

CALCULATION OF THE DISPLACEMENT OF THE OSCILLATING BEARING ACCORDING TO THE INTENSITY OF THE RADIAL PRESSURE

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Annotation: this method allows engineers to accurately predict the displacement of oscillating bearings under different radial loads, which is very important for the design and optimization of mechanical systems.

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The radial pressure in an oscillating bearing is known to have a considerable effect on the overall displacement of the bearing. Displacement, in this context, refers to the amount of movement or deflection of the bearing from its original position. In this article, we will explore the calculation of displacement in an oscillating bearing according to the intensity of the radial pressure.

To begin with, it is important to understand the basic structure of an oscillating bearing. An oscillating bearing generally consists of two rings, an inner and outer ring, which can oscillate or move relative to each other. Between these two rings, there are rolling elements like balls or rollers that support the load carried by the bearing. The radial pressure in the bearing refers to the force that acts perpendicular to the axis of rotation of the bearing and is exerted on the rolling elements. This pressure can arise due to a variety of causes like misalignment, wear, or contamination of the bearing.

The displacement of the bearing due to the radial pressure can be calculated using a simple formula that relates the displacement to the radius of curvature and the radial load. This formula is given as:

$$\delta = (F_r * a^2) / (E * I)$$

Where δ is the displacement of the bearing, F_r is the radial load, a is the radius of curvature of the bearing, E is the modulus of elasticity of the bearing material, and I is the moment of inertia of the bearing. This formula assumes that the contact between the rolling elements and the raceways of the bearing is perfectly elastic.

Let us now dive deeper into this formula and understand each of the parameters.

Radius of Curvature (a): The radius of curvature refers to the radius of the circle that is tangent to the raceway of the bearing at the point where the maximum deflection occurs. It is a geometric property of the bearing and is determined by the design of the bearing.

Radial Load (F_r): The radial load is the force that acts perpendicular to the axis of rotation of the bearing and is exerted on the rolling elements. This load can arise due to a variety of causes like external loads, misalignment, or eccentricity of the rotating parts.

Modulus of Elasticity (E): The modulus of elasticity is a measure of the stiffness of the bearing material. It is a property of the material and is determined by the type of material used in the bearing.

Moment of Inertia (I): The moment of inertia is a measure of the resistance of the bearing to bending or twisting. It is also a property of the bearing and is determined by its design.

Using this formula, we can calculate the displacement of the bearing for any given value of the radial load. As the load increases, the displacement also increases proportionally. This displacement can cause a variety of issues like increased wear, increased noise, and decreased bearing life. Therefore, it is important to ensure that the radial load on the bearing is within the recommended limits.

In conclusion, the calculation of displacement in an oscillating bearing due to the intensity of the radial pressure is a crucial parameter that needs to be analyzed for the proper functioning of the bearing. The formula mentioned above can be used to calculate this displacement, which is determined by several factors like the radius of curvature, radial load, modulus of elasticity, and moment of inertia of the bearing. A thorough analysis of these parameters is necessary to ensure that the radial load on the bearing is within safe limits, thereby minimizing the risk of bearing failure and increasing its lifespan.

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