ACTOM

MECHANICAL EQUIPMENT

# Engineering

## Selecting for Efficiency

ARNOT

Vibration & Rubber
Engineering Solutions

# *Anti-vibration Mounts – Selecting for Efficiency*



## METRIC UNITS

The metric system distinguishes between the units of mass and weight. The Kilogram (kg) is the unit of mass whereas weight, being a force, is expressed in Newton .

We express loads in kg and spring rates ( load divided by deflection ) in kg/mm, using the gravitational constant G = 9.81 meter per sec$^2$ to convert from spring rates measured in N/mm.

## SELECTING SPRING MOUNTINGS FOR MORE EFFICIENCY

Sometimes, with a little ingenuity in selecting mountings, a significant improvement in efficiency can be achieved without too much extra cost. The best way to demonstrate this is with an example.

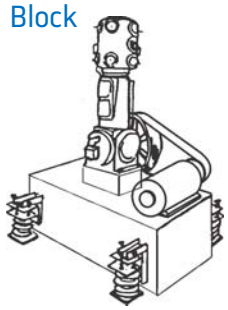
## SELECTING FOR 120 KG

The obvious choice would be SLFA-310. With a Spring Rate of 6.1 kg/mm the deflection will be 120/6.1, under 20 mm.
An alternative selection is SLFB-280. With a Spring Rate of 3.2 kg/mm the deflection will be 120/3.2, over 37mm.
For low cost the choice is SLFA-310, but if you are looking for efficiency then SLFB-280 would be much better.

## INERTIA BLOCKS

While steel equipment bases are more economical concrete bases have some advantages. It should be understood that the extra mass does not reduce the vibration transmitted to the floor i.e. improve the mounting efficiency. That depends only on the ratio of the disturbing frequency of the equipment to the natural frequency of the mountings as explained in the Engineering Section. What a heavy base does is increase the mass that the unbalanced force has to accelerate, and therefore it reduces the amplitude. The classic example is an old-fashioned single cylinder slow speed compressor. Running at perhaps only 360 rpm these machines cannot be perfectly balanced and if isolated by spring mountings are likely to oscillate too much. From the unbalanced force information supplied by the compressor manufacturer the necessary additional mass to reduce the amplitude of movement to an acceptable figure can be calculated, perhaps 3 times the mass of the equipment alone, or more.

Inertia Block



Another use of a concrete base is to counteract external forces such as the discharge thrust of a fan or pump. For example doubling the mass requires doubling the spring stiffness for any particular deflection, and that would halve any movement.

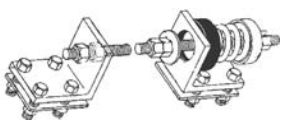
Apart from the above a concrete base (or a steel base filled with concrete ) serves to stiffen the base, prevent flexing, and maintain correct alignment between the motor and equipment shafts.

## HORIZONTAL THRUST

Some machines such as high pressure fans and pumps can exert considerable thrust against the direction of flow. If that occurs in the horizontal direction with spring mounted equipment consideration should be given to the horizontal stiffness of the springs.

As a rule of thumb we consider horizontal thrust excessive if it exceeds 10% of the equipment weight. In that event horizontal displacement can be reduced two ways.

Horizontal Thrust



The first is to fit Spring Thrust Restraints. A typical design is illustrated. The horizontal springs can be compressed to counteract the thrust, the spring size being selected accordingly.

The second way, as stated above, is to mount the equipment on a concrete inertia block.

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