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Analysis of equivalent supporting point location and carrying capacity of misaligned journal bearing

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Abstract: This paper analyzes property of vertical misaligned journal bearing, aiming to provide an approach for efficiently analyzing equivalent supporting point location and carrying capacity of misaligned journal bearing without using numerical simulation. Equivalent supporting point location is described through the dimensionless axial coordinate of equivalent supporting point and presented versus length-diameter ratio, eccentricity ratio, and dimensionless misalignment angle. The ratio between misaligned bearing carrying capacity and corresponding aligned bearing carrying capacity is referred as to misalignment factor for carrying capacity for short. Functions of equivalent supporting point location and misalignment factor for carrying capacity dependent on length-diameter ratio, eccentricity ratio, and dimensionless misalignment angle are obtained. By typical examples, the accuracies of the functions are verified to meet engineering requirements.

Keywords: Equivalent supporting point location; Carrying capacity; Journal misalignment

1. Introduction

For heavy load bearings, bending deformation of the shaft occurs under the influence of gravity, such that journal's axis and that of bearing are misaligned. For bearings supporting cantilever, such as marine stern tube bearing supporting the propeller stretching outside the ship, the misalignment is particularly serious and will significantly affects bearing carrying capacity [1-4]. Meanwhile, bearing is an important part of shaft system and an aligned bearing is usually simplified as an equivalent supporting point at bearing axial midplane in shaft dynamic analysis [5-6].

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