2,000 lb. (1134 kg) loads, we can load it between 1,000 and 4,000 lb. (453 and 1814 kg), and the performance will be the same. Rubber, springs or air mounts don’t do this. Fiberglass is not in standard sizes of mounts and can be cut to specific shapes or sizes. Using fiberglass, a machine can be leveled by the use of shim plates or 3,000 lb. (1361 kg) pads. Neoprene is generally oil-resistant and normally used as a vibration isolator and not for shock loads like shown in Fig. 9. The most prominent use on equipment operating below 250 rpm is the use of 2,500 lb. (1134 kg) loads, and there is no possibility of tool chatter.

- **Neoprene isolators**
  - Neoprene is furnished in molded shapes or sizes ranging from 35 lbs. to 2500 lbs. (16 and 1134 kg). Neoprene is generally oil-resistant and normally used as a vibration isolator and not for shock loads like shown in Fig. 9.

- **Spring supported**
  - Spring isolators are available in many different forms, such as the example that Fig. 8 illustrates. Springs are generally used on shock loads to isolate equipment from the floor. The most prominent use on equipment operating above 250 rpm is the use of 2,500 lb. (1134 kg) loads, and there is no possibility of tool chatter.

- **Pendulum designs**
  - Pendulum designs are available for supporting large masses and unbalanced forces, and are almost always used on equipment operating above 500 rpm. Neoprene is generally oil-resistant and normally used as a vibration isolator and not for shock loads like shown in Fig. 9.

- **Springs**
  - Springs are available with vertical restraints (anti-lift springs, to permit uniform deflection and performance. Some isolators have adjustable snubbers, which permit damping control to overcome high initial torques. Available in standing sizes ranging from 35 lbs. to 2500 lbs. (16 and 1134 kg) or higher if required. When a spring is overloaded, it may become solid, providing no isolation. Therefore, the simple rule for spring-loaded isolators is: Always use the full theoretical load range, or the entire load range which permits maximum performance. The chart indicates recommended isolation for industrial machinery. Kinetics Noise Control, Inc. is continually upgrading its products and is soliciting information to add to this guide.

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**Industrial Machinery Vibration and Shock Isolation Recommendations**

**Spring isolation supporting a process chiller**

- **Neoprene isolators**
  - Neoprene isolators are generally used on shock loads to isolate equipment from the floor. The most prominent use on equipment operating above 250 rpm is the use of 2,500 lb. (1134 kg) loads, and there is no possibility of tool chatter.

- **Springs**
  - Springs are generally used on shock loads to isolate equipment from the floor. The most prominent use on equipment operating above 250 rpm is the use of 2,500 lb. (1134 kg) loads, and there is no possibility of tool chatter.

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**Vertically restrained Spring isolation used with a gyratory crusher**

- **Spring isolation supporting a process chiller**
  - Most equipment can be supported with either spring isolators or neoprene pads.

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**Shock Guide 8/09**

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**Control of Vibration, Shock, and Structure-Borne Noise**
In many cases, buyers of production machinery give little thought to vibration and shock control. But how much simpler—and more economical—it would be without reduction. An isolation efficiency of 50 percent means that with a machine producing a certain out-of-balance force, the vibration caused by the operation of the pump would be nearly non-existent.

Vibration isolation. Effectiveness of isolators in providing vibration isolation is affected by the frequency characteristics of the material used for the machine isolation, the natural frequency of the mountings, and the frequency characteristics of the building in which the machine is installed. The natural frequency is a characteristic of the machine and the building. It is the frequency at which, as a result of vibration, the mountings are suspended in the building rather than resting on the floor or other supporting building structure. This ratio will usually be greater than one (1). That is when the natural frequency is exactly a natural frequency of 9 Hz for the rubber pads, a ratio of (10/9) or (10/3) is 3.3. According to the chart, a ratio of 3.3 intersects the transmissibility of the rubber pads at a natural frequency of 9 Hz, which means that the isola-


tion efficiency is 70 percent. If the ratio is 0.5, it means that the isolation efficiency is 95 percent.

Shocks, on the other hand, are caused by reciprocating action such as presses and pumps. The shock is in the machine as such; it is not propagated through the mountings to the supporting building structure and vibration can be quite severe, causing damage to the machine and the supporting building structure. This makes it difficult to examine the natural frequency of concrete floor construction. Vibration isolators must be carefully selected to compensate for the isolation disturbance. The shock is then transmitted to the building, but it is dissipated by the building material to be vibration-free. If the shock occurs, the building is excited to a natural frequency of vibration, and therefore the transmitted force of a pump operating at 1800 rpm. At 95 percent isolation efficiency, the vibration caused by the operation of the pump would be noticeable.

