WARE
ALL WAYS STEAM

THE GRIME

FALL 2020 Newsletter

Tuning the Combustion on a Steam Boiler: why it's important and when to do it.

By Jude Wolf

It's important to tune the combustion on your boiler on a regular basis.

Why?
Because even if everything looks great when you start running the boiler, there are multiple things that can affect your combustion, like:

- Seasonal changes
- Building changes
- Weather changes
- Wear and tear on linkages
- And many other things

No matter the size of your boiler — annual tuning is critical to make sure you're not emitting a lot of carbon monoxide or sooting up the boiler.

Our bare minimum tuning recommendation is that you tune your boiler once per year.

If at all possible, we recommend tuning quarterly. That way, you can keep your boiler in tune with the seasons.

The size of the boiler and the amount of fuel you're burning is what will really dictate how often you should tune your boiler. Because tuning can help save fuel, it becomes very important when you're using a lot of fuel at your facility.

So what are the optimal conditions for tuning?
Well first, you need to make sure you have a load on the boiler to properly assess its efficiency.

To tune a boiler, you have to run it up and down through the firing range. And you have to be able to leave it any given firing rate long enough to get good readings.

On a simple burner, this might take a minute or two.

But on a Low NOx burner, you may need 3 - 6 minutes to get a full development of stack values.

It's also important that your boiler be warmed up and at full operating temperature. Because the stack temperature is going to affect draft, which would affect your combustion numbers.

A lot of times, combustion readings change from when the boiler is cold to when it's hot. And if you're tuning when the boiler isn't warmed up yet, you're making changes that, at best, won't be necessary — and at worst, might even be in the wrong direction.

A great way to ensure you have a good load while tuning is to have a vent on the steam system. Because if you don't have enough process or heating load to run the boiler at high fire, you won't be able to make accurate adjustments.

So being able to use or dump steam is important.

Another important thing to pay attention to is the location where you take your stack sample. If your boiler has a barometric damper, your sample point has to be below that damper.

Why?
Because if you take a reading above it, you'll get a mixture of the boiler flue gases and the air going in. That means you won't get valid numbers if you take the reading there.

At minimum, you want to take readings at 3 points:

- High-fire
- Mid-fire
- Low-fire

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How to Blowdown a Steam Boiler

There are 3 types of blowdown on a firetube boiler:

1. Low-Water Cutoff and Sight-Glass Blowdown
2. Surface Skimmer / Continuous blowdown
3. Bottom Blowdown

Each type of blowdown has a different procedure and purpose. And in this article, we're going to walk you through all 3.

Before you go through any blowdown process, make sure you perform chemical testing. That way, your readings can be taken at a steady operating state.

Now, let's start with the Low-Water Cutoff Blowdown.

The Low-Water Cutoff Blowdown is designed to verify that the low-water cutoff is operating correctly and to clean the float chamber to ensure it continues to work correctly.

Note: Remember to wear your PPE any time you're opening or closing valves on a boiler.

Your first step with a Low-Water Cutoff Blowdown is to crack the valve and let in a small amount of flow to preheat the pipe.

(This is to make sure you don't thermally shock the piping.)

Once you're confident the piping is warmed up, you can open the valve all the way. This will trip off on low water.

Once that happens, you can close the valve and let the boiler return to normal operation.

Let's talk about Sight-Glass Blowdowns next.

You'll especially want to do a Sight-Glass blowdown if you have any cloudiness in your Sight-Glass.

For this type of blowdown, simply open the Sight-Glass valve all the way and then close the valve again.

Once you do that, the boiler will go through the process of relighting. While that's happening, you can check the boiler's chemical readings.

In this case, you're looking specifically at the conductivity readings.

If you have a manual conductivity skimming surface blowdown, you can adjust it according to the chemical readings.

If your reading is low, you can throttle the valve closed slightly.

This will reduce the amount of water that will drain through the day and allow the conductivity to rise back up to the optimal levels.

