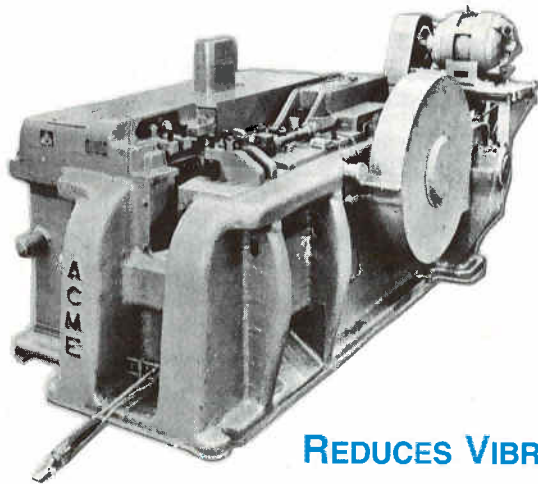
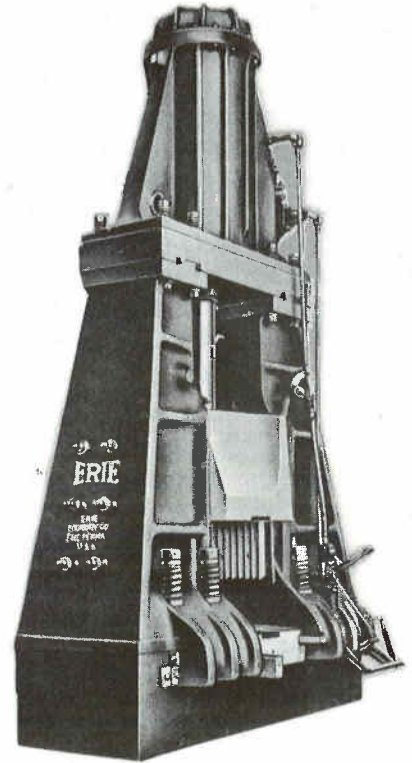


Voss

engineering, inc.

Fabricated Pads for Shock and Vibration Control in Heavy Equipment



- **SORBTEX**
- **UHMW PE**
- **PHENOLIC**

REDUCES VIBRATION REDUCES NOISE PROTECTS EQUIPMENT

voss engineering, inc.

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SORBTEX is a high quality resilient structural grade elastomeric material that has the unique ability to absorb and dampen impact shock and vibration in heavy equipment applications.

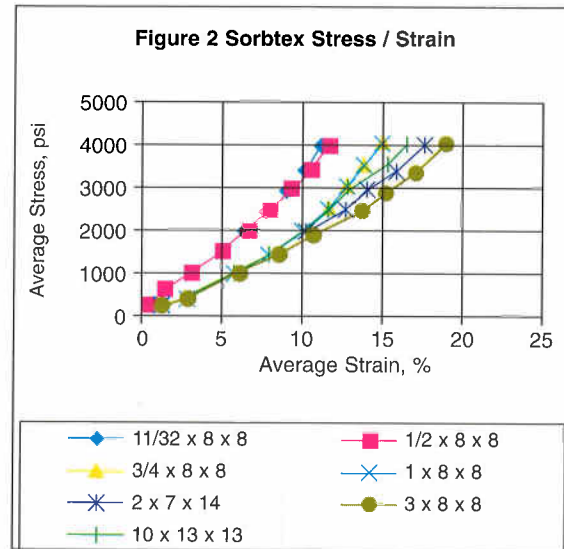
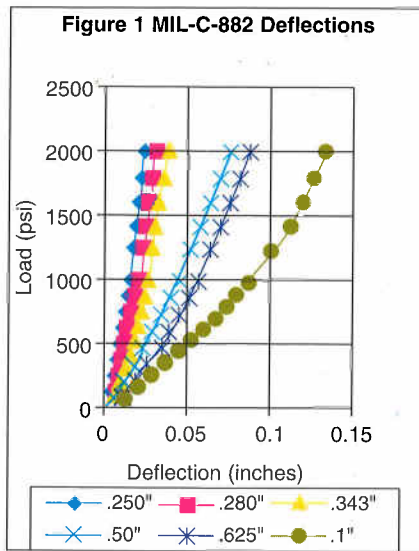
SORBTEX material is composed of multiple layers of the highest quality woven 8 ounce cotton-polyester duck fabric, treated with mold and mildew inhibitors and impregnated with oil resistant synthetic rubber. SORBTEX pads have approximately 64 layers of this fabric / rubber laminate in a one inch thick pad. SORBTEX is manufactured to the military specification MIL-C-882 E, 27 January 1989. SORBTEX properties are exceptionally suited for the reduction of impact shock, vibration and structure borne noise.



