Mechanical Engineering Division

Vibration Diagnostics

turboset vibrations

Measuring, analysing and assessing

Identify damage early with
mobile, part-static or static
vibration measurement/analysis

- Bearing and shaft vibrations
- Vibrations of stator end windings
- Torsional vibrations

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Planning overhauls more effectively

Power plant operators are bound by strict criteria in terms of both time and budget when planning and implementing overhauls on steam turbosets (turbine plus generator).

Good planning can mean:
- Longer intervals between outages (prolonged service life)
- Shorter overhaul times
- Reduced spare parts stocks

Any unexpected findings can often have serious consequences for the power plant operator:
- Specialist personnel and spare parts have to be sourced quickly and repairs scheduled
- The overhaul goes over budget because of the additional work
- The overhaul period / outage time is extended and replacement services (power, steam) have to be sourced at great expense to fill the unplanned gap.

In addition to the use of process quality monitoring, problems like this can be avoided – or at least significantly mitigated – by the appropriate measurement, analysis and assessment of the vibrations detected in a turboset.

A number of areas should be considered in terms of machine diagnostics:
Bearing and shaft vibrations
Vibrations of stator end-windings
Torsional vibrations

Bearing and shaft vibrations occur when the turboset is in operation, and represent the effects of rotating forces. Excessively high bearing and shaft vibrations – due for example to eroded blades in the turbine area – adversely affect the turbine's operating mode and can cause damage to both rotating and non-rotating components.

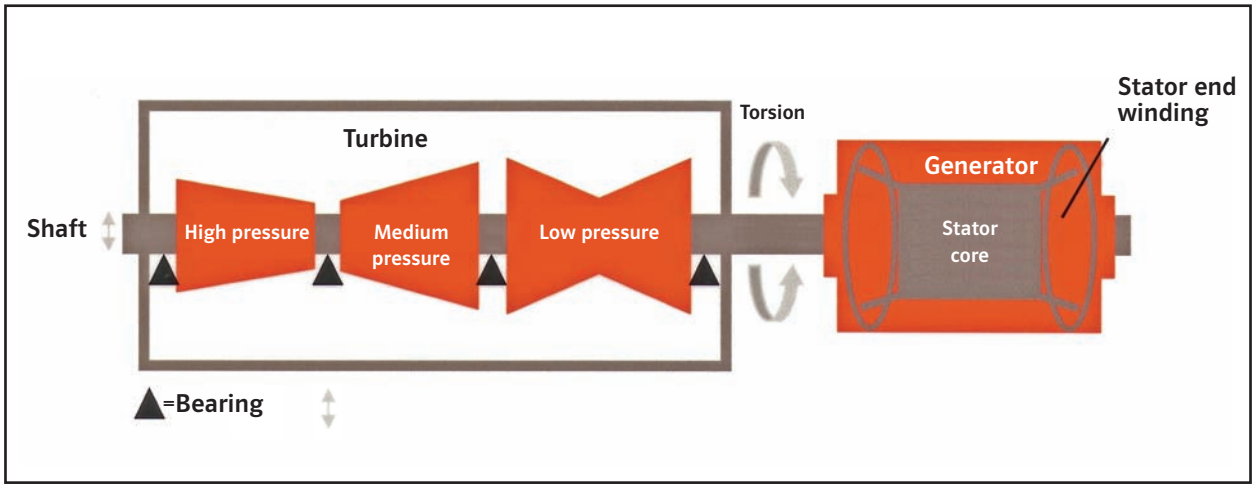
Vibrations of stator end-windings in the generator are due to the rotation of the electromagnetic rotor field and the hysteresis of the stator core. Excessive vibrations of stator end-windings, which may be caused by loosening in the end-winding area following grid faults, can even result in the total destruction of a running generator under certain circumstances.

