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Spring 2021 Newsletter

Parts of The Boiler Feedwater System Explained

By Jude Wolf

It's important to understand the path of the water in your boiler room, as many of your troubles can be traced back to getting water to the boiler. Knowing your water system from the point of entry all the way through the system will allow you to track down and solve issues more efficiently. In this article, we'll cover a few of the most basic elements of your boiler feed water system.

The Water Softener

The very first piece of your water system is the water softener. This step in the process is your first line of defense against scale and is the first of many steps to come that will treat the water so that it's ready to use in your boiler. City water comes in, and the softener removes calcium, magnesium, and other components. This softened water then moves on to the recovery unit.

The Recovery Unit

Not all systems have a recovery unit. However, if you have a complex path in your boiler's process, this unit helps extract heat, boosting the water's temperature on its way to the deaerator. It's crucial to note that appropriate water pressure is essential in this part of the process, as the water needs pressure to make sure that it makes its way to the deaerator. Any valve the water meets along its way will reduce the pressure. If left unchecked, the water pressure would be so low that you would eventually run out of water at the boiler. We like to have a gauge on the incoming water to ensure that we have the pressure needed.

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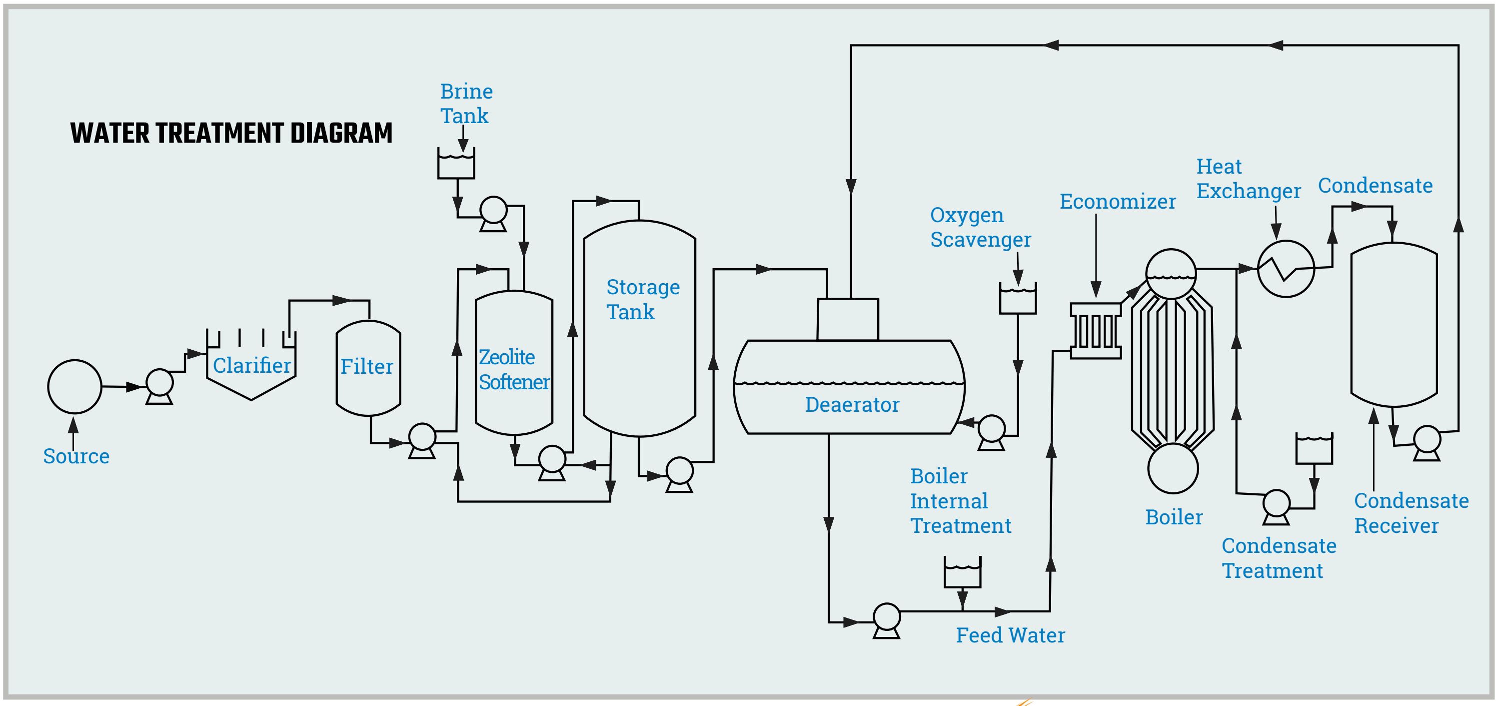