Vibration isolation effectiveness depends on the frequency characteristics of the material used for the machine isolation, the natural frequency of the mountings, and the frequency characteristics of the building in which the machine is installed. There are three important factors to consider when selecting vibration isolators: the range of expected frequency of the equipment, the frequency characteristics of the building, and the isolation efficiency. Zero isolation efficiency, for example, means that the vibration isolation is not effective at all.

Second, the building structure itself may vibrate due to any number of causes. This can be a problem with buildings that are not designed to withstand severe vibration. The accuracy of which would be impaired if building vibration were above a certain magnitude. In either case, the goal is to dampen the shock rather than simply placing the machine on a machine isolation system.

A situation worse than amplification is resonance. As can be seen from the graph on the right side of Fig. 1, the transmissibility of the rubber pads is very low near the natural frequency of the machine, that is, the frequency at which the isolating material has a natural frequency of 8 Hz, from an operating frequency of 60 Hz. This is a concern in many situations. For example, electron microscopes are used on 6000 vibrations per minute to study the microstructure of castings, as Fig. 6 indicates. They are used to determine the natural frequency of the mountings is actually greater than the frequency of concrete floor construction. Vibration isolators are designed specially for the equipment being supported. Some of the factors to consider when selecting the proper isolator are the range of expected frequency of the equipment, the frequency characteristics of the building, and the isolation efficiency.

Vibration and shock are caused by different kinds of machinery and equipment. Vibration may be found in standardizing or reciprocating equipment, and usually occurs in the operating range from 200 to 7000 cycles. Rotating type production machinery may which is to say about 1/2 psi to 500 psi (3.4 to 3447 kPa). Most large pumps use fiberglass isolators. While used in many applications, these isolators are not affected by those materials.

In manufacturing fiberglass pads, they are precompressed, and have a modulus of elasticity about the same as spring steel, and a softness of individually annealed glass fibers having a modulus of elasticity about the same as spring steel, and a softness of rubber. The reason for this is that fiberglass does not deteriorate with time, and it doesn’t age. Neither does it change color, nor rust, nor flake. It is used in high-temperature applications, in molds, in the production of airplane wings, in turbine blades, in automobile engineering, etc., fiberglass is not affected by those materials.


developed selection guides which the machine isolation system in the plant structure. This makes it difficult to examine the natural frequency of concrete floor construction. Vibration isolators must be carefully selected to compensate for the isolation disturbance. The shock is then transmitted to the building, but it is dissipated by the building material to be vibration-free. If the shock occurs, the building is excited to a natural frequency of vibration, and therefore the transmitted force of a pump operating at 1800 rpm. At 95 percent isolation efficiency, the vibration caused by the operation of the pump would be noticeable.

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Vibration and shock are caused by different kinds of machinery and equipment. Vibration may be found in standardizing or reciprocating equipment, and usually occurs in the operating range from 200 to 7000 cycles. Rotating type production machinery may which is to say about 1/2 psi to 500 psi (3.4 to 3447 kPa). Most large pumps use fiberglass isolators. While used in many applications, these isolators are not affected by those materials.

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In many cases, buyers of production machinery give little thought to vibration and shock until after the equipment they have purchased is installed and running in their plants. At that point it is too late to have the problems with vibration and shock eliminated satisfactorily from the design or during the installation. Similarly, it is too late for the buyers to consider the new material that would have allowed the choice of a vibration isolator to be made during the selection of the original equipment. Thought must be given to vibration and shock during the selection of the equipment and during the design stages of the machine. In many cases, buyers of production machinery give little thought to the fact that vibration and shock of the equipment that they have purchased is installed and running in their plants. At that point it is too late to have the problems with vibration and shock eliminated satisfactorily from the design or during the installation. Similarly, it is too late for the buyers to consider the new material that would have allowed the choice of a vibration isolator to be made during the selection of the original equipment. Thought must be given to vibration and shock during the selection of the equipment and during the design stages of the machine.

Second, the building structure itself may vibrate due to any number of causes. This can be a problem when the machine is placed next to the building and the vibrations are transmitted to the building structure. The accuracy of which would be impaired if building vibration is transmitted to the structure. This can be a problem when the machine is placed next to the building and the vibrations are transmitted to the building structure. The accuracy of which would be impaired if building vibration is transmitted to the building structure.

Theoretically, isolation begins when... 1/4, and this position is 1/14. Also, 1/4 less than 1/4 = 1/14. The supported unit is said to be isolated.

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Bearing shock impact, for so we have addressed situations here the role of the frequency to the natural frequency of the system as defined.

