

STABILITY ANALYSIS OF VERTICAL ROTOR WITH EXTERNAL STIFFNESS AND DAMPING SUPPORTED ON JOURNAL BEARINGS

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ABSTRACT

This paper presents the stability boundaries for vertical Jeffcott rotor, extended vertical Jeffcott rotor, and an external flexible damped support vertical Jeffcott rotor with external stiffness and damping supported on hydrodynamic journal bearings. This paper extends the analysis presented by Guo and Kirk [1,2] by considering the effect of external stiffness on the rotor bearing system stability. The minimum value of negative real parts of all eigenvalues used to describe stability characteristics is determined from the numerical solution of characteristic equation of rotor bearing system. It is shown that for a vertical Jeffcott rotor with external stiffness and damping there are two regions of stability boundary with a region of instability between them. For the extended vertical Jeffcott rotor with external rotor stiffness and damping, two regions of stable operation are observed. The lower stability region is due to external stiffness while the upper stability region is influenced by external rotor damping, respectively. For the external flexible damped rotor bearing system two regions of stable operation are observed and the external stiffness and damping to the rotor influences lower threshold speeds.

Keywords: Jeffcott rotor, stability analysis, stiffness and damping, journal bearings.