Schiller GmbH

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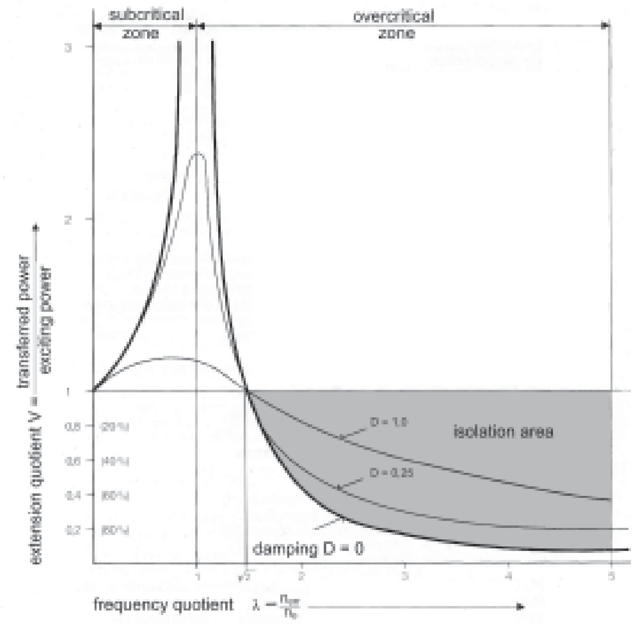
Fundamentals of Vibration Isolation

The aim of vibration isolation is to isolate either the vibrating object (active isolation) or the object that must be protected against vibration (passive isolation) from its surrounding. This is realized by interposing springs in order to make the particular object an independent, oscillatory system.

The interference suppression functions as follows: The frequencies must be coordinated in such a way that the cyclical movements of the system are no longer synchronized but antiphased with the interference. That means that when the exciting power directed downwards has reached its maximum, the vibrating object is in its highest position, i. e. it swings contrary to the exciting power.

To reach an effective isolation of osciallation the frequency quotient λ must as high as possible:



$$\lambda = \frac{\textit{exciting frequency}}{\textit{natural frequency}}$$

$\lambda < 1$	no vibration isolation impact sound insulation possible
$\lambda = 1$	unstable oscillation - max. values within the resonant area
$\lambda > \sqrt{2}$	vibration isolation; efficiency η depending on λ

When the frequency quotient λ has a value $> \sqrt{2}$, we call it vibration isolation.
When designing a resilient bedding, you must choose the natural frequency so that it is out of the resonant area. If the exciting frequency is in phase with the natural frequency, you might face unstable oscillations.

In general you reach an effective vibration isolation by a low frequency tuning, i. e. a high frequency quotient. A high damping D influences the isolation efficiency in a negative way, because in this case dynamic forces will be transferred into the ground. Nevertheless a certain damping of the isolation elements is necessary in order to avoid high vibration amplitudes in the resonant area as well as too fast swinging at shock excitation.

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