All You Need to Know About

BOILER FEED WATER TREATMENT

A PUBLICATION OF SAMCO TECHNOLOGIES

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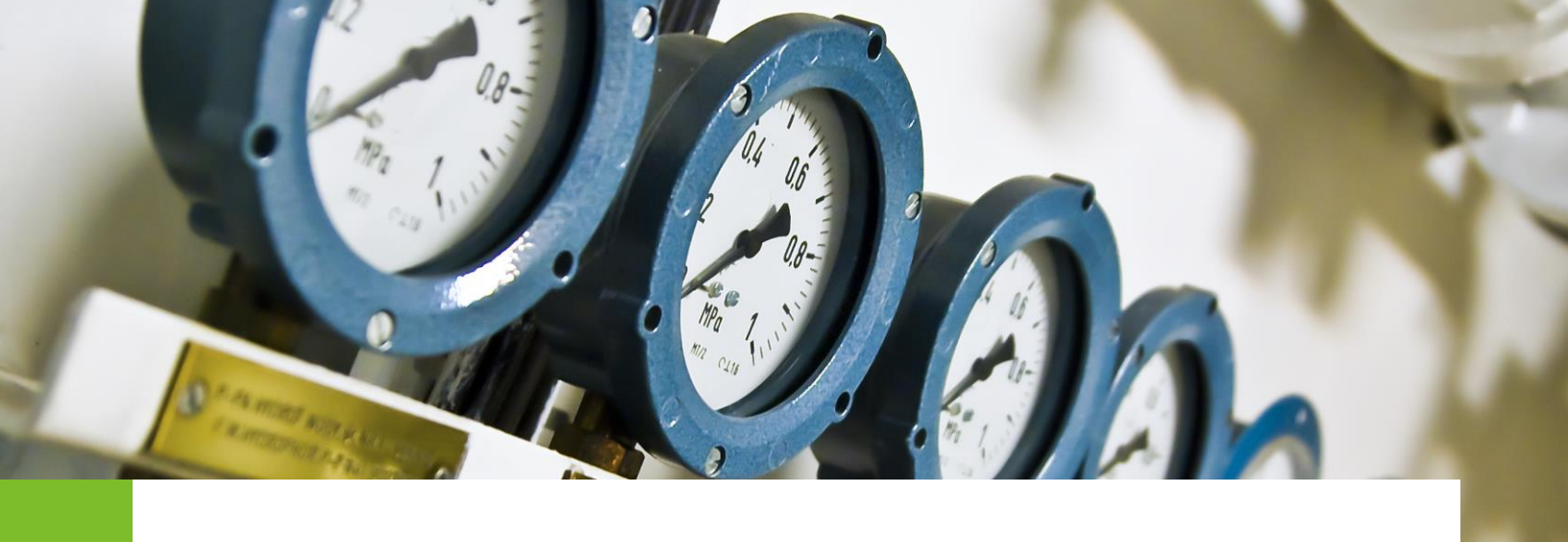

Chapter One

WHAT IS A BOILER FEED WATER TREATMENT SYSTEM AND HOW DOES IT WORK?

BOILER FEED WATER TREATMENT SYSTEMS

What they are and how they work

For industrial companies using a boiler for its facility, some type of boiler feed water treatment system is usually necessary to ensure an efficient process and quality steam generation. The most appropriate boiler feed water treatment system will help the facility avoid **costly plant downtime**, **expensive maintenance fees, and boiler failure** as a result of scaling, corrosion, and fouling of the boiler and downstream equipment.

But **what is a boiler feed water treatment system and how does it work**?

The complex answer to this question (which largely depends on the quality and quantity of makeup water needed for the boiler on an individual basis) is simplified and broken down for you below:

What is a boiler feed water treatment system?

A boiler feed water treatment system is **a system made up of several individual technologies that address your specific boiler feed water treatment needs**.

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Treating boiler feed water is essential for both high- and low-pressure boilers. Ensuring the correct treatment is implemented before problems such as fouling, scaling, and corrosion occur, will go a long way in avoiding costly replacements/upgrades down the line.

An efficient and well-designed boiler feed water treatment system should be able to:

- Efficiently treat boiler feed water and remove harmful impurities prior to entering the boiler
- Promote internal boiler chemistry control
- Maximize use of steam condensate
- Control return-line corrosion
- Avoid plant downtime and boiler failure
- Prolong equipment service life

What's included in a basic boiler feed water treatment system?

As mentioned above, the exact components of a boiler feed water treatment system depend on the **quality of water being drawn from** in relation to the **quality of water makeup needed for the specific boiler** (according to the manufacturer's recommendations), but in general.

A basic boiler feed water treatment system typically includes some type of:

- Filtration/ultrafiltration
- Ion exchange/softening
- Membrane processes such as reverse osmosis and nanofiltration
- Deaeration/degasification
- Coagulation/chemical precipitation

Depending on the impurities present in your water, any combination of these treatments might best suit your facility and make up your treatment system, and depending on the needs of your plant and process, these standard components are usually adequate. However, if your plant requires a system that provides a bit more customization, there might be some features or technologies you will need to add on.

What does a boiler feed water treatment system typically remove?

