Acceleration of Unbalanced Cracked Flexible Rotor Through the Critical Speed

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ABSTRACT

The dynamic response of a rotor system when it passes through critical speed during acceleration is of great importance for vibration monitoring and diagnostics. Many types of rotating machines, for example turbine aircraft engines, typically operate above the first or higher critical speed and they are subjected to frequent start-ups and shut-downs. In the present study the dynamic response of a cracked rotor passing the critical speed and subjected to constant driving torque is investigated, with a simple hinge model for small cracks and modified function for deep cracks. The effects of crack depth, eccentricity, damping ratio, and driving torque on vibrational behavior of a cracked rotor occurring through the critical speeds or during "stalling" in resonance are investigated.