

Rotor Vibration Measurements Using Laser Doppler

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Rotor Vibration Measurements Using Laser

Rotor vibration measurements are often highlighted as a major application of Laser Vibrometers due to their non-contact operation and inherent immunity to shaft run-out. Method of Approach: In such measurements, resolution of the individual axial and torsional

Rotor vibration measurements using laser Doppler ...

Rotor vibration measurements are often highlighted as a major application of laser vibrometers due to their noncontact operation and inherent immunity to shaft runout. In such measurements,

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resolution of the individual axial and torsional vibration components is possible via particular arrangement of the laser beam(s).

Rotor Vibration Measurements Using Laser Doppler ...

Laser Doppler vibrometry (LDV) offers an attractive solution when radial vibration measurement directly from a rotor surface is required. Research to date has demonstrated application on polished-circular rotors and rotors coated with retro-reflective tape.

Radial vibration measurements directly from rotors using ...

This important equation can be used to derive an expression for the velocity measured, U_m , in a scanning Laser Vibrometer measurement on a rotating target of flexible cross-section undergoing six degree-of-freedom vibration, θ :
$$U_m = \sin 2\theta S_x [x \dot{r}(P_0) + x \dot{f}(P)] - \cos 2\theta S_x \sin 2\theta S_y [y \dot{r}(P_0) + y \dot{f}(P)] + \cos 2\theta S_x \cos 2\theta S_y [z \dot{r}(P_0) + z \dot{f}(P)]$$
, in which $x \dot{f}(P)$, $y \dot{f}(P)$, $z \dot{f}(P)$ are the vibration velocity components in the x, y, z directions ...

Vibration measurements using continuous scanning laser ...

The application to vibration measurements on rotors is the particular focus of this paper which includes, for the first time, a three-dimensional consideration of the incident point on the target and validation of the DC component of measured velocity leading to evaluation of the individual components of the small but inevitable misalignments between the rotor and optical axes.

Vibration measurements using continuous scanning laser ...

Rotor vibration measurement is a key part of both the development and condition monitoring of rotating machinery. Measurement of the vibration transmitted from the rotor into a non-rotating component is the most common arrangement but in many situations the ideal rotor vibration measurement would be one taken directly from the rotating component.

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Radial vibration measurements on rotors using laser ...

Parallel beam laser vibrometers offer the additional advantage of insensitivity to translational vibrations, a factor of particular value in torsional vibration measurements on rotors and in pitch / yaw vibration measurements from the exposed end face of a rotor such as the crankshaft pulley of an engine.

Angular (pitch and yaw) vibration measurements directly ...

Radial vibration measurements directly from rotors using laser vibrometry: the effects of surface roughness, instrument misalignments and pseudo-vibration Steve J. Rothberg, Ben J. Halkon, Mario Tirabassi and Chris Pusey Wolfson School of Mechanical and Manufacturing Engineering Loughborough University, Loughborough, Leicestershire, LE11 3TU, UK.

Radial vibration measurements directly from rotors using ...

Radial vibration measurements taken directly from rotors using Laser Vibrometry are known to show a significant cross-sensitivity to the orthogonal radial vibration component. A process for resolving the individual components is now well established and is suitable for both radial measurements and pitch / yaw measurements which show an

Radial vibration measurements directly from rotors using ...

The photo detector is connected to the storage oscilloscope and microvoltmeter to display and measure the output. Next an electric motor, whose rotor vibrations are to be detected and measured, is so introduced in the experimental set up that its rotor cuts the laser beam partially. Download : [Download full-size image Fig. 1.](#)

Laser based optical sensor for vibration measurements ...

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The measurement of translational vibration velocity (on nonrotating structures) with laser - Doppler velocimetry (LDV) is now a well-established experimental technique. The basic principle of LDV requires the detection of the Doppler frequency shift in the coherent light scattered from a moving object.

Torsional and bending vibration measurement on rotors ...

Rotors with surface roughness up to 50 nm satisfy the former case provided the vibration displacement at the rotor surface does not exceed 20% beam diameter. For surfaces with roughness of 10 nm this can be extended to 50%.

Angular (pitch and yaw) vibration measurements directly ...

Rotor vibration measurements are often highlighted as a major application of laser vibrometers due to their noncontact operation and inherent immunity to shaft runout. In such measurements, resolution of the individual axial and torsional vibration components is possible via particular arrangement of the laser beam(s).

OPUS at UTS: Rotor vibration measurements using laser ...

Angular (pitch and yaw) vibration measurements directly from rotors using laser vibrometry 1. Introduction. Vibration has long been acknowledged as the most effective measure of the condition of rotating... 2. Surface velocity and measured velocity. The velocity measured by a parallel beam ...

Angular (pitch and yaw) vibration measurements directly ...

Laser Doppler Vibrometry (LDV) has been widely used in engineering applications involving non-contact vibration and sound measurements. This technique has also been used in some biomedical applications including hearing research. The detectable frequencies are in the range of near-DC to 1

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GHz or higher.

Novel Applications of Laser Doppler Vibration Measurements ...

Laser Doppler vibrometry (LDV) offers an attractive solution when radial vibration measurement directly from a rotor surface is required. Research to date has demonstrated application on...

Radial vibration measurements directly from rotors using ...

The vibration measurement of gas turbine rotor blades in an environment with a gas temperature of 1,600°C has been enabled by the adoption of air cooling and high-temperature laser sensors with excellent frequency characteristics for detection of the timings of turbine rotor blade passage (Figure 7).

Non-contact Vibration Measurement of the Rotor Blades that ...

Based on the principles of laser Doppler velocimetry, the laser torsional vibrometer (LTV) was developed for non-contact measurement of torsional oscillation of rotating shafts, offering significant advantages over conventional techniques.

TORSIONAL AND BENDING VIBRATION MEASUREMENT ON ROTORS ...

measure blade vibrations using laser Doppler vibrometry (LDV). Most research with this approach implements LDV in the Lagrangian reference frame (more commonly known as tracking LDV) where the...

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