WARE
ALL WAYS STEAM
THE GRIME
WINTER 2022 Newsletter

Fuel System Safety

By John Wizor

Combustion is the heart of the entire boiler system. That's where the energy comes from that makes the entire system work. Unfortunately, in natural gas fed boilers, it also has the highest potential for disaster. Gas explosions claim lives every year. While some of these tragedies may have been unavoidable for one reason or another, a lot of them could have been prevented. There are several key issues to remember when dealing with gas boiler combustion. Staying on top of them will keep a boiler running safely and efficiently. Ignoring them could lead to disaster.

Compliance and Design

Constructing a boiler fire train requires professional expertise. Running it requires proper training and skill. Repairing it requires a special skill set, as well. If someone in any one of those roles doesn't have the proper level of experience with natural gas equipment, they could set the stage for catastrophe. Having the right people with the right expertise in place can go a long, long way to preventing explosions. Regulatory compliance is also important, because the current laws, codes, and regulations have helped make boilers safer than ever.

Proper and Timely Inspections

Boilers are sturdy and robust by design, but that doesn't mean they're invulnerable. Time, pressure, and temperature take their toll on even the toughest equipment, so it's important to stay on top of the condition of every part of your boiler system. Just eyeballing it isn't enough, either. Properly trained boiler technicians know what to look for, and where. They're able to recognize little problems before they become big problems, and they know how to keep a boiler running at optimal efficiency. Make sure a qualified technician inspects your entire boiler on the recommended schedule. That will help make your system safer, while saving fuel costs.

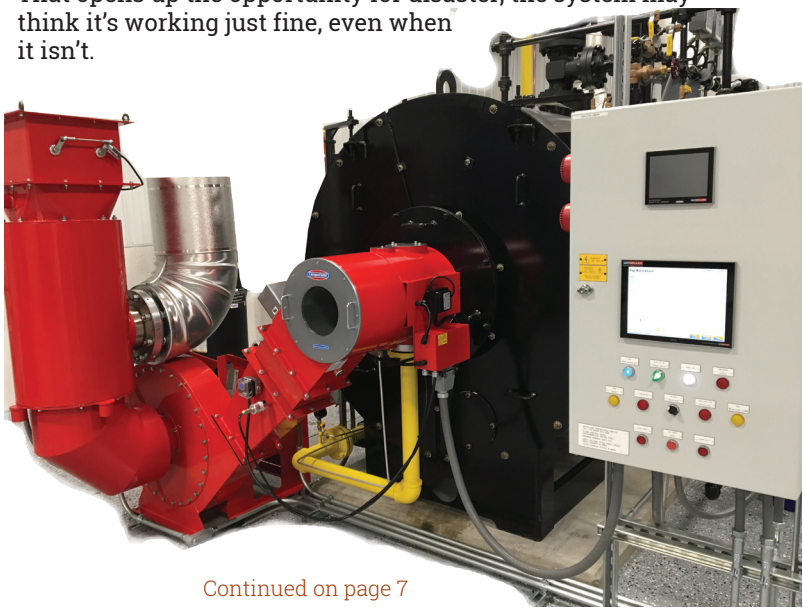
Grandfathering Old Equipment

Just because it passes inspection doesn't mean it's safe. Just because it's already installed doesn't mean it should stay that way. And just because it worked in the past doesn't mean it's the right solution today. Unfortunately, the laws concerning inspections don't really take any of that into account. When evaluating the safety of a boiler, inspectors have to make sure it follows the standards and codes in place at the time it was installed. Which means that modern inspection and safety protocols don't legally apply to older equipment. It's up to boiler owners to get their equipment inspected by trained professionals who can evaluate whether a fuel and burner system will operate reliably and safely.

Interlock Testing

The fuel train in a gas-fired boiler is made up of a complex combination of pipes, valves, wires, switches, sensors, regulators, and motors. Every component is ultimately controlled by the Burner Management System, or BMS, which manages proper fuel flow during operation. The BMS is also responsible for maintaining safety during the two most dangerous times of a gas burner's operation: lightoff and shut down.

To ensure safety, the BMS maintains a series of interlocks that keep every component of the fuel train within spec, to prevent unsafe conditions from ever occurring. To make sure the BMS can do its job, the entire fuel train needs to be inspected and calibrated regularly. If something gets out of spec, the BMS may start to receive faulty data from the misadjusted component. That opens up the opportunity for disaster; the system may think it's working just fine, even when it isn't.



Continued on page 7

Weld Well

By Jimmy Curtsinger

Because of the heat, pressure, and related stress placed upon boilers, there's really only one way to put them together. They have to be welded. Opinions vary on how to do that, because there are actually five common welding processes out there. But based on our extensive expertise, WARE chooses to use only two of them. Here's how they all compare.

