

## **BALL VALVE SIZING TORQUE REDUCTION FACTORS FOR RACK & PINION TYPE SPRING RETURN ACTUATORS**

When sizing rack & pinion pneumatic spring return actuators, a 0.70 multiplier may be applied to the published ball valve torque. The following explains why this factor is used, and how it works.

The philosophy behind the 0.70 (or 70%) valve torque factor when sizing spring return actuators is based on the fact that the published valve torques are breakaway torques from the closed position, and spring return actuators are selected on the minimum of either the spring ending or air ending torques. A spring return actuator selected on this basis would probably be over-sized, since the valve torque is at maximum, and actuator torque is at minimum.

The 0.70 factor reflects the maximum valve torque expected at conditions other than breakaway. This takes into consideration that the maximum output torque of the spring return rack and pinion actuator is at the start of the spring (or air) stroke. The actuator air (or spring) break torque will exceed the valve breakaway torque by an amount greater than the valve torque is reduced using the 0.70 factor.

This factor would not necessarily apply to a scotch yoke or crank arm actuator, because the torque curve for these designs dips in the center, and may fall below the valve running torque if not sized based on full break torque for the valve.

Actuator manufacturers typically publish all of the air and spring starting and ending torques, requiring the user to select an actuator by determining which torque values apply. This is done because the actuators may be used on other than ball valves. This also means that they can't allow for torque curves of the equipment being actuated, without making the actuator selection process more cumbersome.

The 0.70 torque factor does not apply to double acting rack & pinion actuators because the output torque is constant over the full stroke. Thus, double acting actuators are sized based on maximum valve torque and maximum actuator torque.