TecsPak® Failure Mode Explanation

TecsPak is a superior elastomer that is not affected by many chemicals and substances typically found in most environments. As such, it will not breakdown over time and become brittle. A typical TecsPak failure mode is not catastrophic in that it will not crack, break or otherwise disintegrate. The failure is more gradual and can easily be planned for and foreseen.

Basic Performance Pattern:

Like any other elastomer or spring element, including steel, will take a compression set (creep) over time. The amount of set is dependent upon how the bumper or spring is used. Factors that will influence the amount of set include, but are not limited to: cycle rate, percent of compression, ambient temperature, etc.

Unlike other elastomers and other media, the amount of compression set with TecsPak is predictable and limited. It is predictable because once the operating conditions are established; all bumpers will behave in a similar manner. Additionally, we publish fourth closure data, which already takes into account a typical amount of compression set. Also, unlike other elastomers and other media, the amount of compression set is limited. It is limited in that there is a break in period where the set takes place. Once this is completed, TecsPak will maintain this amount of set and there will be no further amount of set, as long as operating conditions do not change. Most other media will continue to take an increased amount of set over their life.

Failure Modes:

Loss of Performance (Cushioning)

Another way to express this is too much compression set and this can occur under two conditions. First, if a bumper is not properly sized for the application, the amount of compression set can be excessive and over time the bumper will no longer have an acceptable amount of cushion. This usually occurs soon after installation and can be a benefit in that with TecsPak products, it is known quickly if it is properly sized.

The second mode is really not that different from the first and pertains to Emergency Stop applications. By the nature of their function, a bumper used in this type of application is to be exposed to a very limited number of cycles. Also, it is typically sized to be used to its maximum capacity, so any amount of cycles will cause compression set. It is up to the discretion of the maintenance staff as to when there has been enough loss in cushioning that the bumper needs to be replaced.

Again, this mode is not catastrophic and can be planned into a normal maintenance cycle without causing any downtime.

Excessive Cycle Rate

TecsPak functions by absorbing the energy (We) due to an impact and converting a percentage of that energy to heat (Wa). This absorbed energy is indicated on our charts both numerically and visually by the hysteresis. The TecsPak bumper then dissipates this energy to the environment.

However, when a bumper is cycled by a combination of a large input causing significant deflection and at a high cycle rate, the bumper can fail. The failure mode is one where the energy is absorbed at faster rate than it can be dissipated to the environment. In severe cases, the bumper can actually begin to melt. In less severe cases, signs that this is occurring is an increased amount of compression set and quite possibly, a leaning of the bumper to one side.

This failure occurs when one of two conditions happens. The first is when a bumper is undersized for the application. Again, this will happen very quickly after installation and a properly sized bumper can be used in its place. The second condition is when there is a change in how the bumper is used. It is no longer sufficient for the duty cycle and can be replaced with a more robust sized bumper.