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A study on the coefficient of restitution effect on single-sided vibro-impact nonlinear energy sink

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Abstract: Vibration mitigation is an essential factor in many engineering applications given the high risk of failure due to the frequent occurrence of earthquakes, blasts, collisions and fluid-structure interaction. Linear and nonlinear vibration absorbers have been continuously studied to be employed in such structures to decrease the vibration levels and therefore protect them from destruction. Up to date, the most effective and efficient passive vibration absorber is the single-sided vibro-impact (SSVI) nonlinear energy sink (NES) which consists of a small mass attached to the primary structure via linear stiffness and linear damping coupling elements in addition to a rigid barrier that enables it to engage in non-smooth inelastic impacts. It has been shown in the literature that an accurately optimized SSVI NES is capable of transferring and dissipating high percentages of the initial input energy into the primary structure. However, most of the investigations in the literature implement a coefficient of restitution of 0.7 corresponding to steel-to-steel impacts. Consequently, this paper investigates further improvements to the SSVI NES by studying the effect of changing the coefficient of restitution to increase the efficiency of targeted energy transfer (TET). It is found that lowering the coefficient of restitution increases the efficiency of the SSVI NES to transfer and dissipate energy from a large-scale nine-story structure.

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