An American Snapshot of Boiler Technology

It's not uncommon for a boiler to be used in a museum building, but it is uncommon for a boiler room to be its own museum display.

But, if you visit the USS Hornet Museum in Alameda, California, you will find exactly that.

The USS Hornet was a Navy ship that was launched in 1943 and decommissioned in 1970. The Hornet was involved in both World War II and the Vietnam War. And, when the Apollo 11 and 12 astronauts came back home, the Hornet was used to recover them.

The ship's history is not the only thing that's impressive about it. It's equipped with a boiler system quite different from what we commonly see today.

The boilers used Bunker C fuel oil, also called "bunker oil" or "NSFO" (Navy Standard Fuel Oil). The fuel was so thick that it was unable to flow without being heated. Transfer of the fuel required that it be heated to 170 degrees Fahrenheit, and use of the fuel on the Hornet required it to be heated to 350 degrees Fahrenheit. As you can imagine, using this type of fuel was quite the task, but the challenge doesn't stop there.

The ship is not equipped with any fuel control valves. A Boiler Technician on duty had to manually change the sprayer plate on the burner lance once every four hours, at least. When the ship needed to go faster, the Technician would need to install a sprayer plate with a larger opening to allow for the generation of more steam.

Glenn Showers on the USS Hornet

Continued on pg.7

Your Annual Inspection

by Alex Taylor, National Account Rep

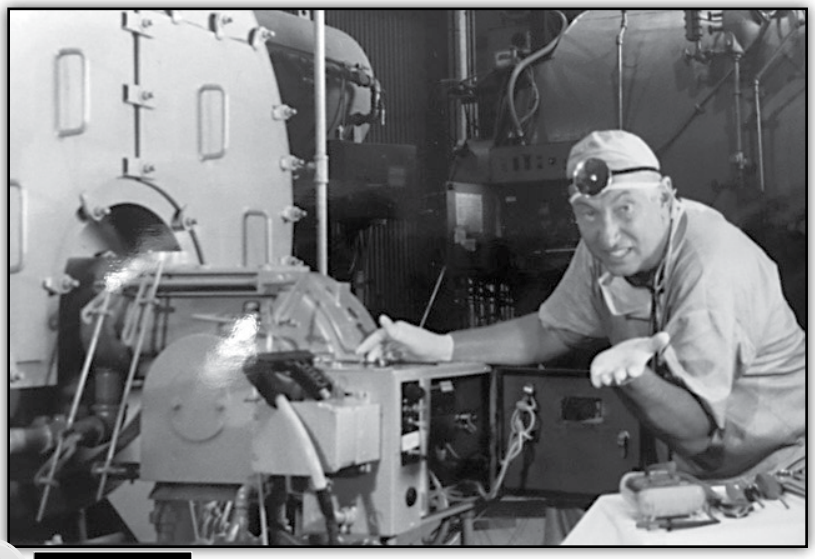
Now that the cooling season is over, many facilities that primarily use their boilers for heating will be shutting their equipment down. When cooler weather returns in the fall and there is once again a demand for heat, the boilers will be brought back online. Some facilities using boilers for their processes won't shut down for the whole summer, but they usually still have a brief shutdown or turnaround period each year. Whether you have a few weeks or a few months of shutdown time, it is a perfect opportunity to take care of any maintenance issues that were discovered and postponed this past year. One of the most important items on the list is the annual inspection.

For those who are unfamiliar, every state requires that pressure vessels be inspected on regular intervals. Some states only require low-pressure vessels to be inspected every two or three years, but most jurisdictions will require boilers and pressure vessels to be inspected every year. This entails both an internal and external inspection; depending on your state's laws, it may be a certified insurance inspector, a designated state inspector, or the local fire marshal's office that performs the inspection. Any items of concern will be noted for correction in a report, and failure to correct those items may result in your boiler being "red-tagged" (condemned) until the appropriate repairs are made. Once the equipment has been cleared, you will typically receive a certificate of inspection for each pressure vessel and a certificate of operation, permitting you to run the equipment.

Even if your boiler or pressure vessel is not due for an inspection, do not forget about your safety relief valves. Most local codes also specify a regular interval to have your safety valves tested and reset to ensure that they remain in good condition and perform as designed. If you can afford to be down for several days, you can remove the reliefs and ship them to a valve shop to be tested, recertified, and returned. Alternatively, you can keep a set of replacement valves on the shelf to swap in while your current valves are being reset and returned to your shelf—then next year you can simply repeat the process.

