

January 13, 2009

To: General Distribution

## f + Y Values

f + Y values were created by EPRI to predict packing friction. 'f' is the friction factor and Y is the axial to radial stress value.

f = 0.08 for 9000-EVSP Simplified Set  
0.10 for 98 & GRAPH-LOCK Sets  
0.09 for 1303-FEP Sets

Y = A method to measure the axial to radial stress value is not known to exist so it is assumed to be 0.5.

## **Reciprocating Frictional Force Formula**

This friction formula will yield an ESTIMATE of the frictional force on a RECIPROCATING valve stem as a result of the packing. Friction Factors (f) are unique to different types of packing. Values of (f) for several styles are listed above.

$$F = \pi d H L F f Y$$

Where: F = Calculated Friction Force (lbs)  
d = Stem Diameter (in)  
H = Uncompressed Packing Height (in)  
LF = Load Factor (psi) [Normally assumed to be 3500psi or 1.5\*system pressure, whichever is higher]  
f = Friction Factor  
Y = Axial / Radial Stress Factor = 0.5

## **Rotating Frictional Torque Formula**

In order to estimate the amount of frictional torque on the stem, we simply assume that the above force will act in a different direction. Taking this force and multiplying it by the moment arm that it acts on (d / 2), we estimate the stem torque with the following equation:

$$\tau = \frac{\pi d^2 H L F f Y}{24}, \text{ Where } \tau = \text{Calculated Frictional Torque (Ft.-Lbs)}$$

Please feel free to contact Applications Engineering should you require anything further.

Sincerely,



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