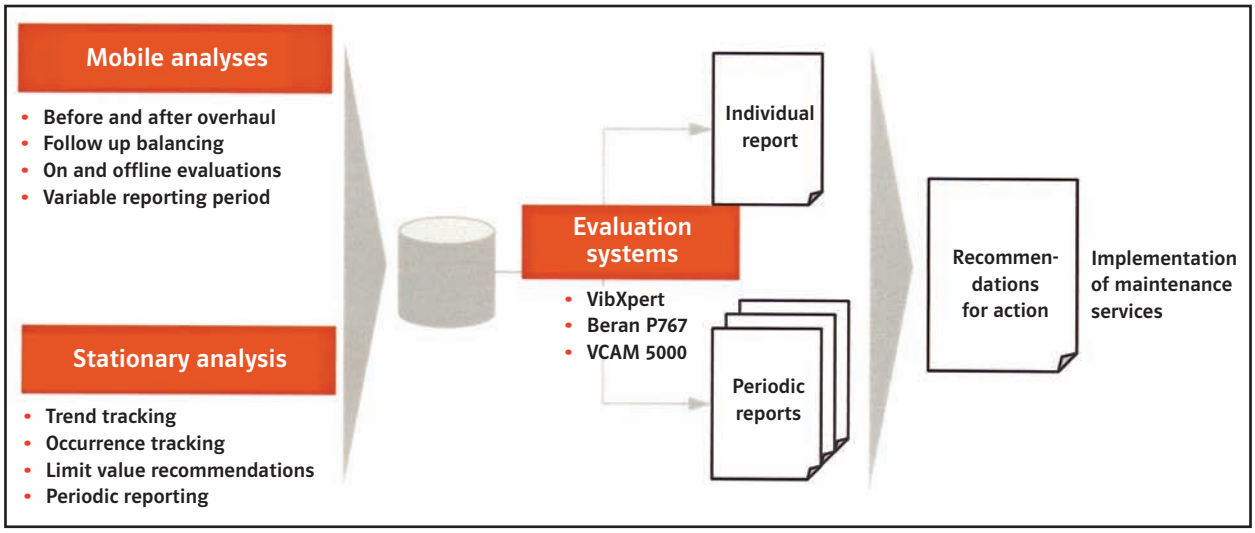
Torsional vibrations indicate that the rotor is twisted upon itself and are the result of an imbalance between input and output torque. Continuously occurring torsional vibrations can be caused by reactions from the supply network and can result in fatal damage to couplings if left undetected.

Confidence in overhaul planning

- Condition-oriented vibration monitoring can be carried out effectively by equipping the turboset with the appropriate vibration detectors and measuring systems.
- On the basis of a vibration analysis and diagnosis, malfunctions (damage identification) can be detected well in advance of an overhaul and steps taken to ensure that they are promptly rectified.
- An early and detailed baseline measurement of the turboset is essential if these objectives are to be achieved.

Turboset vibrations





Measurement and analysis – machine diagnostics – carrying out maintenance

Whatever the manufacturer, the Mechanical Engineering/ Vibration Diagnostics Division can offer a range of services for all major turbosets (ABB, AEG, Alstom, Ansaldo, BBC, GE, KWU, Siemens, Westinghouse, …) and industrial turbosets (Blohm & Voss, MANTurbo, LDW …), including

- sensor procurement and fitting (vibration sensors) and
- installation of customised measuring systems

as well as consultation on:

- vibration measurements
- analytical processing and visualising
- diagnostic evaluations and
- recommendations for remedial action.

Vibration measurements can be
mobile, i.e. as a kind of 'snapshot' of an operating point, using portable instruments,
part-static, i.e. monitoring operational vibration transmitters over longer periods of time using multichannel analysis and diagnostic systems,
static, i.e. continuous, with multichannel analysis and diagnostic systems.
With part-static and static measurements the data acquired from vibration monitoring can be supplied for evaluation purposes either online (data link) or offline (data media).

Following an expert technical evaluation (VibXpert, Beran P767, VCAM 5000 or other systems), appropriate measures are agreed and implemented if required.
Our approach is further supported by statistical comparisons of similar machines. At the same time this can provide a basis for long-term operational decisions.
We also offer the following **services**:

- In-service rebalancing of turbosets with high shaft and bearing vibrations
- Stator end-winding natural frequency analysis (bump test) at rest
- Mobile contactless torsional vibration measuring during ongoing operation.

Service package	1 Mobile measure	2 Part-static measure	3 Static measure
Before and after overhaul	•	•	•
Indiviual report	•	•	•
Periodic reports	•	•	•
Annual report			•
Recommendations for action	•	•	•

Cooperation with BERAN Instruments

The main objective of the cooperation between E.ON Anlagenservice and BERAN is to expand the range and availability of services, primarily for operators of industrial turbines in Germany and Austria.

BERAN has enjoyed 25 years of success on international markets as a supplier of vibration measuring technology that meets the most exacting demands. The range includes hardware and software for calibration, monitoring and portable measuring instruments for resolving vibration problems.

This cooperation allows E.ON Anlagenservice to enhance its own portfolio with the supply and installation of complete vibration measuring systems. Monitoring contracts also allow the machines to be remotely monitored by our experienced Vibration Diagnostics (MTS) specialists.

When it comes to developing new hardware and software, the two cooperation partners work closely to offer products that are both cost-effective and tailored to the customer's specific needs.

Our partner:

BERAN
Proven Condition Monitoring Solutions

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