Inspections will typically cost anywhere from $50-$300 per unit inspected, but it varies from state to state. There is also a nominal fee for the operating certificate. Your local boiler inspector's office or designated boiler regulatory authority will be able to tell you what the associated fees are for inspection and certification of your equipment. If you need someone to reset and certify your relief valves, WARE's Valve Shop offers that service year-round and can provide a set of backup valves as well. Perhaps you have numerous maintenance issues to clear up, or maybe your inspection revealed extensive damage that needs to be repaired? If so, WARE has rental boiler packages that can hold your facility over until the necessary maintenance can be completed.

Don't put off your inspections. They are ultimately a safety issue, regardless of how burdensome they may seem to be. Ask yourself: would you prefer to be the one scheduling when your equipment is taken offline, or would you rather have an inspector flag it and force an unexpected shutdown? Whether you need a rental boiler, boiler maintenance and repair service, or parts for your equipment, WARE is committed to being available as a resource for you.



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Watch a video on -

Annual Steam Boiler Open and Close

Last Line of Defense

The Story of the Safety Valve Getting Results When It Matters Most

A properly-functioning safety valve can be the difference between a normal day of boiler operation and catastrophic failure.

A safety valve is the last line of defense against abnormally high pressure in a boiler. Put simply—it's important.

During the normal course of operation, boilers create high pressure steam. This steam is then used productively throughout the facility where the boiler is located.

But, sometimes things go wrong, and pressure inside the boiler gets too high. When this happens, that pressure has to be released somewhere. Generally, this pressure is released from the safety valve on top of the boiler. If it cannot be released through the safety valve, it may exit the boiler in other less-desirable, dangerous ways.

The safety valve on your boiler consists of a few things: a disc, a nozzle, upper and lower rings, and a spring. The valve itself is threaded or flanged to the boiler. The safety valve is designed to "pop" open fully and immediately once it reaches its Set Pressure.

A helical spring sits over the disc—which sits over the nozzle—and applies force. This force can be increased or decreased by an adjusting screw. Under the nozzle is the steam from the boiler.

As long as the downward force of the spring is greater than the upward force from the steam, the valve remains closed. When the upward force of the steam is greater than the downward force of the spring, the valve will open, but will not "pop" open.

The force described above can be expressed as "Pressure (P) x Area (A) = Force (F)."

As the valve gets closer to its Set Pressure, it begins to "simmer." This increases the area that is being acted on by the pressure from the steam. Since the area is increased, the total force on the valve is also increased. If the upper and lower rings are properly adjusted, the valve will "pop" open fully and reach its full-rated capacity.

It is very difficult to get a valve to "pop" open exactly at its Set Pressure. That being the case, ASME Section I Code allows for a set pressure tolerance of plus or minus 3% for valves set at 100 psi.

> A safety valve should pop very rarely.

That means if the Set Pressure on a valve is stamped at 100 psi, that valve can "pop" open between 97 and 103 psi. Most valve assemblers and valve repair shops will set the valve on the "high" side of the code, meaning the valve would actually "pop" open closer to 103 psi than 97 psi.

A safety valve should pop very rarely. Remember, this is the last line of defense. So, if the safety valve is doing its job, a few other things have gone wrong before that point.

After a valve pops, it should be taken down and repaired. Most municipalities require that an entity with a VR stamp perform these repairs. This ensures that the individual performing the repairs is qualified.

WARE has a VR stamp and provides safety valve repair services in which we check the dimensions on all component parts of the valve and take them back to the manufacturer's allowable tolerances.

With proper maintenance, safety valves can last a long time. It's not uncommon to get 30-40 years of operation from a flange safety valve if it remains fully repaired. Safety valves are designed to be repaired, not thrown away.

While it might seem like a small part of the operation, a properly functioning safety valve is necessary to keep your boiler operating safely.

Contact your local representative (800-228-8861)for Steam Studies

Watch a video on -
How a Saftey Valve works on a boiler.

