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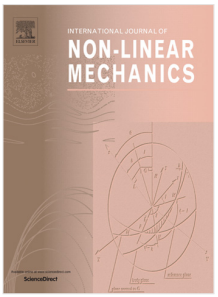


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# Mitigation of nonlinear oscillations of a Jeffcott rotor System with an optimized damper and nonlinear energy sink

**Ghasem Ghannad Tehrani and Morteza Dardel[1]**

## Abstract

Contact occurrence between disk and stator as result of undesirable vibrations produced by eccentricity of the disk is one of the most destructive and common phenomena in rotor dynamics systems. In this work, utilizing tuned mass damper (TMD) and nonlinear energy sink (NES) are suggested as a solution for preventing contact occurrence. The mass and angular position of absorbers determine their efficiency for resisting the eccentricity force produced by the disk, and their stiffness and damping coefficients determine the displacement scope of the absorber. In order to efficiently design absorbers, optimization is proposed. In this suggested optimization process, complex averaging method is used in order for deriving the equations of motion of the system in presence of dynamic absorbers at the steady state condition. Afterwards, for determining trustworthiness of each absorber's performance, system's behavior is studied for different values of its parameters such as rotational speed, stiffness, clearance and eccentricity in presence of each absorber. From the obtained results, it can be perceived that TMD and NES are as efficient as possible and they have exactly the same positive influence on the system's vibrations. The reliability of the proposed optimization process can be determined by the results.

**Key word:** Jeffcott rotor, Contact, TMD, NES, Complex averaging method, Optimization, rotor dynamics.

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