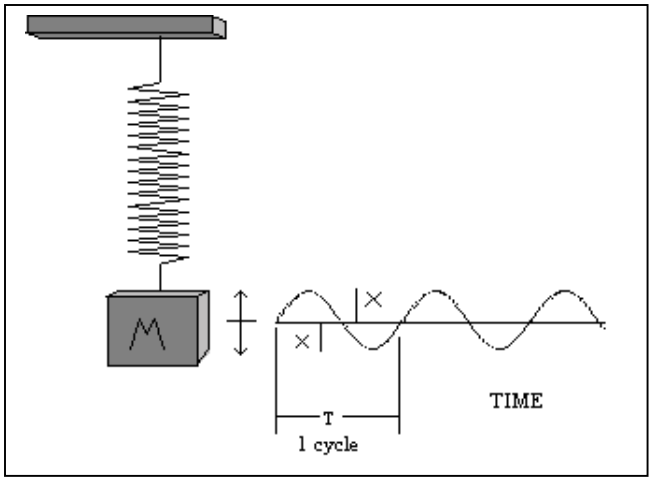
The Importance of Standard Test Conditions 2 – Test Loads

By Alan Friedman, DLI Engineering Corp.

To illustrate the importance of standard test conditions, we can look at the simple mass spring system and remind ourselves what vibration is. The block hanging from the spring has a mass (M) and the spring has stiffness (K). We can write a simple equation to describe how much force is needed to move the spring (compress or stretch) a distance, which we will call (X)



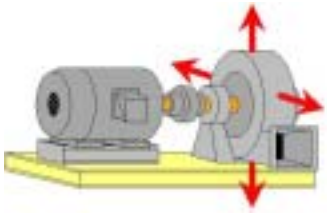
F = KX

F = Force
K = Stiffness
X = Amplitude of Movement

What we can see from this equation is that if we want to move the mass more distance, we can increase the force. If we want to decrease the distance, we can decrease the force. The two are linearly related.

Although machine Vibration is more complex, it follows similar rules. Typically, when analyzing the vibration from a machine, one identifies a peak in the spectrum and relates it to a machine component. One then says that if the amplitude of the peak goes up, this component has a problem. Consider for a second the machine as the spring and the load as the force. What we can see now is that if we increase the load (the force) the response of the machine (the spring) to the load will be to vibrate at a higher amplitude (X). And this is exactly what will happen in real life.

What this means is that there are now 2 causes for increased vibration in a machine. One cause is a machine fault, the other is an increased load. Since we are conducting vibration analysis in order to identify machine faults, we need to be careful to maintain a constant load between tests if our vibration trends will be meaningful.



Does it have a fault or is it just running under more load than last time?