

Title:	Mitigating the Effects of Scaling on DSS Knife Gate Valves
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Introduction

DSS Knife Gate Valves are designed to handle the rigors caused by the precipitation of media, also known as scaling. There are specific operating techniques and best practices that can be employed to mitigate the difficulties that scaling presents.

Scale

Scale is the result of media coming out of solution (precipitation), it will be found to adhere to surfaces within the piping system and can prevent mechanical equipment from operating as intended. Causes of scale vary greatly but are typically attributed to changes within the fluid which causes a compound to come out of suspension or solution. The ability of a fluid to hold compounds in solution or suspension is often affected by chemical reactions, changes in temperature, pressure, velocity, and pH.

Buildup of scale can occur on any surface that is in contact with the process liquid. Often the buildup will appear on the gate, seals, and seats. The scale buildup can increase the force required to actuate the valve and can impede the gate from reaching its seating position. A severe case of scaling is shown in Figure 1.



Figure 1: Scaling

Fully Open or Closed

One of the most common issues that scale causes is for valves to not fully close or open under normal operating conditions. Determining whether a DSS knife gate is fully open or closed is simple.

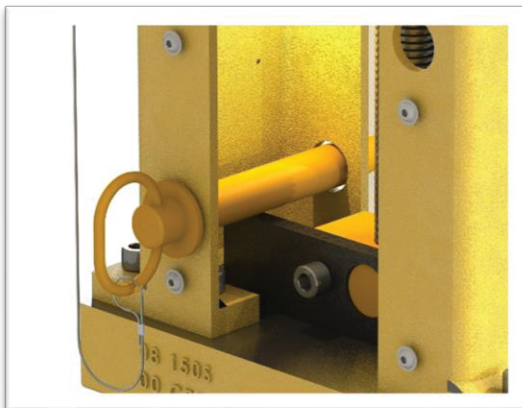


Figure 2: Lockout Pin in Fully Closed Position.

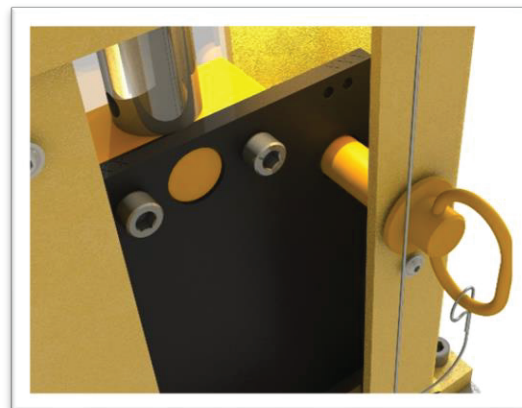


Figure 3: Lockout Pin in Fully Open Position

When the valve is fully closed the orange lockout pin can be inserted through the left-hand yoke. As can be seen in Figure 2, the lockout pin will pass over the gate which indicates that the gate has traveled far enough to fully engage the valve seat. If after actuation the gate has not seated, the lockout pin will not be able to pass through the yoke due to contact with the unseated gate.

Similarly, for the open position, the lockout pin must be able to pass through the right-hand combo yoke and gate when fully open. In the open position the pin must pass through the gate and yoke to indicate that the valve is fully open which is represented in Figure 3.

Tips for Actuation

Scaling can prevent the gate from fully seating, this is easily identifiable by the process described above. Reasons for short travel are typically related to increased thrust requirements and/or obstructions caused by scale.

In most cases, issues related to short travel can be mitigated by applying different actuation strategies, these can be applied individually or combined:

Repetitive Cycling (Opened Valve)

- Stroke the valve closed stopping at 30% open. If the valve cannot progress to 30% open, then stop where the actuator will allow. This step will begin the process of breaking up or dislodging any scale that may be obstructing gate movement.
- After partially closing, fully re-open the valve. While flow is passing through the valve, this opening stroke will allow material to flush away from the valve.
- Repeat the closing stroke to 20% and then fully open the valve again.
- Repeat the closing stroke to 10% and then fully open the valve again.
- Repeat the closing stroke all the way to full close. If the valve is not able to fully seat, repeat the process above until the valve has fully seated.

Seat Flushing

- Open the valve between 10 to 20% and hold in this position (the recommended length of time will be dependent on the application). This will allow any material that has been trapped between the gate and the seat to be flushed away by the increased flow velocity caused by the partially opened gate.
- This process can be repeated until tight shutoff is achieved.

Inertial Assistance

- When powering through difficult media, it is important to not restrict the stroke speed of the valve. A gate traveling at higher velocities will carry more driving force than can be applied by the cylinder force alone.
- It is important to size all air/hydraulic supply equipment adequately as to not restrict the free motion of the valve.
- Quick exhaust valves can be implemented on pneumatic systems to reduce the back pressure on the exhausting side of the cylinder. This is often necessary when the solenoid valve exhaust ports are not large enough to support the needed air flow evacuating the cylinder.

Valve Build Options

There are additional design options available that are beneficial in scaling applications. These include: Purge ports (seat area and/or chest area), Extended flush outs, Gate guide modifications, Severe Guard coating and Oversized actuation. Please consult DSS Sales or your local distributor for further details.