If your conductivity reading is high, you can open the valve a little bit.

This would cause more surface blowdown to occur, so your conductivity reading will come down.

Let's talk about Bottom Blowdown now.

Doing a Bottom Blowdown removes sediment and other particles that have settled to the bottom of the boiler.

The ASME procedure for Bottom Blowdown is to first open the Quick Open Valve and keep the Slow Open Valve closed. That way, you don't have any extended flow through that valve.

The next step is to open and close the Slow Open Valve, then close the quick open valve.

Note: If your conductivity is high, you can leave the valve open for up to 5 - 15 seconds to decrease the conductivity by dumping more water.

But if the conductivity is low, you want to leave the valve open for a much shorter period of time.

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WAREboilers channel

How to blowdown a steam boiler

How to Manage Condensate Return Temperatures for Deaerators

By Alex Taylor

Steam turns into condensate after it's used, in a closed-loop system and in many cases, it makes sense to re-use this condensate.

A lot of facilities do.

But if you're not careful, you can run into problems when pumping the condensate back into the boiler system.

Why?
Because condensate returns to the deaerator (DA), which is only designed to handle a certain amount of temperature and pressure.

In general, there are 3 different types of condensate returns:

• Low-Temperature Returns — At a much lower temperature or pressure than the DA is operating, these returns are generally piped back into the makeup water inlet area.

• Medium-Temperature Returns — Typically these returns are below the actual operating temperature in the DA by no more than 30 degrees, and they are piped back into the DA tank's holding area. (Example: If the water in the DA is at 227 degrees, then condensate with a temperature between 197 and 227 degrees could be considered "Medium-Temperature".)

• High-Temperature Returns — These returns are at a higher temperature and pressure than the DA. They are generally injected into the DA at the same place the steam enters the tank. This makes sense, because returns at these pressures and temperatures are likely to flash into steam when they enter the DA. But there are limits to this. If you flash too much steam in the DA, you can overpressure the tank. Or you could cause overheated water to cavitate in the pumps and severely damage them. Sometimes a back-pressure relief valve set at a lower pressure can remedy this, but the manufacturer should be consulted to ensure that it is a feasible solution.

So what can you do to handle condensate returns appropriately?

First, make sure your DA is sized properly.

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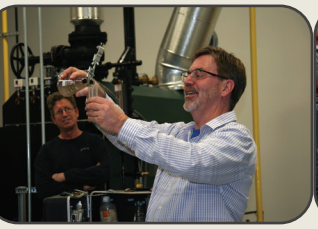



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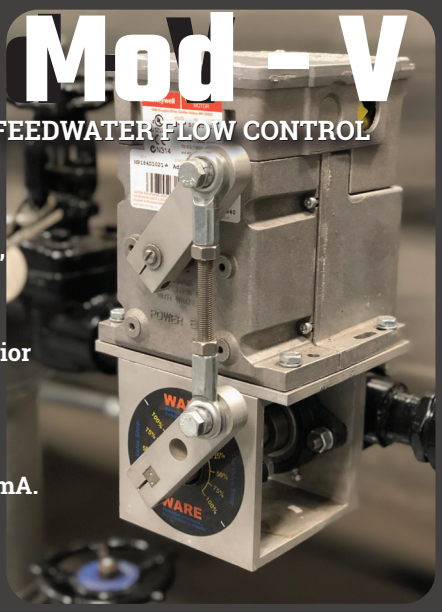

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ALL EQUIPMENT LISTED IS FOR SALE OR LEASE AND SUBJECT TO AVAILABILITY

Unit	HP/PPH	Year	Manf.	Fuel	Type	PSI	Ctrl.
779	82,500	2013	Victory Energy Limpsfield	(Low NOx) G/#2	Steam	350	IRI
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
SSB-49	800XID	2019	Victory Energy	(Low NOx) G#2	Steam	250	UL/CSD-1
620	800	1975	York-Shipley	G/#2	Steam	250	IRI
SSB-46	600XID	2019	Victory Energy	(Low NOx) G/#2	Steam	250	UL/CSD-1
SB-139	500	2001	Cleaver Brooks		Steam	150	
SB-243	400	2018	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD1
SB-138	350	1994	Cleaver Brooks		Steam	150	
SSB-39	300XID	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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NEW AND USED LIST continued