The Purpose of Each Boiler Pressure Control

By Jude Wolf

In your boiler room, you're likely familiar with each boiler having between two and four Honeywell pressure controls. Even if you're familiar with these pressure controls and understand their importance, you may have wondered a few things: why we need so many, which one does what, and how you can keep them set properly. WARE is here to help. In this article, we'll explain each pressure control's purpose and proper setting so that you can keep your boiler running smoothly and safely. Let's take a look at four crucial boiler pressure controls.

1. Operating Control

This operating control is the first line of protection to shut the boiler down on an increase of pressure. It does this by breaking open the limit circuit of the boiler and turning the burner off when the pressure reaches its set point. Often, this control is misunderstood, as its name implies that it determines the pressure point of a boiler. In reality, it's a shut-off precaution, which means that we need to set the pressure limit to the highest PSI we would want to see at any given time. We do this because we want the boiler to stay on as long as possible. This process prevents us from starting the boiler back up again if the load resumes.

2. High Limit Control

If your operating control fails, that's where your high limit control comes into play—it will step in and shut off your boiler. This control is a redundant backup that ensures that the boiler is shut off if your operating control doesn't do its job. It also requires a manual reset so that you know your primary control did not function properly.

3. Firing Rate Control

This is what we use to maintain the boiler pressure when there is a load on it. Using a three-wire configuration (series 90), the firing rate control has a slide wire potentiometer giving information to the firing rate motor. Ideally, it positions the burner to match the load. The control's set-point establishes the point at which the burner runs at high fire. The differential on the control is referred to as the "additive" because that differential is anything above the set point, putting you in low fire. If you don't have your firing rate control and your operating control coordinated, you could be short cycling.

4. Low Fire Hold

This low fire hold control allows you to get a certain level of pressure on the boiler before allowing it to come out of the low-fire position. As it's important to build your pressure slowly, this control is an insurance policy to prevent firing the boiler too hard before you have the necessary pressure built. Otherwise, if firing at full speed before it's ready, you could thermally shock the unit and stress the tubes and refractory.

The Importance of Boiler Pressure Controls

Your pressure controls may sound like they're doing the work for you, and therefore require you to pay less attention to your boiler's conditions; however, that couldn't be further from the truth. These pressure controls are in place to increase your boiler room's safety and help you monitor the pressure more closely. Each one performs a specific function, and together, they provide a safeguard against hazardous or inefficient conditions.

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Video On
Understanding Pressure Control

How Can You Implement FGR into Your Boiler Room?

Using Flue Gas Recirculation to Lower Boiler Emissions

By Steve Taylor

You may hear the term FGR but wonder what exactly it means and how it works. Flue gas recirculation (FGR) is the process of reducing your boiler's emissions by pulling the flue gas back into the boiler's combustion chamber. In this article, we'll explain in more detail what FGR is and how it helps you to reduce emissions.

What is Flue Gas Recirculation (FGR)?

