xylem
Let's Solve Water

# SteamTeam®

Bell & Gossett®
McDonnell & Miller™

VOLUME 3 / ISSUE 2/ MAY 2016

*Steve Almgreen*
Assistant Product Line Manager – Steam Products

## Do I need a high temperature seal for my condensate pump?

Rapid or repeating pump failures often lead clients to ask if a high temperature seal is needed. But it's more likely there are NPSH problems.

Keep in mind that the maximum temperature that can be reached in the receiver is 212°F. Domestic Pump condensate and boiler feed receivers are vented to atmosphere, and anything higher than 212°F is steam. Seals are rated for 250°F water with a pH range of 7 to 9. So the temperature in which the seal is used can't exceed the temperature limitation of the original material.

Here's the real story. When condensate or feed water is returned at 212° F, there is 0 ft. of NPSHA in the water. The pump starts, the impeller in the pump volute creates its low pressure zone—and NPSHR exceeds NPSHA, causing the water inside the pump to flash to steam. The resulting cavitation mimics running the seal dry.

The failure is caused by heat and friction. Temperature affects both the chemical and physical properties of water. For example, the viscosity of water drops rapidly as temperatures rise. Water at 70°F is 1.0 centipoise; at 212°F, it drops to 0.3 centipoise and loses its lubricating properties. Reduced lubricity between the seal faces can increase seal face wear. Thus, elevated temperatures make the secondary seal, or O-rings made of Buna-N, susceptible to damage, and the seal eventually fails.

**Series B35 - Style PVF-B**

Pumps are selected for specific duty points, based on the NPSH characteristics of the pump and the design temperature for the complete pumping package. For example, Domestic CC unit literature notes maximum operating temperature of 200°F. You can infer that the pumps selected require less than 7.5 feet of NPSHR, because the water at 200°F has 7.5 feet of NPSH available at 0 feet of elevation above the pump suction.

When available NPSH is greater than required, there's no cavitation, and the pump may provide years of service without seal failures. But when steam traps fail and condensate is returned too hot, or when the product is improperly selected or installed, cavitation may occur. Installing a high temperature seal won't cure the problem; in fact, this much more expensive seal will also fail quickly, because no seal is designed to run indefinitely in a pump that is cavitating.

**NPSH TABLE FOR WATER AT SEA LEVEL* AND ATOMOSPHERICALLY VENTED SUPPLY TANK**

| Temp. °F | Temp. °C | STATIC SUCTION HEAD IN FEET (M) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 (0.3) | 2 (0.6) | 3 (0.9) | 4 (1.2) | 5 (1.5) | 6 (1.8) | 7 (2.1) | 8 (2.4) | 9 (2.7) | 10 (3.0) |
| | | NPSH | | | | | | | | | | |
| 212° | 100° | 0 (0) | 1 (0.3) | 2 (0.6) | 3 (0.9) | 4 (1.2) | 5 (1.5) | 6 (1.8) | 7 (2.1) | 8 (2.4) | 9 (2.7) | 10 (3.0) |
| 210° | 98.9° | 1.4 (0.4) | 2.4 (0.7) | 3.4 (.0) | 4.4 (1.3) | 5.4 (1.6) | 6.4 (2.0) | 7.4 (2.3) | 8.4 (2.6) | 9.4 (2.9) | 10.4 (3.2) | 11.4 (3.5) |
| 208° | 97.8° | 2.6 (0.8) | 3.6 (1.1) | 4.6 (1.4) | 5.6 (1.7) | 6.6 (2.0) | 7.6 (2.3) | 8.6 (2.6) | 9.6 (2.9) | 10.6 (3.2) | 11.6 (3.5) | 12.6 (3.8) |
| 206° | 96.7° | 4.0 (1.2) | 5.0 (1.6) | 6.0 (1.8) | 7.0 (2.1) | 8.0 (2.4) | 9.0 (2.7) | 10.0 (3.0) | 11.0 (3.4) | 12.0 (3.7) | 13.0 (4.0) | 14.0 (4.3) |
| 204° | 95.6° | 5.1 (1.6) | 6.1 (1.9) | 7.1 (2.2) | 8.1 (2.5) | 9.1 (2.8) | 10.1 (3.1) | 11.1 (3.4) | 12.1 (3.7) | 13.1 (4.0) | 14.1 (4.3) | 15.1 (4.6) |
| 200° | 93.3° | 7.5 (2.3) | 8.5 (2.6) | 9.5 (2.9) | 10.5 (3.2) | 11.5 (3.5) | 12.5 (3.8) | 13.5 (4.1) | 14.5 (4.4) | 15.5 (4.7) | 16.5 (5.0) | 17.5 (5.3) |
| 290° | 87.8° | 12.5 (3.8) | 13.5 (4.1) | 14.5 (4.4) | 15.5 (4.7) | 16.5 (5.0) | 17.5 (5.3) | 18.5 (5.6) | 19.5 (5.9) | 20.5 (6.2) | 21.5 (6.6) | 22.5 (6.9) |

•Boiling point decreases 1°F (.55°C) for every 500 feet (150M) of elevation above sea level [@500' (150M) above sea level, boiling point is 211°F (99.44°C)].

