FABSORB™ vs. Felt

FABREEKA® VIBRATION & SHOCK CONTROL

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An Application Example

In order to select the proper isolator to provide vibration and/or shock isolation, the properties of the isolator (dynamic natural frequency and damping), the dynamic disturbance and the dynamic response of the isolator (transmissibility curve) must be known.

To illustrate the difference between static and dynamic test data and to support the principles discussed, the following example will be used.

In this example, a comparison between traditional felt material versus Fabsorb™ material will be made. The static natural frequencies of each will be calculated using the static equation and load-deflection data supplied by the manufacturers. The dynamic natural frequencies are the results of dynamic testing.

Example

A 7,500 lb machine tool requires a support foundation 5' x 10' x 4' deep for proper support. The foundation and machine require isolation by either Fabsorb™ or felt material 1" thick.

Assuming concrete with reinforcement to be 150 lb/ft^3, the foundation will weigh approximately 30,000 lbs.

30,000 + 7,500 = 37,500 lbs Total Supported Load

The base of the foundation is 5' x 10' or 50 ft^2, so the load on the isolation material will be:

$$\frac{37{,}500 \text{ lbs.}}{50 \text{ ft}^2} = 750 \text{ lbs/ft}^2 \text{ or } 5.2 \text{ psi}$$

From manufacturer's static load-deflection data at 5.2 psi:

Fabsorb™ will deflect 0.200".

Felt material will deflect 0.265".

We will use the Static Principle equation below to determine the isolator's static natural frequency, where g represents the gravitational constant and δs represents the isolator's static deflection.

$$Fn = \frac{1}{2\pi}\sqrt{\frac{g}{\delta s}}$$

Fabsorb™

$$Fn_{STATIC} = \frac{1}{2\pi}\sqrt{\frac{386 \text{ in/s}^2}{0.200 \text{ in}}}$$

$$= 0.159 \times 1930$$

$$Fn_{STATIC} = 6.98 \text{ Hz}$$

Felt

$$Fn_{STATIC} = \frac{1}{2\pi}\sqrt{\frac{386 \text{ in/s}^2}{0.256 \text{ in}}}$$

$$= 0.159 \times 1508$$

$$Fn_{STATIC} = 6.17 \text{ Hz}$$

Now, consider the dynamic natural frequency and damping properties of each material using the following equation:

$$T = \frac{1}{(Fd/Fn)^2 - 1}$$

where T = transmissibility, Fd = disturbing frequency and Fn = natural frequency.

Using this equation, the dynamic natural frequency of 1" thick Fabsorb™ at 5.2 psi is *actually* 19.0 Hz.

and the dynamic natural frequency of 1" thick Felt material at 5.2 psi is *actually* 38.0 Hz.

Fabsorb™ $Fn_{DYNAMIC}$ = 19.0 Hz.

Felt $Fn_{DYNAMIC}$ = 38.0 Hz.

Dynamic testing for both materials was conducted by an independent laboratory.

For additional information regarding isolation material dynamic performance, please refer to pages 12-13 of Fabreeka's® *Foundation Isolation Solutions for Equipment & Machines* brochure #FAB 3000-050.