Simplify Boiler Protection – TD02

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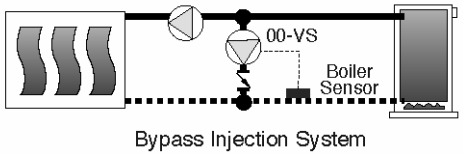
So much attention has been paid over the last few years to temperature control and its effect on comfort and efficiency. Just as much attention needs to be paid to the effect on the boiler of low return water temperature and duration of the exposure. Many premature boiler failures can be traced directly to these two variables. These problems have become especially true in commercial applications of cast iron boilers, where many manufacturers now have specific piping guidelines that must be met to ensure warranty coverage. The problems associated with return water temperatures being below manufacturers minimum temperature ratings has been made worse with the explosion of snow melt, radiant, and conversion of steam to hot water systems or misunderstanding the protection value of primary / secondary piping.

The Taco 00 Variable Speed Setpoint Circulator (00-VS) is the simplest, most economical and effective means of protecting the boiler from thermal shock and flue gas condensation within the boiler. An appropriately sized 00-VS pump is chosen (see Figure A) based on the BTU load of the boiler. The pump is located in a by-pass line and the boiler return sensor is installed as per Figure B. All power and sensor connections are made directly to the circulator. The minimum return temperature and direct acting pump mode is set through the dial and dip switches on the PC board. A 00 circulator with built-in flow check (i.e. 007-VSF5-IFC) eliminates the need for an external flow check and prevents gravity flow through the by-pass line. When the return water to the boiler starts to approach the minimum setting the pump turns on and by-passes water from the boiler supply to the boiler return. Since the 00 is variable speed any rate of injection can be achieved.



Bypass Injection System

Figure B

Figure A: CIRCULATOR SIZING FOR THE BY-PASS LOOP

$$(1/4 \text{ to } 1/3 \text{ flow (gpm) of system pump}) \times \frac{1}{\#\text{ of boilers}}$$

EXAMPLE:

1,000,000 BTUH Boiler

$$\text{System flow rate with 20T through boiler} = \frac{1{,}000{,}000 \text{ btuh}}{10{,}000 \text{ btuh}} = 100 \text{ gpm}$$

$$\text{By-pass flow rate} = 1/4 \times 100 \text{ gpm} \times \frac{1}{1 \text{ boiler}} = 25 \text{ gpm} = \text{0010-VS circulator}$$

Primary / secondary piping, as illustrated in Figure C, has been sold as a way to protect the boiler from thermal stresses because the system is designed to maintain a high primary loop temperature, almost always above 140°F, even in night setback. Primary / secondary piping delivers a constant flow back to the boiler. This

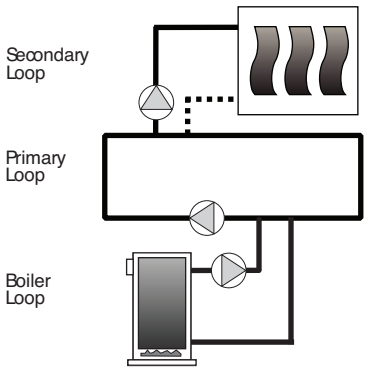


Figure C

Product & Application Documents:

PA05 – Variable Speed Setpoint "00" Circulator (00-VS)

Products with Boiler Protection Option:

PA02 – PC705 Variable Speed Injection Mixing Control
PA03 – Variable Speed Outdoor Reset "00" Circulator (00-VR)
PA04 – iSeries-R (Outdoor Reset) Mixing Valve
PA05 – Variable Speed (Setpoint) "00" Circulator (00-VS)
PA06 – iSeries-S (Setpoint) Mixing Valve
PA09 – Radiant Mixing Block

is an improvement over a parallel piping system that utilizes the pump to do the duel function of system pump as well as boiler pump. However, the weakness of only doing primary / secondary can be seen when monitoring the temperature of the return water. Nothing prevents ambient water conditions from entering the boiler. Multiple zones actuating at the same time, such as when recovering from night setback, can still return water as cold as the ambient temperature in the pipes. For optimal comfort control, especially in radiant systems, the combination of primary / secondary piping and boiler protection is needed, see Figure D. If the primary / secondary piping is being used solely as a means of protection, then a 00-VS in a by-pass line can replace the primary / secondary piping, as per Figure B.

Boiler protection is just as important to the proper operation of the system as is the boiler itself. There are many ways to achieve boiler protection; the simplest and most cost effective is the 00 Variable Speed Setpoint Circulator (00-VS). Available in every size and style 00 from 003 – 0014, it can be easily adapted to new or existing applications, as the piping is basic and everything needed to operate and control the pump is integral to the unit.

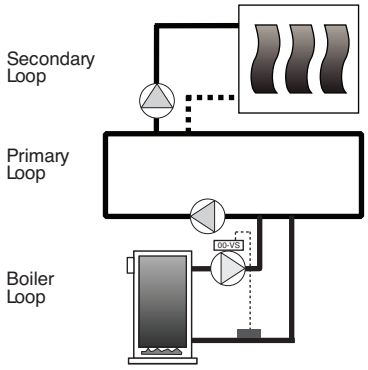


Figure D

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