SORBTEX SPECIFICATIONS

1. Hardness (Shore A)	90±5
2. Compression-Minimum Ultimate Strength	10,000 psi
3. a. Shear Modulus (G) Based on tests conducted according to ASTM D4014-87, annex A1 at pure shear strain of 33 percent	450 psi
b. Apparent Shear Modulus (GA) At compressive stresses of 500, 1000, 2000 and 3000 psi, based on shear stress measurements made at 70 degrees F at a shear plus slip strain of 50 percent	400, 850, 1150 & 1235 psi
4. Tensile Strength ASTM-D-412 Heat aged 7 days at 212 degrees F	5900 psi ±40%
5. Permanent Set	2±1%
6. Volume swell per FED-STD-601 (Ref.)	25% max
7. Dielectric Strength, ASTM D 149 (VDC/mil.)	155
8. Volume Resistivity, ASTM D 257 (ohm degrees cm x 10 ¹⁰)	3
9. Compressibility ASTM F-36	4.0
10. Thickness Tolerance	5% of thickness

SORBTEX can withstand compressive loads between 10,000 and 20,000 psi depending on the thickness and plan size of the pad. Military Specification MIL-C-882 details compression test on 2" x 2" plan size samples to insure a quality product is being manufactured. An average of these compression requirements is detailed in Figure 1. In addition Voss Engineering, Inc. has conducted numerous tests on SORBTEX on actual size pads utilized in the industry as shown in Figure 2.

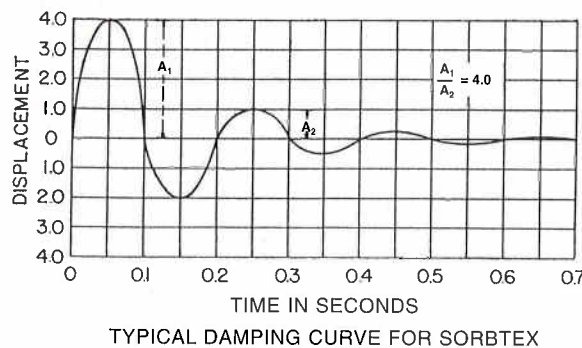


Even though SORBTEX can handle very high compressive loads without failure, it is recommended that the compressive stress placed on the pads to be no greater than 2000 psi to accommodate safety factors and to allow the SORBTEX pad to adequately dissipate vibration.

All vibration and shock isolators require the use of resilient materials. Resilience is described as the ability of a material to deform and store energy when subjected to a load. Vibration isolators are either linear or non-linear. A linear isolator is generally the mechanical type in which the deflection will increase proportionally to the load. SORBTEX is classified as a non-linear type of isolator or hardening spring type isolator. The amount of deflection will decrease at higher loads as seen demonstrated in the above stress / strain curves. In many applications, a non-linear isolator is preferred due to its ease of application, no maintenance, and low cost.

The physical effect of damping in the resilient SORBTEX material is to cause the machine set in motion to come to rest more quickly than without it. When a machine on a mounting is suddenly displaced and "just" returns to its original position of equilibrium without oscillating, it is said to be "critically damped." When a machine oscillates many times before coming to rest, the mounting is said to have low damping qualities. Damping is measured in terms of logarithmic decrement. SORBTEX has a logarithmic decrement of 1.40 which is almost 50 times greater than steel which has a logarithmic decrement of .03. A typical damped oscillation curve for SORBTEX is shown in Figure 4.