Informative
WARE videos

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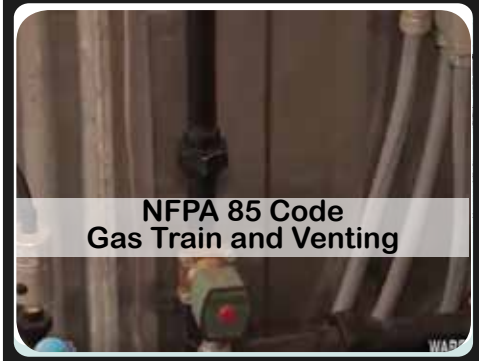
BOILING POINT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NEW VIDEOS UPLOADED ALL THE TIME.

WARE 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.
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
SSB30	800XID	2014	York Shipley	(Low NOx) G#2	Steam	250	UL/CSD-1
620	800	1975	York-Shipley	G/#2	Steam	250	IRI
SSB28	600XID	2012	York Shipley	(Low NOx) G/#2	Steam	250	UL/CSD-1
SSB15	500XID	2011	York Shipley	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB139	500	2001	Cleaver Brooks		Steam	150	
SB226	400	2016	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD1
SB138	350	1994	Cleaver Brooks		Steam	150	
SSB39	300XID	2016	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SSB40	250	2017	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
415	250	1980	Eclipse	#2 Oil	HT/HW	954	IRI
SB216	250XID	2015	York-Shipley	(Low NOx) G/#2	Steam	150	UL/CSD1
SB148	200	1995	Kewanee	Gas	Steam	325	IRI
SB146	200	1995	Kewanee	Gas	Steam	325	IRI
SB213	175XID	2014	York-Shipley	G/#2	Steam	150	UL/CSD1
SB220	175XID	2015	York-Shipley	G/#2	Steam	150	UL/CSD1
SB210	175XID	2014	York-Shipley	G/#2	Steam	150	UL/CSD1
SSB20	175XID	2012	York Shipley	(Low NOx) G/#2	Steam	150	UL/CSD-1

One hour quote on-line at www.wareinc.com or call 800-228-8861

continued

WARE new and used List

WeRentBoilers.com

All equipment listed is for sale or lease and subject to availability

Unit	HP/PPH	Year	Manf.	Fuel	Type	PSI	Ctrl.
SSB38	150	2016	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB235	150	2016	Victory Energy	G/#2	Steam	150	UL/CSD1
SB236	150	2016	Victory Energy	G/#2	Steam	150	UL/CSD1
769	150	1998	Precision	Electric	Steam	150	UL
SB-232	100	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-228	100	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB37	100	2016	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB-277	70	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-238	70	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB35	70	2016	Victory Energy	(Low NOx) G/#2	Steam	150	UL/CSD-1
SB-234	50	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SB-227	50	2016	Victory Energy	G/#2	Steam	150	UL/CSD-1
SSB33	50	2015	York Shipley	(Low NOx) G/#2	Steam	150	UL/CSD-1

Chillers

Unit	Size	Manf.	Volt.	Type	Year		
RC-24	30 ton	Mc Quay	480v	3 ph	2000		
RC-26	40 Ton	Mc Quay	480 v	3 ph	1999		
RC-1	60 Ton	Mc Quay	480 v	3 ph	1995		
RC-2	60 Ton	Mc Quay	480 v	3 ph	1995		
RC-13	60 Ton	Trane	200-230 v	3 ph	1989		
RC-5	95 Ton	Mc Quay	480 v	3 ph	1995		
RC-6	105 Ton	Mc Quay	480 v	3 ph	1995		
RC-10	195 Ton	Mc Quay	480 v	3 ph	1995		
RC-11	195 Ton	Mc Quay	480 v	3 ph	1995		

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Continued from pg 1

An American Snap shot of Boiler Technology

Another responsibility of Boiler Technicians on the ship was to look inside the boilers with a periscope to observe the color of the smoke being produced. Based on the smoke's color, this Technician could inform the other Boiler Technicians in the room if the fuel mixture needed to be adjusted.

The ship is equipped with eight Babcock & Wilcox M-Type boilers. There are six burners in the primary furnace, and five burners in the superheater section. These boilers powered steam turbines in order to produce 150,000 shaft horsepower.

Boiler technology has improved considerably since the USS Hornet's launch in 1943. We are now able to automate many of the processes that had to be done manually on the Hornet.

The USS Hornet serves as an exceptional snapshot of boiler technology at the time of its launch and as an example of the skills and effort required to keep a ship of its size operational.

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