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THE GRIME

SPRING 2025



RIGHT-SIZING YOUR BOILER: GETTING WHAT YOU ACTUALLY NEED

By: Steven Taylor, VP of Rental Division, WARE

You Need What You Need

What you want isn't always what you need. A 900-hp supercar sounds like fun. That is, until you get your first insurance bill. Ice cream for dinner every night sounds like a dream, but when your next physical rolls around, your doctor may have some bad news. When it comes to the boiler business, a 1,900 hp boiler may sound like the kind of powerful workhorse your factory needs, but as it turns out, it may be too much of a good thing. You might need something less, and that's a good thing to know.

That's just one of the factors to consider when renting or replacing a boiler. As WARE Rental Division Vice President Steven Taylor puts it, "Don't just look at the size of the boiler and swap in the same size. I mean,

anybody can do that. You have to know what you're looking for."

A Look Back

Taylor recommends keeping a few factors in mind, starting with the boiler's history. That's not just about age and wear, either. That boiler's been there for a long time, and your company's probably changed a bit since then. You need to confirm that you have the same steam demand you did when the boiler was first commissioned. What may have been plenty of steam back then may just be barely enough – or not enough – today.

Share the Load

It's also important to consider any change in heat load

on the boiler as well, and whether the current boiler was able to handle it. For example, if your feedwater temperature has changed since the boiler was installed, the new boiler is going to have to be able to produce more heat to compensate. This means seasonality also comes into play. "A boiler installed in August may just be handling process load and nothing more. But you put in a boiler in the middle of January, and you've got the heat load from cold utility water, cold air through the dampers, and a colder operating environment."

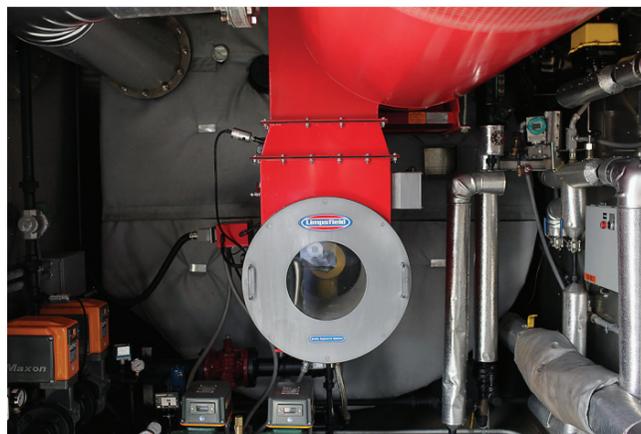
Colder temperatures also mean greater heating load on boilers that supply environmental heat as part of their work processes. So season to season, it just can't perform the same. It's best to plan for the worst conditions when you get a replacement, so you'll have plenty of steam every and any time you need it regardless of the temperature outside.



Fuel In Steam Out

Changes in your fuel supply can also affect whether your old boiler is a proper indicator of what your next

boiler should be. If you're operating with a different fuel, or if the fuel quality has shifted, you'll have to take that into account when specifying a replacement. Otherwise, you may end up with more heat or less heat than your plant needs.



Track Record

According to Taylor, past boiler performance is also a key indicator of what the next boiler should look like.

"Let's say a customer calls us and wants us to quote a 75,000 pound-per-hour boiler. That may be what they need, and we'll quote them for that, but we'll also take the time to ask about how their previous boiler was operating. If they tell us 'well, it never really got out of low fire, soooo' we know their previous boiler was oversized, and not operating at its highest efficiency. In that case, we'll quote them something that will deliver all the steam they need, but at greater efficiency."

Add-Ons

Another important consideration when sizing a new or rental boiler has to do with whatever else is in your



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system, particularly if it's a deaerator. The function of a deaerator is to remove excess air and oxygen from your boiler's water supply. It does this by blasting the water with steam to release trapped air. Where does that steam come from? That's right, your boiler. So if you don't take the steam demands of auxiliary equipment into consideration, your new or rental boiler won't be properly rated for your actual steam demand.

"Deaerator demand can take up to 10% of your boiler's output," says Taylor. "So if you look at your steam flow recorder and it says 75,000 pounds-per-hour, and you replace it with a 75,000 pound-per-hour boiler, once you bring those deaerators online you're only looking at 67,500 pounds-per-hour of steam that actually makes it to your work processes."

Look Ahead

Another important consideration when specifying a new or rental boiler involves thinking about the future. What might be the ideal boiler today may be inadequate for your steam demand in 10 years. Or even five. Consider growth, then, when you're considering what goes in your boiler room.