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Unit	HP/PPH	Year	Manf.	Fuel	Type	PSI	Ctrl.
SB-248	175XID	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-249	175XID	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-240	175XID	2017	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB-48	175XID	2019	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SWVB1	1200	2017	Victory Energy	(Low NOx) G/#2	Steam	250	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-47	150	2019	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB-252	150	2019	Victory Energy	G/#2	Steam	150	UL/CSD1
SB-250	150	2019	Victory Energy	G/#2	Steam	150	UL/CSD1
769	150	1998	Precision	Electric	Steam	150	UL
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-41	100	2017	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
SB-254	100	2020	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB-45	50	2019	Victory Energy	G/#2	Steam	150	UL/CSD-1

Tuning the Combustion on a Steam Boiler: Why It's Important and When to Do It, continued from page 1

Another thing to consider is the fact that every burner is different.

So if you have a specific service person tuning your boiler with greater frequency, they can become familiar with what your burner is capable of doing combustion-wise.

And each manufacturer has target values for each burner. So it's important to be as efficient as it can be, but you also want to be within the manufacturer's recommended range.

In summary, tuning is important for economical reasons, environmental reasons, and reliability reasons. So make sure you're doing it on a regular basis.

Tuning the combustion on a steam boiler

How to Blowdown a Steam Boiler continue from page 2

That said, you don't want to do a Bottom Blowdown for longer than 15 seconds because you could actually create low water in the boiler by doing this.

If your conductivity is still high after a long blowdown like this, your best bet is to come back to the boiler in 4 hours and do a second blowdown to bring the conductivity down even more.

Once the Slow Open Valve is closed, you can close the Quick Open Valve.

After you close the Quick Open Valve, you can crack the Slow Open Valve again to bleed the pressure in-between the valves and then reclose it.

Note: If your boiler has separate blowdown lines or if the line to your blowdown separate is long — the Bottom Blowdown line could be cold... which creates the potential for water hammer or steam hammer.

So if you have a long, unheated run to your separator tank, you may want to crack your slow open valve for a few moments before opening it fully. That way, you can prevent water hammer or steam hammer.

And that's it!

Those are the processes we follow for...

1. Low-Water Cutoff and Sight-Glass Blowdown
2. Surface Skimmer / Continuous Blowdown
3. Bottom Blowdown

We hope you've found them helpful!

How to Manage Condensate Return Temperatures for Deaerators, continued from page 3

That means the return sizes can handle the condensate flow and that the vessel is rated for the condensate pressure.

Second, make sure the condensate is piped to the appropriate inlet for its temperature/pressure.

Low-Temperature Returns should be added back in near the makeup water inlet. Medium-Temperature Returns should generally be piped back into the DA's main storage area. And High-Temperature Returns should be allowed to safely flash into steam as they enter the DA. (But again, you can overdo this, so be careful here.) When in doubt, consult the manufacturer's drawings and instructions for selecting the appropriate inlet, or contact them directly

Finally, if the condensate temperature, pressure, or flow is too high for your DA to handle, you may have to install a surge tank. This is a place where you can store condensate and let it safely cool or otherwise pump it to the DA at a lower pressure.

Once it's at a safe temperature and pressure, it can be sent back to the DA via transfer pumps.

The surge tank essentially acts as a buffer to protect your equipment and still use the condensate you've collected. Additionally, if your condensate is at too low of a pressure to overcome the DA's operating pressure and physically enter the tank, a surge tank's transfer pumps can help deliver it back into the DA tank.

Following these tips can help you appropriately store and use your condensate without causing damage to your equipment.

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