

Title:	Effects of Electric Actuators on Non-Rising Stem bearings used on DSS Knife Gate Valves
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Affected Part(s):	DSS Knife Gate Valves with Non-Rising Stems and Electric Actuation

Introduction

DSS Knife Gate Valves are designed to withstand the loads and thrusts imparted by all manners of actuation including manual actuation with both a handwheel and bevel gear, electric actuators, and both hydraulic and pneumatic cylinders. Both Rising and Non-Rising stems can be used in manually actuated valves, but only Rising stems should be used on all electrically actuated valves.

Heat Buildup

The high rotational velocity of an electric actuator relative to a handwheel or bevel gear in high thrust/torque applications can often lead to a buildup of heat in the Non-Rising stem thrust bearings that would not otherwise occur in a manually actuated valve. Elevated bearing temperatures can quickly degrade the material properties of thrust bearings reducing their compressive strength. High temperatures combined with large thrust loads can lead to premature failure of thrust bearings. The results of this can be seen in Figure 1.



Figure 1: Bearing Failure

Surface Wear

A consequence of continued operation of overheated bearings in high thrust/high torque applications is that the sliding surfaces will wear and degrade. This wear will result in increased surface friction resulting in decreased operating efficiency, electric actuator stall or over torque, and increased heat buildup. Once this process has begun it will self-perpetuate, thereby creating more heat reducing material strength causing more surface wear creating even more heat. This cycle will continue until either a steady state of wear has been achieved, the bearings have failed, or the electric actuator has stalled and can no longer actuate the valve. An example of excessive wear can be seen in Figure 2.



Figure 2: Premature Bearing Wear

Rising Stems

A Rising stem valve has no roller thrust bearings that are integral to the actuator. A Rising stem valve can also use torque energy more efficiently potentially allowing the use of a smaller, lower torque, actuator for the same application. The only friction in Rising stem actuation is between the stem ACME thread and the inside of the actuator drive hub. DSS Valves uses a Xylan coating on all stems to reduce friction between the stem and the drive nut. Because the stem is translating both linearly and rotationally through the drive nut there is no excessive buildup of heat. The thrust of the screw is spread out over the screw thread engaged within the stem nut, thereby reducing surface pressure. Any heat that is built up locally is quickly moved away from the friction interface as that portion of the screw exits the stem nut. Reduced heat buildup results in less degradation of the material properties, reduced friction losses in the system, and longer life for both the valve and the electric actuator.