SHARPE® VALVES
A Division of Smith-Cooper International, LLC

Product Data

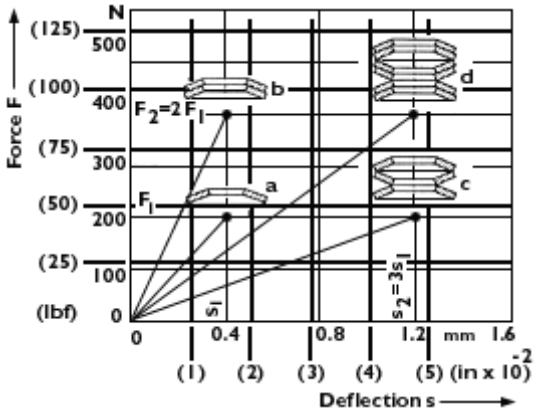
SPD-04
July 8, 2004

Sharpe Ball Valves
Live-loaded Stem Seals

All Sharpe Ball Valves which utilize a stem seal arrangement where the seals are retained by a stem or packing nut, also include live-loading of the stem seals. This live loading is accomplished by the addition of Belleville (also known as disc) springs below the packing nut . The purpose of live loading the stem seals is to maintain the initial sealing load on the seals as they wear, or as they compress further, reducing or eliminating the need for frequent packing nut adjustments. The Belleville springs perform this function by storing compressive force as the packing nut is tightened, and releasing this force as packing wear or compression occurs.

The number of Belleville springs needed, and the way they are arranged depends on the packing compression requirements. In the cases where they are supplied on Sharpe valves, the springs are installed in "series", or stacked with outer diameters touching, rather than in "parallel", where the dished springs would be nested together. The arrangement of 2 (or 4) springs in series provides essentially the same pre-load as a single spring when compressed, and a spring stroke double that of a single spring. Where 2 (or more) springs are installed in parallel, the spring load is the multiple of a single spring times the number in parallel, but the spring stroke is still that of a single spring. For examples, see the following:

CHARACTER LINES FOR SPRING STACKS WITH SPRINGS OF THE SAME SIZE ARRANGED IN DIFFERENT ORDER



a) Single disc
b) Two discs stacked in parallel (double force at same deflection)
c) Spring column with three single springs stacked in series (triple deflection)
d) Spring column with three parallel pairs arranged in series (double force, triple deflection)

Sharpe Valves are using either 2 or 4 springs in series for live loaded stem seal arrangements. The springs have been designed and sized to provide the packing load required when the springs area compressed, and the series arrangement provides sufficient spring travel to ensure that a suitable compressive force remains applied as the stem seals wear, or compress. Primarily, manual lever operated valves are supplied with 2 Belleville springs mounted in series, and power actuated valves (or those likely to be power actuated) are supplied with 4 springs in series. The reason for the use of 4 springs in series on these valves is that the adjustment of the stem nut to tighten the packing is more difficult when they are actuated, since the mounting brackets and couplings can interfere with access to the stem nut. Using 4 springs provides a longer stroke than the 2-spring stack, while retaining more of the spring load for an equivalent amount of stroke. The end result is that the need for packing nut adjustment on actuated valves becomes far less frequent, or is eliminated altogether over the life of the stem seals.

It should be noted that belleville springs are nearly limitless in available sizes, materials, and strengths, and that there is no “magic number” of springs (or spring sizes) that is inherently better than another. The importance is that the springs be properly designed, selected, and arranged to suit the specific valve requirements. As Sharpe has found, our 2-spring series arrangement was satisfactory, but for automated valves the 4-spring stack was an improvement. Adding more springs in series would serve no purpose (a longer stroke is not needed), and a heavier spring, or parallel arrangement is also not needed. The current arrangement provides sufficient packing load.

The advantage of the “4 springs in series” arrangement for automated valves offers the same benefits to manual valves as well; more constant compression load on stem seals, and minimized corrective maintenance to adjust the stem packing nut.