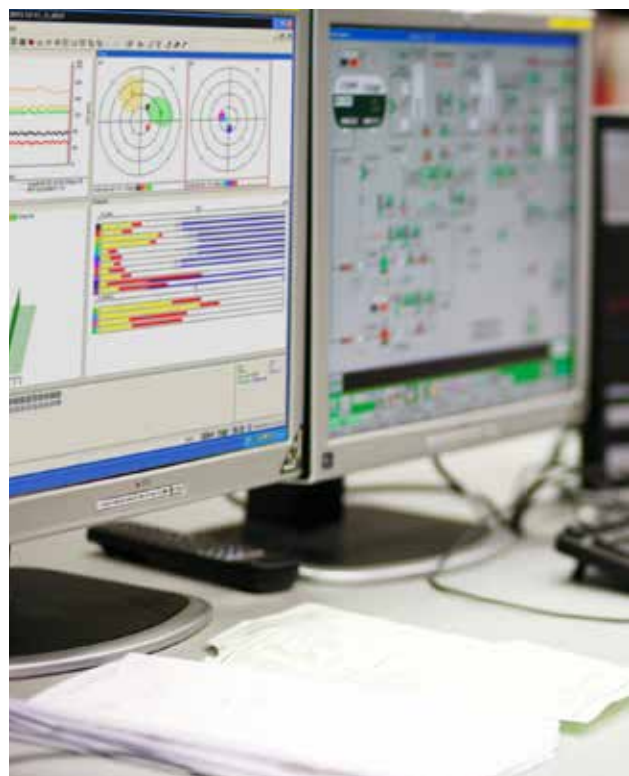
Yes. LVMS is typically installed in addition to standard protection systems that are most often already present on your turbogroup. LVMS typically uses the measurement signals of your existing sensors, but also offers the possibility to integrate additional sensors or exchange digital signals. A galvanic isolation per channel guarantees a trouble-free connection for all analog signals.

Is LVMS suited for all types of machines?

Yes and no. LVMS can be installed on all types of heavy duty rotating machines equipped with journal bearings. LVMS has been successfully installed on more than 100 shaft lines all over the world, ranging from 5 to 1200 Megawatts, including gas turbines, steam turbines and feed water pumps.

Can LVMS deal with multiple shaft configurations?

Yes. The data acquisition, processing and alarming for a turbogroup are optimised for one generator, regardless if different drive shafts are present. For example, in the frequent situation where two shaft lines are coupled by means of a gearbox or a clutch, both shaft lines are monitored with one LVMS system. One system can treat up to four independent phase reference signals. When different systems are used in a plant, they interface their data with a central LVMS system for visualization and analysis.



Five reasons for you to choose Laborelec

- Wide range of technical competencies in Electricity Generation, Grids, and End-Use
 - Increased profitability and sustainability of your energy processes and assets
 - Unique combination of contract research and operational assistance
 - Independent advice based on certified laboratory and field analyses all over the world
 - More than 50 years of experience
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