SteamTeam®

VOLUME 3 / ISSUE 2/ MAY 2016

For 200°F condensate or below, standard Centriflo condensate pumps are appropriate. For temperatures above 200°F, you must use the Domestic "B Series, 2ft NPSH pumps," which have low NPSHA values at these temperatures.

In short, high temperature seals are not typically required for condensate or boiler feed applications in steam systems. Failing seals are often symptoms not of a problem with the seal, but of a problem with the system. Treating the symptom without addressing the cause can be expensive and ineffective.

For installation issues, see the November 2014 SteamTeam newsletter on start-up pump balancing. (http://unitedstates.xylemappliedwater.com/2014/11/04/condensate-pump-start-up-and-balancing/) .

*Steve Almgreen*
Assistant Product Line Manager – Steam Products

## Pressure testing series 2000 valves

A customer recently asked our recommendation on testing the regulator valve and piping between the PRV station shutoff valves. "I am required to hydro test to 150 PSI on the high pressure and 60 PSI on the low pressure steam," he wrote. "Could these test pressures damage the regulator or regulator valves? We plan to do AIR testing to these pressures first, and then a hydro test."

**Series 2000 Valve**

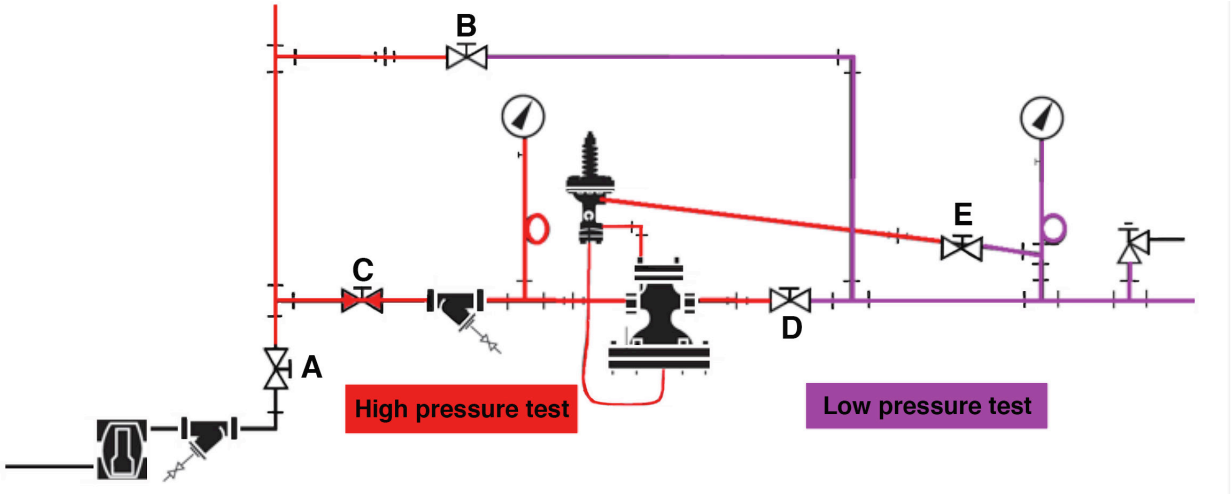
Our review found the regulator valves are rated to a pressure higher than the testing pressures, so there's no issue with subjecting the valves to these pressures. But we do recommend following a few basic testing guidelines, referring to the diagram below:

For the high pressure test, we recommend that you first close valves A, B, D and E. Leave valve C open. Then pressurize the high pressure side of the system (indicated in RED). When the test is complete, open valve D slowly in order to release the pressure on the valve.

For the low pressure test, we recommend closing valves B, D and E. Now pressurize the low pressure side of the system (indicated in PURPLE). When the test is complete, release the pressure.

This approach ensures that as pressure is added and released, the diaphragm inside the valve is not damaged by the pressure test.

Have a question? Your Hoffman Specialty representative is always willing to help you solve your steam heating problems. Call them the next time you need help.




xylem
Let's Solve Water

Xylem Inc.
8200 N. Austin Avenue
Morton Grove, Illinois 60053
Phone: (847) 966-3700
Fax: (847) 965-8379
www.bellgossett.com