SHIELDED METAL ARC WELDING

This is the most popular type of weld used in boiler manufacturing, and one of WARE's preferred methods, because it is the most versatile. It also requires the least equipment to get the job done right, and can be used in tight spaces. Shielded metal arc welding is a form of stick welding; during the welding process, the metal surface and a metal rod called the electrode are both heated to their melting point with high-amperage electricity, forming a molten pool. That pool then hardens into solid metal, forming a continuous connection between the two surfaces being welded.

The "shielded" in the name refers to the fact that at the point of joining, the welding reaction is shielded from the outside air by gases that are released from the electrode as it is consumed. By releasing that gas shield, the electrode protects the metal and the electrode at the point of welding from potential contamination by outside air.

ADVANTAGES:

- Low equipment and material costs
- Forms a solid and sturdy joint
- Can be used on multiple types of metal
- Can be used on dirty or rusty surfaces

DISADVANTAGES:

- The electrode is consumed quickly, requiring frequent replacement
- Time-intensive
- Welds are strong but not pretty

MIG WELDING

Metal Inert Gas welding, the other preferred WARE method, uses the same basic principle as shielded metal arc welding. The weld is still made by melting the two metal surfaces and an electrode together with electricity. However, MIG welding uses a tool called a "spool gun" that dispenses the electrode from a spool automatically as the weld progresses. Shield gases are not built into a MIG welding electrode, though. That's where the "inert gas" in the name comes in. As the weld is formed, the welder must maintain a constant flow of a specific type of inert gas through the spool gun to shield the weld.

Different metals each require their own specific combination of electrode material and inert shield gas, which means it's up to the welder to know what they're doing to preserve the quality of the weld.

ADVANTAGES:

- Easy to learn
- Can be used on multiple metal types
- Works on thin metal surfaces
- Welds look neat and clean

DISADVANTAGES:

Difficult to regulate gas flow in outdoor environments
Metal surfaces must be cleaned before welding
Requires knowledge of different electrode and gas combinations for each surface

GAS TUNGSTEN ARC WELDING

Also called TIG welding, gas tungsten arc welding is similar to MIG welding in that the electrode uses no flux, so an inert gas must be added to shield the weld as it forms. TIG welding can be done automatically or by hand, but tends to be a time-intensive process. Automatic TIG welding can be done at high amperage to produce high temperatures, resulting in good metal fusion. Manual TIG welding tends to be performed at lower temperatures, and produces a weld with few impurities and finer grains that really stands up to mechanical stress.

ADVANTAGES

- Highest weld quality

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Stay On The Ball About an Offline Boiler

By Steven Taylor

Sometimes, you have to take your boiler offline for a while, and what you do after shutdown can play a big role in your boiler's life, safety, and operation. Leaving condensate and air just sitting in your boiler will bring corrosion and pitting if not properly managed, or eliminated entirely. That's why it's important to follow the processes and procedures for the right type of boiler storage, under the right conditions.

Proper boiler storage takes two forms, wet and dry. They're each designed for different time periods of inactivity. Make sure the proper method is used, or the consequences can be fairly steep.

Wet storage

If your boiler is just going to take a short nap, wet storage is probably the best choice. It's also great for shutdowns that have to be done on very short notice. Since water will remain in the boiler during wet storage, temperatures must remain above freezing to avoid damage. If water in any part of the boiler freezes, it can cause wear and damage as it expands. That can prove disastrous when the boiler is fired back up again.

To manage the pitting and corrosion problem, the water inside the boiler must be kept at specific levels of alkalinity and sulfite. Furthermore, the boiler has to be sealed from intrusion by air, feedwater, steam, or condensate, which could all introduce more oxygen.

To maintain proper protection against corrosion and pitting, a wet-stored boiler should ideally be drained, washed out, and then refilled with the proper mixture of water and chemicals. If draining isn't possible, the water inside must be tested, with chemicals being added to maintain the proper protection. It's also important to circulate the boiler water at least weekly to prevent precipitate from forming layers in the water or collecting on the tank surface.

When the boiler is fired up again after wet storage, increased blowdown may be required to get the water back to the correct levels of alkalinity and sulfite for daily operation.

Dry storage

If your boiler will be stored for a while, dry storage is the best option. It's also the only choice you have for extremely cold conditions, since the absence of water also means an absence of ice. As the name suggests, dry storage leaves no water in the boiler. However, a dry-stored boiler must be washed out thoroughly and completely dried with warm air to ensure no impurities or moisture remain inside.

To further protect against moisture and corrosion, a properly washed, drained, and dried boiler will also have trays of desiccant placed inside during the storage period. Once the desiccant is in place, the boiler is then sealed off completely, leaving the desiccant to do its job of keeping internal humidity at a safe level. To monitor the desiccant's moisture-absorbing efficacy, desiccant monitoring cards are attached that let inspectors know when the desiccant becomes saturated and no longer effective.