First things first, flue gas is the term used for gas emissions that are expelled through a flue (the chimney-like channel that your boiler uses to release exhaust fumes). Flue gas recirculation, also referred to as FGR, is the process during which you reduce NOx (nitrogen oxide) and carbon monoxide emissions. This process reduces these fumes by recirculating your boiler's flue gas into the main combustion chamber.

What Happens During the FGR Process?

Though some might think the goal of FGR is efficiency, it's actually all about reducing your output of thermal NOx and carbon monoxide. When boiler systems are built, or retrofitted, to include FGR capabilities, they reduce their emissions by pulling flue gas from the stack and then pushing it back into the boiler's flame.

Thermal NOx is created when nitrogen and oxygen combine during the combustion process. As we aim to reduce the NOx emissions, we must ensure that the oxygen is limited and that temperatures stay low—as NOx is created when nitrogen reaches more than 2500 degrees Fahrenheit.

By pulling in the flue gas, we accomplish a few different goals:

- It gives the burners the airflow they need for proper combustion.
- It cools the flame's peak temperature, reducing the amount of thermal NOx created.
- It limits the amount of oxygen, as the flue gas has approximately 3 to 5%.

So, if we take a look at the goals listed above, you can see that it's essential to use flue gas to maintain airflow while also reducing the oxygen level and cooling the flame. When we combine these effects, we see that flue gas recirculation can make a significant difference in emissions. In fact, a standard Low NOx burner will have around 70 ppm of NOx without FGR. With 15% FGR, however, you can get down to as low as 22 ppm. Specialized Ultra Low NOx burner systems can achieve single digit NOx numbers with higher FGR rates.

The good news is that adding FGR to your boiler is fairly inexpensive, even when you're retrofitting an older system. By adding a system of dampers,

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some might think the goal of FGR is efficiency, it's actually all about reducing your output of thermal NOx and carbon monoxide

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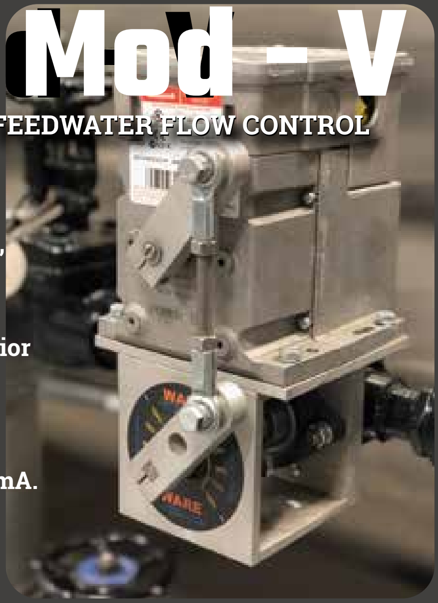

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ALL EQUIPMENT LISTED IS FOR SALE OR LEASE AND SUBJECT TO AVAILABILITY

Unit	HP/PPH	Year	Manf.	Fuel	Type	PSI	Ctrl.
796	82,500	2016	Victory Energy Faber	(Low NOx) G/#2	Steam	350	IRI
797	82,500	2016	Victory Energy Faber	(Low NOx) G/#2	Steam	350	IRI
767	75,000	2011	Victory Energy	(Low NOx) G/#2	Steam/SH	750/750	IRI
747	75,000	2000	B&W	(Low NOx) G/#2	Steam/SH	750/750	IRI
791	75,000	2016	Victory Energy	(Low NOx) G/#2	Steam/SH	750/750	IRI
750	70,000	1996	Nebraska	(Low NOx) G/#2	Steam/SH	750/750	IRI
709	60,000	1979	Zurn	(Low NOx) G/#2	Steam	500	IRI
741	60,000	1979	Zurn	G/#2	Steam	550	IRI
795	40,000	1986	Cleaver Brooks	Gas	Steam	260	IRI
496	800	1990	York-Shipley	(Low NOx) G/#2	Steam	200	IRI
634	800	1972	York-Shipley	G/#2	Steam	150	IRI
620	800	1975	York-Shipley	G/#2	Steam	250	IRI
SSB-55	800 XID	2021	Victory Energy	(Low NOx) G#2	Steam	250	UL/CSD-1
SSB-46	600 XID	2019	Victory Energy	(Low NOx) G/#2	Steam	250	UL/CSD-1
SB-139	500	2001	Cleaver Brooks	G/#2	Steam	150	
SB-243	400	2018	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD1
SB-138	350	1994	Cleaver Brooks	G/#2	Steam	150	
SSB-39	300 XID	2016	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SSB-51	250	2020	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
415	250	1980	Eclipse	#2 Oil	HT/HW	954	IRI
SB-148	200	1995	Kewanee	Gas	Steam	325	IRI
SB-146	200	1995	Kewanee	Gas	Steam	325	IRI