A typical damped oscillation curve with SORBTEX is shown in Figure 4.

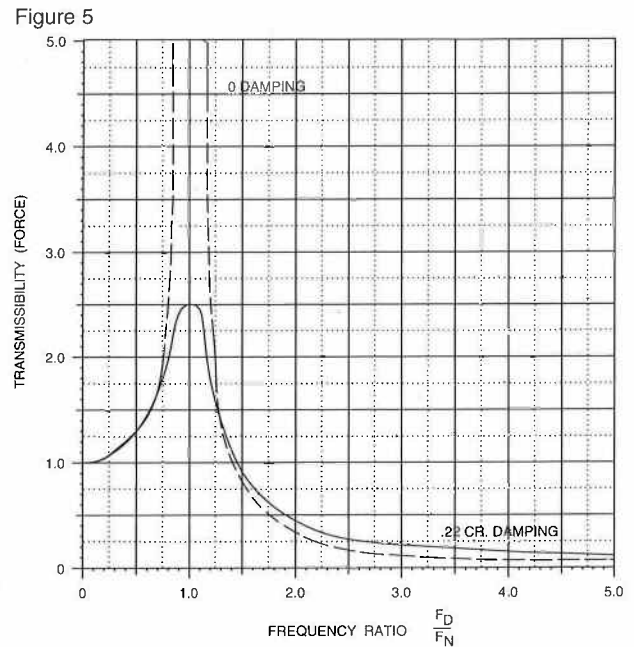


A reasonable amount of damping has a desirable effect in both vibration and shock isolation. In shock, damping permits the oscillation of the impact to die out more rapidly. In vibration isolation, damping reduces the motion of the vibrating machine for all frequencies and reduces the force transmitted to the supporting base or sub structure.

There are two terms that pertain to the load conditions placed on the SORBTEX pads. Static deflection pertains to the change in thickness of the pad under the weight of the machine being supported. Displacement is the distance the object is moved from its rest position when vibrating. Displacement of a vibrating object may change due to the disturbance, but the deflection (or static deflection) depends only on the weight of the supported object, and is determined from the load deflection characteristics of the resilient material.

An object supported on a resilient mounting can be forced to vibrate at a frequency other than its natural frequency by subjecting the object to uniformly periodic disturbances. Such disturbances are produced by the unbalance of a rotating machine; the frequency of the disturbance is the same as the RPM of the machine.

When the forced frequency of the machine is the same as its natural frequency on the resilient mounting, resonance occurs and the machine moves through large amplitudes; under such response, the force transmitted to the supporting structure is also large. At other than resonant frequency, the amount of motion of the machine and the force transmitted to the support depend on the ratio of the force disturbing frequency to the natural frequency. For an isolator like SORBTEX, the transmissibility, which is the ratio of the force transmitted by the isolator divided by the force applied to the machine due to the unbalance. This is shown in Figure 5.