An alternative method of dry storage involves purging the boiler completely of moisture, then pressurizing it with nitrogen to hamper any corrosive reactions inside. Startup after either dry storage method involves simply removing the desiccant and monitoring cards, or purging the nitrogen, then adding the correct chemical mixture for daily operation as the boiler is refilled.

Consequences

If a boiler is not stored properly, internal surfaces can be subjected to the damaging effects of corrosion and pitting. These are both very bad for the health of a boiler, because they not only introduce impurities into the water side, they also weaken the structure of the boiler itself. That can lead to leaks, lost efficiency, and even an explosion if left unchecked. Always be safe. Shut down like a pro.

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NEW AND USED LIST

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
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-57	600 XID	2021	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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WARE new and used List

NEW AND USED LIST continued

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

Unit	HP/PPH	Year	Manf.	Fuel	Type	PSI	Ctrl.
SWVB4	2500	2021	Victory Energy	(Low Nox) G/#2	Steam	250	UL/CSD-1
SWVB3	1500	2021	Victory Energy	(Low Nox) G/#2	Steam	250	UL/CSD-1
SSB-56	1200	2021	Victory Energy	(Low NOx) G/#2	Steam	250	UL/CSD-1
SB-258	300	2016	Cleaver Brooks	Gas	Steam	150	ULs
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
SB-264	175 XID	2021	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-240	175 XID	2017	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
SSB-52	150	2021	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
769	150	1998	Precision	Electric	Steam	150	UL
SB-260	100	2010	Johnston	Gas	Steam	150	UL
SB-254	100	2020	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-259	100	2021	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-262	100	2021	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-265	70	2021	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-263	50	2021	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-261	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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Oct 11 - 12, 2022 - Chattanooga, TN

201 CLASS 2020

Jan 18 - 20, 2022 - Louisivlle, KY
Mar 01 - 03, 2022 - Louisville, KY
Apr 19 - 21, 2022 - Louisville, KY

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Classes are three days

BOILER 201 - In-Depth Boiler Room, Components, Operation / Lab
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BOILER 302 - Principles of Combustion
BOILER 303 - Hands on Flame Safeguard and Boiler Control Wiring

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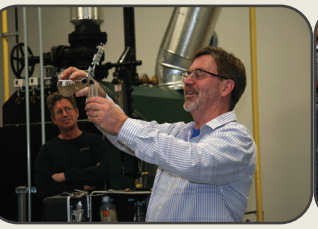



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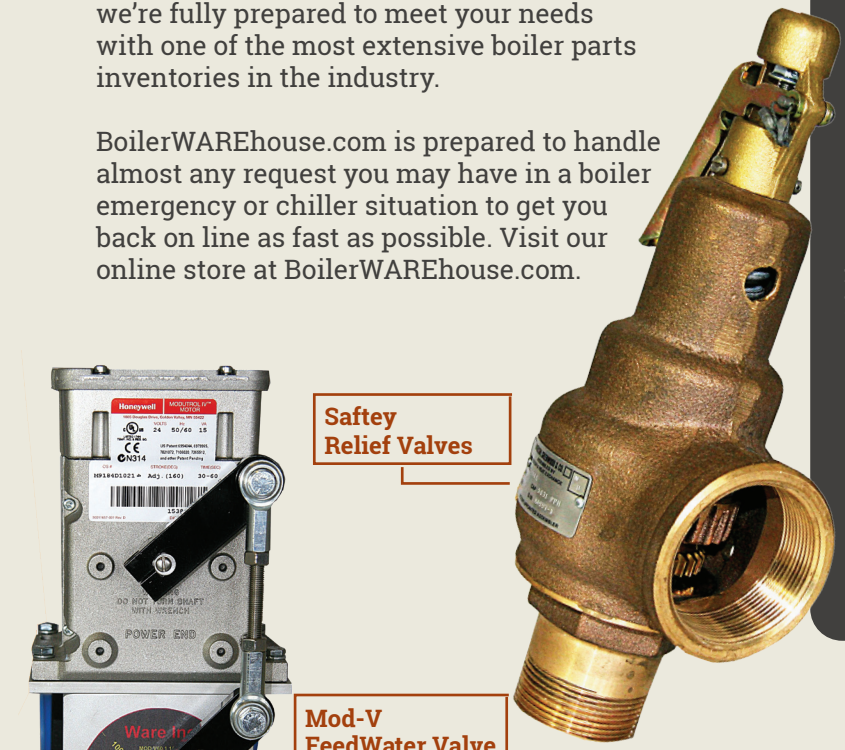