Not Just Boilers

Knowing the actual size boiler you need goes beyond just replacement of the boiler itself. Any equipment replacement, from water softeners to deaerators

to economizers, has to be properly matched to the actual boiler, in the actual operating conditions, under actual real-world demand. That means more than just reading the boiler manual or a few engineering documents. It means applying real-world boiler expertise to make sure your new equipment will do what you need it to, and do it well, so your boiler operates at its most efficient.

These are the kinds of things to keep in mind when looking at a new or rental boiler. But they're also proof that WARE is the only place to go for a new or rental boiler, because we think to ask the important questions. Whatever you need, from a rental to a new boiler to service and maintenance, we're here to help. We also have the nation's largest online boiler parts store, BoilerWAREhouse.com, for all the parts and supplies you need, with shipping to anywhere in the country in about 2 days or less. No matter what you need, we're here to help. ■

Boiler Trivia

1. What was one of the earliest uses of steam power?

- A) Cooking food
- B) Opening drawbridges
- C) Spinning a toy
- D) Heating bathhouses

2. How many boilers powered the Titanic?

- A) 10
- B) 29
- C) 42
- D) 55

The Grime Riddle:

I have no mouth, yet I whisper. I rise, yet I have no legs. I can disappear without a trace. What am I?

Reveal answers!

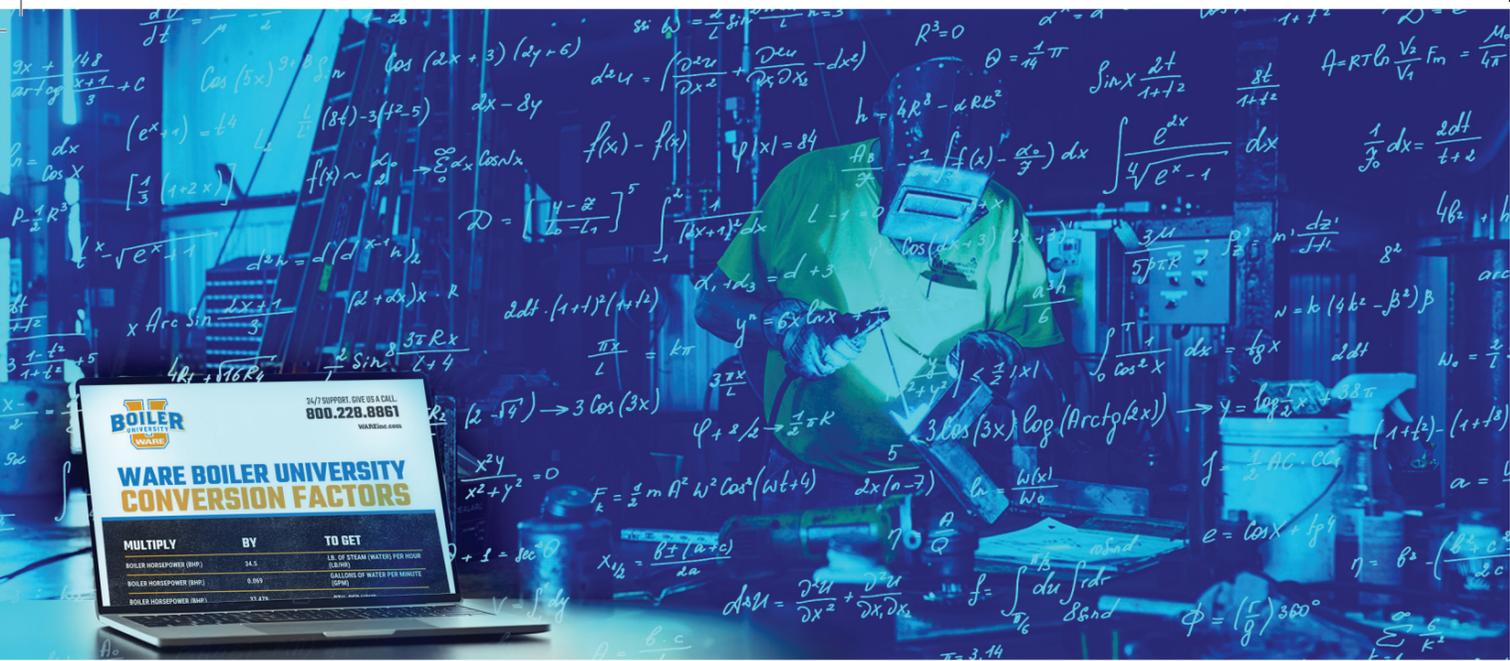


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Boiler Formulas and Measurements to Know

By: Jude Wolf, Senior Instructor at Boiler University

Doing the Math: The Formulas Behind Boiler Output

If you're in the market for a new or rental boiler, WARE has a massive number of them in stock. So how do you know which one to choose? You ask an expert. WARE has made it easy to figure out the ideal system for whatever you need. After all, the size of your boiler is probably the most important decision you'll make.

