

Gate Valve Bonnet Failures From Thermal Expansion of Fluids at High-Temperature

SAFETY ALERT

ISSUE #: 07-2013

Enform

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Description of Incident:

- In a SAGD application, immediately after start-up, a gate valve bonnet failure caused a release to atmosphere. In thermal applications throughout the oil and gas industry, there have been incidents of valve failures during start-up. Resulting damage can include stretching studs and loss of pressure integrity between the body and bonnet.



What Caused It:

- Pressure build-up occurs in the gate valve cavity from thermal expansion of fluids. Extreme pressure build-up from fluid expansion can occur if the valve body is completely full of fluids (e.g., a grease/oil/water mixture) and heated to elevated temperatures. Such pressure can exceed the rated working pressure of the valve.
- A valve with the ability to isolate the body cavity from the flow line may be at risk.
- Presence of grease or compounds designed to enhance sealing ability may exacerbate the condition.
- Grease or a grease/oil/water mixture when heated in a sealed enclosure can exceed 7000 psi (48.5 MPa) at 250 °F (121 °C).
- Gate valve body cavities that are not 100% full of fluids do not experience excessive pressure as the vessel was heated. Trapped air or gas allows room for thermal expansion.

Corrective/Preventive Actions:

- Before start-up for thermal applications, ensure the valve bodies have a void for fluids to expand into as the temperature rises.
- Before start-up, ensure valves are in good working order and have not been compromised by ice expansion damage.
- During start-up, position the valves' sealing mechanism (if possible) where the cavity is not isolated.

By industry, for industry