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Unit	HP/PPH	Year	Manf.	Fuel	Type	PSI	Ctrl.
SWVB4	2500	2021	Victory Energy	G/#2	Steam	250	UL/CSD-1
SWVB3	1500	2021	Victory Energy	G/#2	Steam	250	UL/CSD-1
SSB-56	1200	2021	Victory Energy	(Low NOx) G/#2	Steam	250	UL/CSD-1
SB-249	175 XID	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-248	175 XID	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB-53	175 XID	2020	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB-251	250	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-255	250	2012	Cleaver Brooks	G/#2	Steam	150	UL/CSD-1
SSB-52	150	2021	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB-257	150	2021	Victory Energy	G/#2	Steam	150	UL/CSD1
SB-256	150	2019	Victory Energy	G/#2	Steam	150	UL/CSD1
769	150	1998	Precision	Electric	Steam	150	UL
SB-254	100	2020	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-246	100	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-253	100	2020	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB-54	100	2020	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB-241	100	2008	York-Shipley	Gas	Steam	150	UL
SB-237	70	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-238	70	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB-35	70	2016	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB-247	50	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-234	50	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB-45	50	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1

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WARE new and used List

Continued from Pg 1 - Parts of The Boiler Feed Water System Explained

The Heat Recovery System

The heat recovery system warms the water coming in, changing the water temperature by around 20 to 25 degrees Fahrenheit. Providing two benefits, this system eliminates the need for cooling water and provides energy recovery.

Chemical Additions

Softening is the first step of the water treatment program, and adding chemicals is a critical second step. The chemical station pumps these substances to the deaerator, as well as to piping points leading from the deaerator to the boiler. These help keep solids in the solution instead of forming scale on the boiler tubes, eliminate oxygen, and other essential changes.

The Deaerator

Not all systems have a deaerator, as some have a vented feed tank. The deaerator is another addition to the water treatment program that helps to remove the oxygen from the water so that you're using fewer chemicals. It also increases the water temperature to relieve thermal stress on the boiler and increase efficiency. The deaerator will usually run pressurized at 5-7psi, with a corresponding final temperature of 225-227 degrees Fahrenheit.

Boiler

From the DA, the water is pumped to the boiler. On the way to the boiler:

•The economizer increases the water's temperature, reducing the boiler's workload.

•A control valve may be present to precisely maintain the proper water level.

•A check valve prevents a reversal of flow to the DA in the pump cycles or is turned off. If this valve fails, the water backs into the deaerator through the pumps, making check valve health a main priority.

These are the basic elements of a boiler feed water system to be aware of. Make sure that you evaluate each piece of your system to fully understand their purpose and ensure that they're functioning correctly. If you need any assistance, parts, or repairs, contact WARE today!

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Parts of the Boiler Room/Boiler Feed Water System

Continued from Pg 3- How Can You Implement FGR into Your Boiler Room?

ductwork, and other elements, you can add FGR to your current equipment. It's important that a trained expert builds this system for you, as any wrong turns could have detrimental effects on your boiler's efficiency. To get started, contact your boiler service company to discuss the possibility of adding FGR.

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