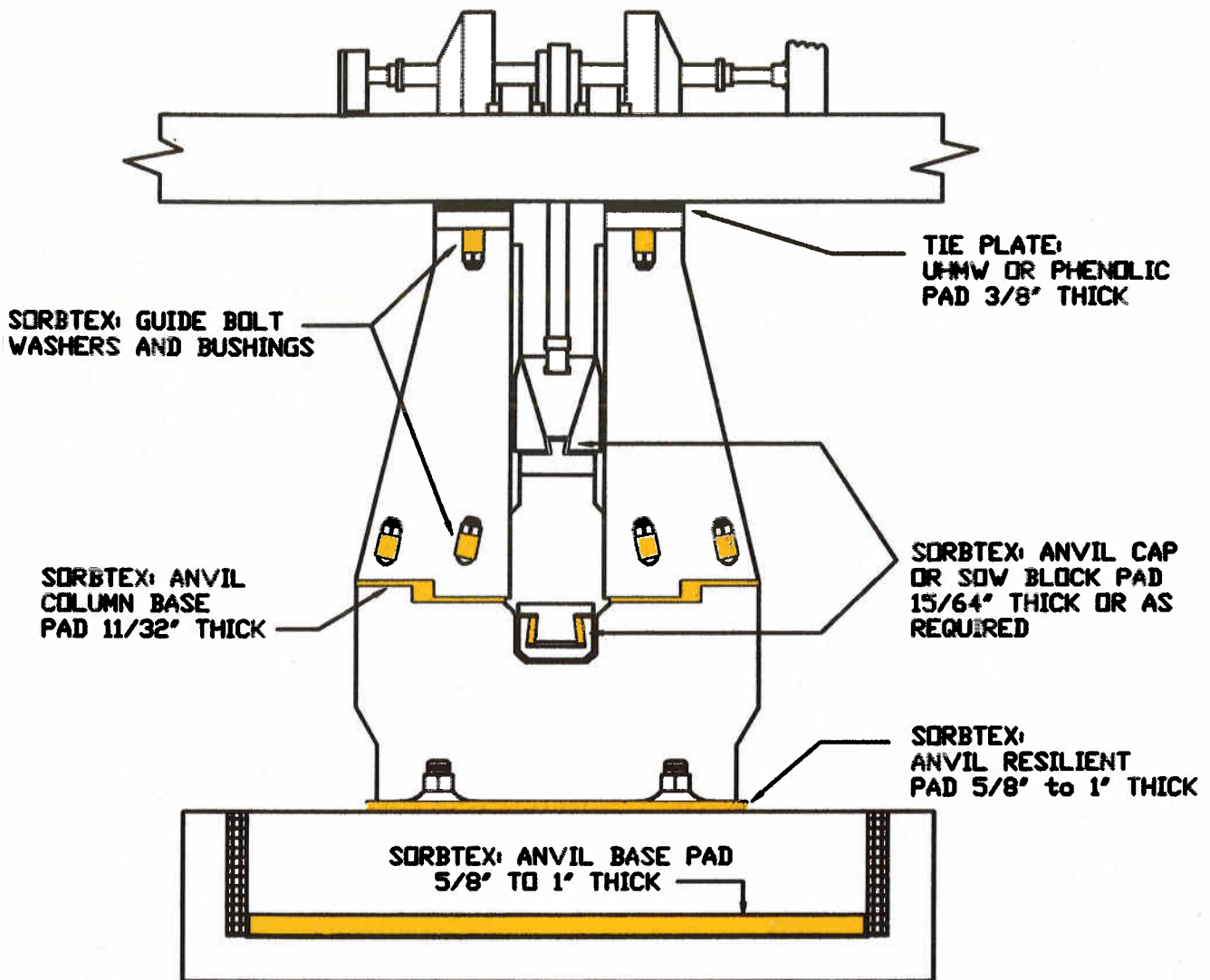


Additional technical information on SORBTEX can be found in the Voss Engineering, Inc. publication "*Technical Manual for Machinery Application of SORBTEX.*"

In addition to being a great base isolation material SORBTEX can be utilized as a shock and vibration material in other components of heavy equipment. SORBTEX can be easily die cut, formed or machined into a variety of shapes to fit a specific application.



