

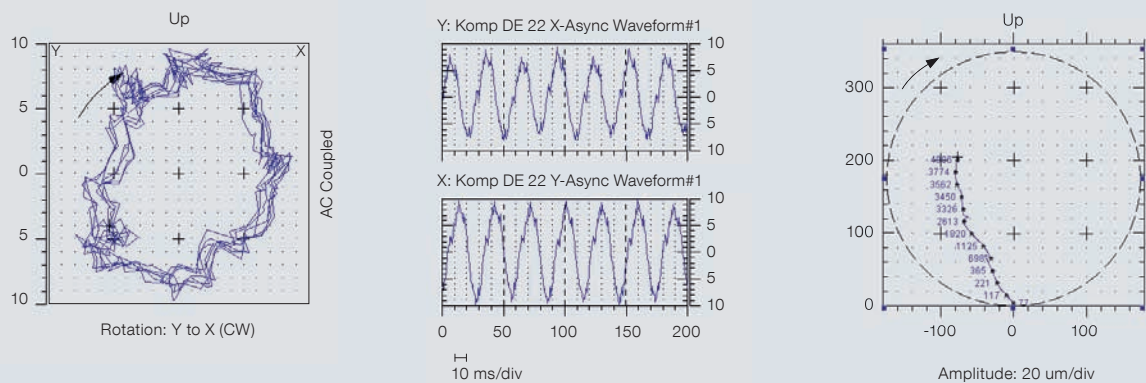
Vibration Analyses

Rotor-dynamic analyses



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Visualization of the rotor vibration orbits, individual probe signals and shaft position

Based on their long-standing experience in the assessment of vibrations and the use of the latest measurement and analysis methods the experts from the MAN PrimeServ Field Diagnostic Team provide you with reliable support in the analysis and assessment of the vibration behavior of your machinery.

Our compressors as well as our turbines normally represent core elements in the production processes of our customers. Unplanned downtimes can therefore lead to considerable production losses and related consequential costs. It is therefore of vital importance for every operator to know the status of his equipment at all times in order to be able to take early action to counteract unplanned downtimes.

Most MAN Diesel & Turbo compressors and turbines are equipped with permanently installed sensors for the direct monitoring of the rotor shaft vibrations. The

associated machinery protection system enables the operator to monitor the running behavior of the machine as well as to read the measurement signals for detailed analyses. The skilled analysis of the vibration behavior by the experts from the MAN PrimeServ Field Diagnostic Team allows precise conclusions regarding the machine status and the cause of changes in the vibration behavior – both through preventive vibration analyses and through the assessment of sudden vibration problems. This allows the operator to adjust his maintenance schedule on-time and therefore to ensure high plant availability.

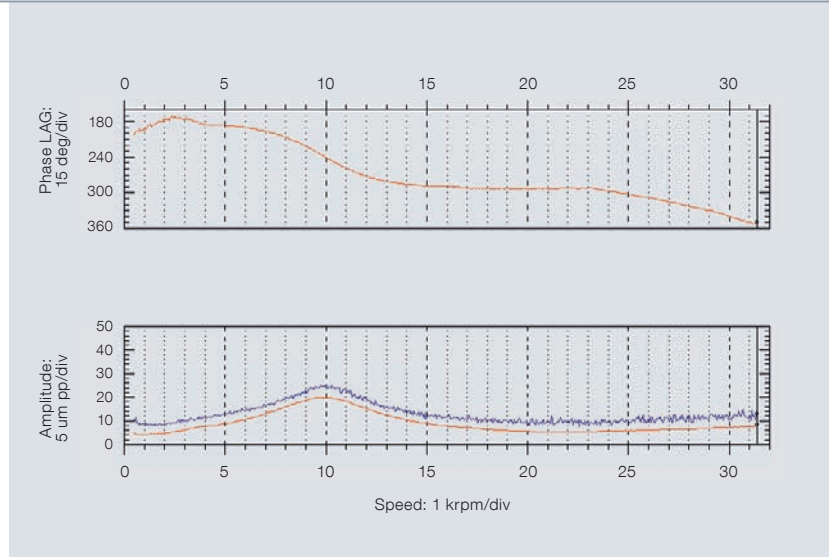
Procedure

The signals from the shaft vibration sensors, which are fitted in pairs on the rotor bearings, are brought together in the evaluation unit of the vibration monitoring system. Via standardized connections on the front of the machine protection system the signals can be directly passed downstream to the mobile analysis system during live operation.

The analysis software enables the experts from the Field Diagnostic Team to obtain an exact representation of the running behavior of the rotor within its bearings with simultaneous correlation to the relevant operation status.

Analysis tools

The analysis of the vibration signals over time enables the fast evaluation of the vibration behavior and of the center position of the shaft ends within the bearings. Furthermore, the depiction of the shape and the amplitude of the shaft vibrations visualizes the cyclical movement of the shaft centers around their average static position. The assessments are made more precise by the formation of frequency spectra that are used to break down the overall vibration into its individual components in terms of frequency and amplitude. In order to assess the dynamic behavior of the rotor over its entire permissible speed range a Bode diagram is recorded showing the behavior of the rotor when passing through the lateral-critical speeds. In addition, further analysis tools can be used depending on the particular case in order to assess the vibration phenomenon qualitatively and quantitatively as exactly as possible.



Bode diagram: Passing through the first lateral-critical speed

Assessment

The final assessment of the rotor vibrations is performed on the basis of relevant standards, guidelines and directives as well as the design of the rotor. Thereby, the direct access to the design data aids the precise machine assessment and the specific development of optimization measures. In addition, preceding rotor-dynamic analyses performed as a fingerprint following after commissioning or overhaul represent an important reference value.

Benefits

In addition to identifying vibration phenomena which cannot be discovered – or can be discovered only with difficulty – in the machine protection system, regular rotor-dynamic analyses also enable the identification of gradual changes in discrete frequency bands. Thereby, conclusions can be drawn about the cause of the changed vibration behavior and suitable maintenance measures can be planned at an early stage.

