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6. Important terminologies and definitions in balancing techniques

In the interest of common terminology the most important concepts and definitions of balancing techniques are summarized as specified in the ISO standard 1925 "Balancing - Vocabulary" [3].

1. Rotor

A body, capable of rotation, with journals which are supported by bearings.

2. In-board rotor

A two-journal rotor which has its center of gravity between the journals.

3. Out-board rotor

A two journal rotor which has its center of gravity located outside the journals.

4. Rigid rotor

A rotor is considered rigid when it can be corrected in any two (arbitrarily selected) planes and, after that correction, its unbalance does not significantly exceed the balancing tolerance (relative to the shaft axis) at any speed up to maximum operating speed.

5. Flexible rotor

A rotor not satisfying the definition of a "rigid rotor".

6. Perfectly balanced rotor

A rotor the mass distribution of which is such that it transmits no vibratory forces or motion to its bearings as a result of centrifugal forces.

7. Principal inertia axis

For any point in a rotor three cartesian coordinates (successively perpendicular existing axes) are given at which the centrifugal moments are zero. These axes are called the principal inertia axes.

8. Shaft axis

The straight line joining the journal centers.

9. Eccentricity

For a two-bearing rotor, the distance of the center of gravity axis from the shaft axis.

10. Unbalance

The physical variable which gives rise to an unbalance condition.

11. Amount of unbalance

The quantitative measure of unbalance in a rotor (referred to a plane) without referring to its angle. It is obtained by taking the product of the unbalance mass and the distance of its center of gravity from the shaft axis. Units of unbalance are, for example, oz-in, g-mm etc.

12. Unbalance vector

A vector whose magnitude is the amount of unbalance and whose direction is the angle of unbalance.

13. Unbalance condition

That condition which exists in a rotor when vibratory force or motion is imparted to its bearings as a result of centrifugal forces.

14. Initial unbalance

Unbalance of any kind that exists in the rotor before balancing.

15. Permissible residual unbalance

The maximum amount of unbalance in a rigid rotor, below which the unbalance condition is considered to be permissible (ISO 1940).

16. Static unbalance

That condition of unbalance for which the central principal axis is displaced only parallel to the shaft axis.

17. Quasi-static unbalance

That condition of unbalance for which the central principal axis intersects the shaft axis at a point other than the center of gravity.

18. Moment unbalance

That condition for which the central principal axis intersects the shaft axis at the center of gravity.

19. Dynamic unbalance

That condition in which the central principal axis is not coincident with the shaft axis.

20. Measuring plane

A plane perpendicular to the shaft axis in which the amount and angle of the unbalance vector is determined.

21. Correction plane

A plane perpendicular to the shaft axis of a rotor in which correction for unbalance is made.

22. Balancing

A procedure by which the mass distribution of a rotor is checked and, if necessary, adjusted in order that the vibration of the journals and/or forces on the bearings at a frequency corresponding to operational speed are within specified limits.

23. Field balancing

The process of balancing a rotor in its own bearings and supporting structure (in the operational condition).

24. Balancing machine

A machine that provides a measure of the unbalance in a rotor which can be used for adjusting the mass distribution of the rotor mounted in it so that once per revolution vibratory motion of the journals or force on the bearings can be reduced if necessary.

25. Method of correction

A procedure whereby the mass distribution of a rotor is adjusted to reduce unbalance, or vibration due to unbalance, to an acceptable value. Corrections are usually made by adding material to, or removing it from, the rotor.

26. Static or single-plane balancing

A procedure by which the mass distribution of a rigid rotor is adjusted to ensure that the residual static unbalance is within specified limits.

27. Dynamic or two-plane balancing

A procedure by which the mass distribution of a rigid rotor is adjusted in order that the residual dynamic unbalance is within specified limits.

28. Multi-plane balancing

As applied to the balancing of flexible rotors, any balancing procedure that requires unbalance correction in more than two axially seperated correction planes.

29. Low speed balancing

A procedure of balancing at a speed where the rotor to be balanced can be considered rigid.

30. High speed balancing

A procedure of balancing at speeds where the rotor to be balanced cannot be considered rigid.

7. Summary

You've made it! Now that the seminar is over do you agree that balancing is not "black magic"? Are you convinced now that field balancing can be learned and doesn't need the involvement of a so-called "expert" to be successfully done?

If you can answer positively to these questions, an important objective of the seminar has been achieved; namely the elimination of the anxiety many feel before starting any balancing. Start solving the balancing problems which exist in your plant as soon as possible. It is more simple than you think.

The modem balancing instruments which are available today simplify and speed up the task to a greater extent than ever before, with intelligent solutions and operator convenience.

If you need any further support please contact your technical support team. As a manufacturer of balancing instruments with world-wide support possibilities, Brüel & Kjær Vibro will be glad to provide you with assistance and be your partner for any balancing questions.

Here's to good future cooperation and plenty of success in solving your balancing problems!