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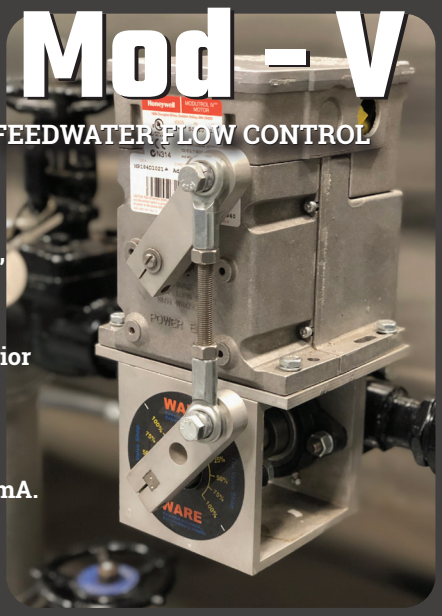

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Continued from Pg 1 - FUEL SYSTEM SAFETY

Passing the Buck
When new fire train equipment is installed, it's often assumed that it was put in correctly. After all, the design and specs have passed through at least a dozen hands, from architects to inspectors to city government. However, that doesn't always mean it's been done right. Many professional and governmental agencies often farm out the boiler design reviewing process to architects and engineers who don't have a lot of specific fire train experience. They, in turn, may consult with city code officials, a consulting engineer, or a vendor, none of whom will actually be on-site during or after the fire train is put in. Only an expert in gas train design can make a proper on-site assessment and verification of the new system. Trusting anyone else is just asking for trouble.

The Human Factor
The fact is, 40% of all boiler combustion accidents are due to simple human error or negligence. Every company with a boiler on-site should maintain a culture of safety that reinforces best practices, awareness, and proactivity. By doing so, the chance of an explosion is greatly reduced.

Training
Boilers are safe when they're in properly trained hands. But, like any energy-based system, they can go disastrously wrong if they aren't handled properly. Every company with a boiler on-site should have someone on staff who is trained in every aspect of the boiler, so they know how it operates, what to watch for, and when to call a professional for help.

Maintenance
A boiler's gas train can go for years without a problem, which can lead to a false sense of security and confidence. Over time, parts can wear out and components can become misadjusted. Proper, timely maintenance by a qualified boiler technician is absolutely crucial to the entire system, but especially the gas train.

Documentation
Detailed records give everyone involved with a boiler's operation a clearer picture of its operation history. This can not only ensure that inspections are carried out when they need to be, it can also help identify trends and changes that can develop into bigger issues down the road. The more information there is about the fire train's operation and history, the safer it will be.

Continued from Pg 2 -WELD WELL

— Welds resist mechanical stress

DISADVANTAGES
— Time-consuming

SUBMERGED ARC WELDING
Submerged-arc welding, also knowns as sub-arc welding, uses very high amperage (1000 amps or more) to do a lot of welding at once. Usually performed by machines, sub-arc welding also uses a constant spool of electrode like a MIG welder. However, because of the extremely high temperatures involved, sub-arc welding can be done very quickly, and can accommodate up to five electrode spools at once. That high speed comes at a cost, though. Sub-arc welding can only be performed in a horizontal or flat position. Furthermore, because of the granular flux used in sub-arc welding, large grains and slag inclusions can form in the weld. It's still a strong weld, but those impurities mean it's more susceptible to mechanical stress.

ADVANTAGES
— Low material costs
— Fast throughput
— Strong welds

DISADVANTAGES
— High equipment costs
— Must be done in a flat or horizontal position
— Welds do not stand up to mechanical stress

FLUX-CORED ARC WELDING
Flux-cored arc welding is probably the most diverse kind of arc welding out there. It comes in two forms, self-shielded and gas-shielded. Gas-shielded is the more popular of the two, and tends to produce a cleaner weld that is more resistant to mechanical stress. Like MIG welding, gas-shielded flux-cored arc welding relies on an external gas supply to shield the weld. Self-shielded supplies its own gas in the form of a consumable compound surrounding the electrode.

Because it can use larger-diameter electrodes, flux-cored arc welding can do a lot of welding in a short time. However, it can only be performed in a flat or horizontal position.

ADVANTAGES
— Useful in a variety of applications
— High throughput
— Strong welds that stand up to mechanical stress
— Larger electrode diameter

DISADVANTAGES
— Must be performed in a flat or horizontal position

ADVICE
No matter how you're welding, there are a few important things to remember. Make sure you're welding from a comfortable position to avoid fatigue. Take your time, and don't let yourself get rushed. Also, make sure you're well-trained on the equipment, and know which kind of electrode, what kind of gas, what gas volume, and what temperature to use. With experience, every welder will get a better feel for how everything works, and will start to develop his or her own particular style. With everything, though, practice makes perfect. And perfect makes stronger welds.

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