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A numerical investigation on passive suppression of the parametric instability phenomenon using a rotative non-linear vibration absorber

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Abstract

This paper presents a numerical investigation on the use of a rotative non-linear vibration absorber (NVA) as a passive suppressor for the parametric instability phenomenon. Focus is placed on the influence of the mass, the *radius* and the damping of the NVA on its capacity to reduce the amplitudes of the cylinder in which it is installed.

Maps of statistics of the cylinder response (namely, its maximum value and standard deviation), time histories of both the cylinder and the NVA responses, as well as the suppression efficiency are obtained for different dimensionless quantities that define the suppressor. The analysis methodology include the discussion of these maps and spectral analyses of the time histories resulting from selected points of these maps.

The results show that, depending on the NVA parameters, bounded responses are achieved even in a scenario in which the parametric excitation parameters lead to unbounded responses of the cylinder without the suppressor. Furthermore, different types of cylinder response are obtained, including strongly modulated responses as well as complete suppression of oscillations. An asymptotic analysis based on the complexification-averaging and multiple scales methods allows identifying that the suppression is associated with a capture on

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