Vibration Isolation. The isolation of vibration begins when an isolation device or material is placed between the vibration source and the supporting building structure. The isolation efficiency shown on the transmissibility curve is more than 250 to 300 strokes/min, the shock can be considered vibration isolation.

Deflection

Allowable

Deflection

Fig. 3

Typical transmissibility curve for an isolated system

Deflection

Allowable

Deflection

Fig. 4

Fig. 5

Supply Fan Supported by Spring Isolators

Presses Isolated with Fiberglass Resin

Natural Frequency of Concrete Floor Construction

Transmissibility for various disturbing frequencies

Bearing shock impact, for so we have addressed situations here the role of the frequency to the natural frequency of the system as defined. Since forcing frequency is derived from the vibration caused by making equipment operating at 250 cp/min, the resulting ratio will likely be greater than that defined with纪检告sion. However, with machines some more than one. In this case in a ratio (for example, 0.1) less than 0.1 less than 1.0. If what we have a press that operates at 100 strokes/min. If to 0.100 to 0.300 strokes/min, in order to maintain the desired load range (for example, 0.1) the following technique to an existing installation. For industrial presses, rubber isolators can be used over 175 strokes/min, shock isolators are standard. As shown in Fig. 5. The shock being transmitted to the building has already been isolated and the support building structure is more flexible and allows the structure to be stabilized and then coated with an elastomeric material not affected by these materials.

Deflection

Allowable

Deflection

Fig. 6

Electromagnetic on air as an air support system.

Negative isolation...
In many cases, buyers of production machinery give little thought to vibration and shock control.unter the common misconception that the vibration is not bad enough to warrant action. However, the potential for problems is much more common than one might think.

But how much simpler - and more economical - it would be to check with a vibration and shock control specialist when a problem arises. The cost of not checking with a vibration professional can result in damage to the equipment and loss of production.

In many cases, buyers of production machinery give little thought to vibration and shock control. They discover that the vibrations are not too bad until after the equipment they have purchased is installed and running in their plants. At that point, if there is a problem with shaking floors and vibrating machines, it is too late - the damage is done.

Theoretically, isolation begins when...

The natural frequency of the equipment is the point that...
2,000 lb. (1134 kg) loads, we can load it between 1,000 and 5,000 lb. (454 kg and 1124 kg), and the performance will be the same. Rubber springs or air mounts don’t do this. Fiberglass is made in standard pads or mounts and can be cut to specific shapes or sizes. Using fiberglass, a machine can be isolated by the use of thin plates or by full encasing. Neoprene is generally oil-resistant and normally used as a vibration isolator and not for shock loads as shown in Fig. 9. The most prominent use of an equipment operating above 250 rpm is horizontal or vertical lathes, jigs, broaches, or other high-speed machining devices. It must be reinforced to increase its load-carrying capacity, in a very narrow load range, and if not used within that range, difficulties can arise from the rapid change of its natural frequency. Springs or neoprene pads are available in many different forms, such as the example that Fig. 8 illustrates. Springs are generally used on equipment operating below 250 rpm, or on rotating equipment such as compressors, generators, pumps, fans, etc. The hanger loads, being non-rotating, have adjustable mounters, which permit damping control to overcome high initial torques. Available in standing pads or stupid pads with tool ends, these isolators can be mounted on many different types of equipment. The size of the mount is determined by the efficiency of the foot loads the concrete floor at about 50 psi (344.7 kPa). Isolation pad materials are designed to operate efficiently between 50 and 200 psi (344.7 and 1379 kPa). Therefore, the simple thing is to get the effective load range of the pad to match the per square inch (psi). After that, cut the pad to the same size as the foot of the equipment, proper loading percent of the time. Most manufacturers design their equipment so that the area of the foot loads the concrete floor at about 50 psi (344.7 kPa). Isolation pad materials are designed to operate efficiently between 50 and 200 psi (344.7 and 1379 kPa). Therefore, the simple thing is to get the effective load range of the pad to match the average load range. If the pad is cut to the exact size of the foot of the equipment, proper loading percent of the time.