There are a series of formulas that are available for **download below**. They are used to calculate a lot of things, including boiler performance, and the sizing of a new boiler for the desired application. As an example, we'll be determining the amount of fuel and water that will be required to keep a 300-horsepower boiler running.

FREE DOWNLOAD

Scan the QR code to get a complete list of essential boiler formulas and conversions to help with repairs, tune-ups, and performance optimization.

Amount of Steam Needed

A boiler that can't keep up with demand is pretty useless. That's why the first thing to determine for our

formulation is the amount of steam the boiler needs to generate over a given period of time, known as generation capacity. Once we start with that, we'll be able to determine how much fuel and water will be needed to keep the boiler operating properly.

Fuel Supply

In order for a boiler to generate steam, it needs heat. That heat comes from fuel, most commonly natural gas, propane, or oil. Each of these fuels is capable of producing a specific amount of energy for a given volume. In other words, if we know how much we have in a container, we can easily calculate how many BTUs of heat it will produce when burned. Since the fuel source's energy is constant, then, the only way to adjust the amount of heat generated is by changing the flow. That's why fuel supply rate is a crucial part of our calculations.

Water Supply

As a boiler generates steam, the water volume in the boiler is going to go down. You have to be able to resupply enough water to keep the boiler running at capacity, so the water level doesn't drop too low. That's why water flow is another crucial variable in calculating the correct boiler size. It's not just about what's coming out of the tap, either. The water inside your boiler has to be properly softened, conditioned, and treated before it feeds the boiler. So what you're

really going to need to know is how much water your deaeration, preparation, and conditioning systems can generate.

Now that we know all the variables we're going to be dealing with, it's time to actually do some calculations. Let's assume that our boiler will have to operate at a capacity of 300 horsepower.

To get the pounds of steam needed per hour, we multiply horsepower by 34.5, which gives us a total of 10,350 pounds per hour. We now know our boiler is going to have to generate 10,350 pounds every hour, but we also know that'll take a lot of heat energy to create that much steam. We need to make sure we have enough fuel flowing in to keep our boiler going.

Let's assume it's a natural gas boiler. Natural gas contains about 1000 BTUs of heat per every standard cubic foot delivered per minute. To get the BTUs per hour it'll take to generate those 10,350 pounds of steam per hour, we multiply boiler horsepower (300) by 33,479, which gives us a total of 10,043,700 BTUs needed every hour the boiler operates.

To calculate the required fuel flow rate, we divide the total required number of BTUs by the BTU rating of our fuel. So we know that at 1000 BTUs per standard cubic foot, a boiler needing 10,043,700 BTUs per hour will require a fuel flow rate of 10,044 cubic feet of natural gas per hour. That means if you want your 300 horsepower, you're going to have to have a gas supply that can deliver enough volume.

A boiler isn't just going to use fuel, though. It's also going to lose water as it makes steam. That means the pumps running from the condensate tank to the boiler have to be able to deliver enough water to keep the steam cycle moving along at full tilt.

To calculate the amount of water the pumps will need to supply, we multiply the horsepower (300) by 0.069 to determine the gallons per minute our pumps will have to handle. That means the pumps must be able to deliver 20.7 gallons per minute. Typically, pumps are rated at twice the necessary capacity, which means this installation would require pumps that could put out 41.4 gallons per minute.

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If a modulating feedwater valve is used, the feedwater capacity is usually specified at 1.5 times the required flow rate, because modulating feedwater valves can adjust the flow in smaller increments to more accurately keep up with demand.

Not Just For New

These formulas can be used for a lot more than just sizing a new boiler. In fact, keeping them handy can help you monitor the ongoing performance of your boiler. That way you can keep tabs on your fuel and water usage, and spot any problems that start to develop before they become major headaches.

There's a lot that goes into sizing, operating, monitoring, and inspecting a boiler. The experts at WARE are your go-to resource for everything you need. We have the services and parts you need to keep your boiler running properly. We also have the technical expertise to keep them properly inspected and operating at peak efficiency. If we can help in any way, please let us know. If you'd like to know a little more (or a lot more) about how boilers operate, we encourage you to sign up for one of our WARE Boiler University classes. Each one provides extensive classroom and hands-on instruction with fully functioning boilers, taught by industry experts. Virtual classes are also available. ■

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