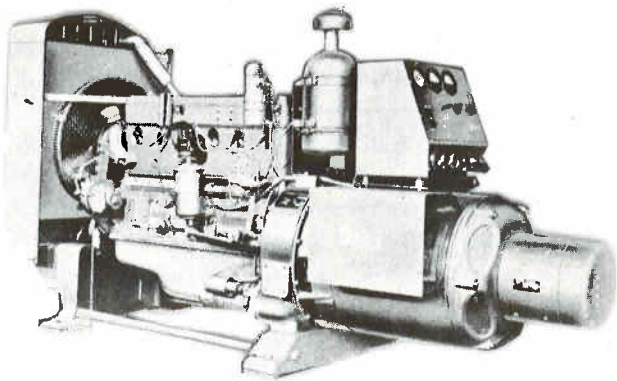
APPLICATIONS IN FORGE HAMMERS



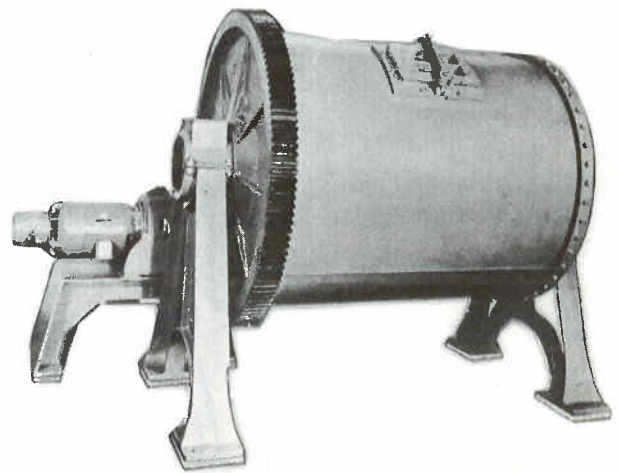
The Advantages of using **SORBTEX** resilient pads on Forge Hammers...

- Greatly reduces impact shock and transmitted vibration
- High damping characteristics with minimal physical deflection
- Reduces breakage resulting in downtime and replacement cost
- Reduces noise

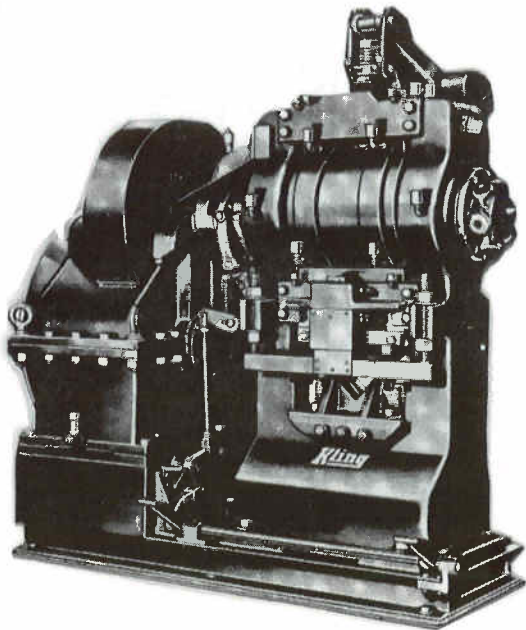
SORBTEX can be used for vibration damping in applications like these...



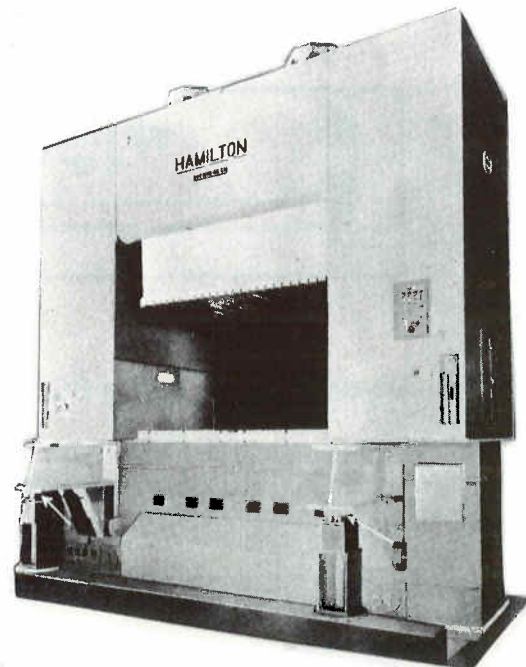
Generators



Ball Mills and Tumbling Barrels



Power Shears



Stamping Machines

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