<table>
<thead>
<tr>
<th>Equipment Type</th>
<th>Shock Isolation Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pumps</td>
<td>Model SFH or KLM, Model L or N</td>
</tr>
<tr>
<td>Business Machines</td>
<td>Model CIB-H or Model SFB</td>
</tr>
<tr>
<td>Boring Machings</td>
<td>Model KAM or Model KIP-SP</td>
</tr>
<tr>
<td>Jig Borers</td>
<td>Model NPD, NPS, or Model KIP</td>
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<tr>
<td>Plates, Drums</td>
<td>Model NDF or Model PSS</td>
</tr>
<tr>
<td>Grinders</td>
<td>Model P, Model SFH</td>
</tr>
<tr>
<td>Milling Machines</td>
<td>Model K, W, R</td>
</tr>
<tr>
<td>Gear Cutters</td>
<td>Model R, R, R</td>
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<tr>
<td>Hammers, Forging</td>
<td>Model R, R, R</td>
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<tr>
<td>Interferometers</td>
<td>Model R, R, R</td>
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<tr>
<td>Business Machines</td>
<td>Model R, R, R</td>
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<tr>
<td>Jolt Molders</td>
<td>Model R, R, R</td>
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<tr>
<td>Shears</td>
<td>Model R, R, R</td>
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<tr>
<td>Hydraulic Presses</td>
<td>Model R, R, R</td>
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<tr>
<td>民間</td>
<td>Model R, R, R</td>
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<tr>
<td>Textile Machinery</td>
<td>Model R, R, R</td>
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<tr>
<td>Microscopes</td>
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<tr>
<td>Jig Borers</td>
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<td>Micrometers</td>
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<td>Business Machines</td>
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<td>Milling Machines</td>
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<td>Business Machines</td>
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</tr>
</tbody>
</table>

**Shock Isolation Suggestions**

- Reduce vibration both to and from a piece of equipment.
- Help reduce structure borne noise.
- Decrease maintenance because vibration can cause bearing wear, etc.
- Improve quality of finished parts by reducing machine tool chatter.
- Improve mobility of equipment, because anchor bolts can be eliminated on certain equipment.
- Control shock and vibrations by using rubber, air, or neoprene isolators.

Neoprene Isolators

<table>
<thead>
<tr>
<th>Isolator Type</th>
<th>Model SFH, KIP, L, N, NPS, or KIP-SP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Model SFH or KIP-SP</td>
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<tr>
<td>Characteristics</td>
<td>Model SFH or KIP-SP</td>
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<td>Pressure Range</td>
<td>Model SFH or KIP-SP</td>
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<tr>
<td>Temperature Range</td>
<td>Model SFH or KIP-SP</td>
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<tr>
<td>Oil Resistance</td>
<td>Model SFH or KIP-SP</td>
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<tr>
<td>Applications</td>
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<tr>
<td>Design Options</td>
<td>Model SFH or KIP-SP</td>
</tr>
<tr>
<td>Enhanced Features</td>
<td>Model SFH or KIP-SP</td>
</tr>
</tbody>
</table>

Vertically restrained Spring Isolators

- Most equipment can be isolated vertically. The pad can be cut to specific shapes or sizes. Using fiberglass, a machine can be isolated by the use of thin plates or by full encasing. Neoprene is normally used as a vibration isolator and not for shock loads.
- If the pad is cut to the exact size of the foot of the equipment, proper loading percent of the time.
- Most manufacturers design their equipment so that the area of the foot loads the concrete floor at about 50 psi (344.7 kPa). Isolation pad materials are designed to operate efficiently between 50 and 200 psi (344.7 and 1379 kPa). Therefore, the simple thing is to get the effective load range of the pad to match the average load range. If the pad is cut to the exact size of the foot of the equipment, proper loading percent of the time.

Spring Isolators

- Springs are generally used on equipment operating below 250 rpm, or on rotating equipment such as compressors, generators, pumps, fans, etc. The hanger loads, being non-rotating, have adjustable mounters, which permit damping control to overcome high initial torques. Available in standing pads or stupid pads with tool ends, these isolators can be mounted on many different types of equipment. The size of the mount is determined by the efficiency of the foot loads the concrete floor at about 50 psi (344.7 kPa). Isolation pad materials are designed to operate efficiently between 50 and 200 psi (344.7 and 1379 kPa). Therefore, the simple thing is to get the effective load range of the pad to match the average load range. If the pad is cut to the exact size of the foot of the equipment, proper loading percent of the time.

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Springs are generally used on equipment operating below 250 rpm, while Neoprene is generally used on rotating equipment such as compressors, generators, pumps, fans, etc. The housing limits, usually available in two forms, have adjustable members, which permit the height of the isolators to be varied. The vibration frequency is considered in order to determine how good a job will result. For most industrial applications, the approach is considered in order to determine how good a job will result. Otherwise, it is just a hit or miss approach and a problem is likely to arise. The isolator material should be selected based on the characteristics of the equipment. The natural frequency of the isolator should be much higher than the frequency of the load. If the pad is cut to size, this will short-circuit the vibration (Fig. 9). For industrial applications, the isolator material should be selected based on the characteristics of the equipment. 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