**An Amplitude Adaptive Sequential Friction-Spring Add-On Damper**

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The damping of undesired oscillations is a constant task faced in any system involving a wide range of excitation frequencies. Especially in mechanical systems, undesired oscillations in the vicinity of a system's resonance lead to large displacements, which reduce or end the life span of a machine. A classical solution involves introducing a viscous damping element into the system, in order reduce the overall magnitude of a system's amplitude response [1]. However, this solution has a low energy efficiency, since energy dissipation is not required over the whole range of frequencies, but instead in the vicinity of a system's resonance.

A more advantageous solution is characterized by an amplitude-adaptive behavior, in which a component only dissipates energy when needed. This amplitude adaptive behavior is for example realized by means of a sequentially connected friction-spring element, as studied in [2]. In order to further investigate the ability of this component to limit oscillations, this work studies it in two arrangements: as a vibration absorber and as a vibration isolator, see Figure 1. An analytical description of the amplitude response of the system is derived via averaging methods in combination with a modal decoupling, as suggested in [3]. These analytical results are compared with numerical simulations. The discrepancy between both predictions are within the expected range of accuracy of asymptotic methods.

It is shown that both systems are able to limit oscillations. By the means of an averaging method an approximation for the maximal amplitude is given and a condition for the amplitude limitation is derived.

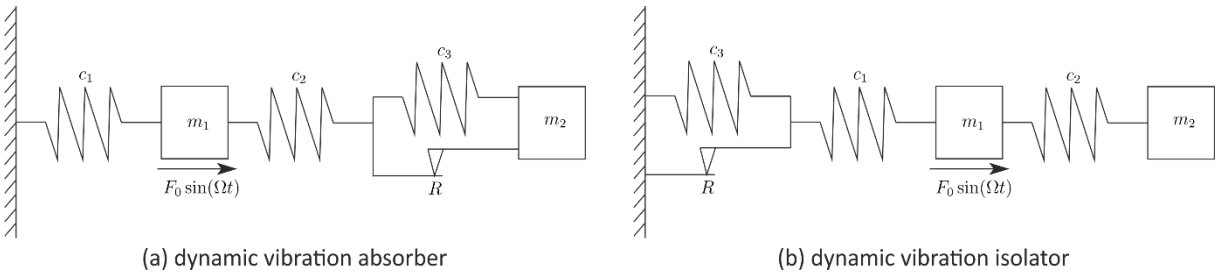


Figure 1: The considered Systems

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**References**

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