A boiler feed water treatment system might be made up of the technologies necessary to remove problematic **dissolved solids, suspended solids, and organic material**, including any number of the following:

- **Iron;** either soluble or insoluble, iron can deposit on boiler parts and tubes, damage downstream equipment, and affect the quality of certain manufacturing processes

- **Copper;** can cause deposits to settle in high-pressure turbines, decreasing their efficiency and requiring costly cleaning or equipment change-outs
- **Silica;** if not removed to low levels, especially in high-pressure boilers, silica can cause extremely hard scaling
- **Calcium;** can cause scaling in several forms depending on the chemistry of the boiler feed water (e.g. calcium silicate, calcium phosphate, etc.)
- **Magnesium;** if combined with phosphate, magnesium can stick to the interior of the boiler and coat tubes, attracting more solids and contributing to scale
- **Aluminum;** deposits as scale on the boiler interior and can react with silica to increase the likelihood of scaling
- **Hardness;** also causes deposits and scale on boiler parts and piping
- **Dissolved gasses;** chemical reactions due to the presence of dissolved gases such as oxygen and carbon dioxide can cause severe corrosion on boiler pipes and parts

How does a boiler feed water treatment system work?

Specific treatment processes vary depending on the requirements of the boiler and quality/chemistry of the feed and makeup water, but a typical boiler feed water treatment system will usually include the following steps:

Makeup water intake

Makeup water, or the water replacing evaporated or leaked water from the boiler, is first drawn from its source, whether raw water, city water, city-treated effluent, in-plant wastewater recycle (cooling tower blowdown recycle), well water, or any other surface water source.

Coagulation and chemical precipitation

After all the large objects are removed from the original water source, various chemicals are added to a reaction tank to remove the bulk suspended solids and other various contaminants. This process starts off with an assortment of mixing reactors, typically one or two reactors that add specific chemicals to take out all the finer particles in the water by combining them into heavier particles that settle out. The most widely used coagulates are aluminum-based such as alum and polyaluminum chloride.

Sometimes a slight pH adjustment will help coagulate the particles, as well.

Filtration and ultrafiltration

The next step is generally running through some type of filtration to remove any suspended particles such as sediment, turbidity, and certain types of organic matter. It is often useful to do this early on in the process, as the removal of suspended solids upstream can help protect membranes and ion exchange resins from fouling later on in the pretreatment process. Depending on the type of filtration used, suspended particles can be removed down to under one micron.

Ion exchange softening

When pretreating boiler feed water, if there's high hardness complexed with **bicarbonates, sulphates, chlorides, or nitrates**, a softening resin can be used. This procedure uses a strong acid cation exchange process, whereby resin is charged with a sodium ion, and as the hardness comes through, it has a higher affinity for calcium, magnesium, and iron so **it will grab that molecule and release the sodium molecule into the water**.

Dealkalization

After the softening process, some boiler feed water treatment systems will utilize dealkalization to reduce alkalinity/pH, an impurity in boiler feed water that can cause foaming, corrosion, and embrittlement. Sodium chloride dealkalization uses a strong anion exchange resin to replace bicarbonate, sulfate, and nitrate for chloride anions. Although it doesn't remove alkalinity 100%, it does remove the majority of it with what can be an easy-to-implement and economical process. Weak acid dealkalization only removes cations bound to bicarbonate, converting it to carbon dioxide (and therefore requiring degasification). It is a partial softening process that is also economical for adjusting the boiler feed water pH.

Reverse osmosis (RO) and nanofiltration (NF)

Reverse osmosis (RO) and nanofiltration (NF) are often used down the line in the boiler feed water treatment system process so most of the harmful impurities that can foul and clog the RO/NF membranes have been removed.

Similar processes of separation, they both force pressurized water through semipermeable membranes, trapping contaminants such as bacteria, salts, organics, silica, and hardness, while allowing concentrated, purified water through. Not always required in boiler feed water treatment, these filtration units are used mostly with high-pressure boilers where concentration of suspended and dissolved solids needs to be extremely low.

Deaeration or degasification

At this point in the boiler feed water treatment process, any condensate being returned to the system will mix with the treated makeup water and enter the deaeration or degasification process. Any amount of gasses such as oxygen and carbon dioxide can be extremely corrosive to boiler equipment and piping when they attach to them, forming oxides and causing rust. Therefore, removing these gases to acceptable levels (nearly 100%) can be imperative to the service life and safety of the boiler system. There are several types of deaeration devices that come in a range of configurations depending on the manufacturer, but generally, you might use a tray- or spray-type deaerator for degasification or oxygen scavengers.

Distribution

After the boiler feed water has been sufficiently purified according to the boiler manufacturer's recommendation and other industry-wide regulations, the water is fed to the boiler where it is heated and used to generate steam. Pure steam is used in the facility, steam and condensate are lost, and condensate return is pumped back into the process to meet up with the pretreated makeup water to cycle through pretreatment again.

Chapter Two

DO YOU NEED A BOILER FEED WATER TREATMENT SYSTEM FOR YOUR PLANT?

DOES YOUR PLANT NEED A BOILER FEED WATER TREATMENT SYSTEM?

How to know if it's necessary

If you use an industrial boiler to create energy with steam, chances are you need some sort of boiler feed water treatment system. But why? We know that **natural water sources carry impurities that can cause harmful deposits, carryover, and corrosion in your boiler system**. We also know that the higher the pressure your boiler runs at, the more pure your water source needs to be.

This chapter breaks down the various **reasons you need a boiler feed water system for your plant**:

Your water source likely carries harmful impurities

Whether you're using raw or municipal water sources for your boiler, chances are some sort of treatment needs to be implemented to remove suspended and dissolved minerals, hardness, and gasses. When it comes to heating water for creating steam and energy, even trace amounts of certain substances, such as oxygen and carbon dioxide, can wreak havoc on your machinery and pipes in a short amount of time.

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Most water sources contain at least one or a few of the following impurities that, at certain levels, can be harmful to your boiler:

- Alkalinity
- Calcium
- Carbon Dioxide
- Chloride
- Magnesium
- Oxygen
- pH
- Silica
- Sodium
- Sulfate

These occur naturally and can vary depending on the location of your source water. Even municipalities might not remove some of these substances enough for use in a boiler because for human consumption, they are fine. But when heated and used to created steam, **they can cause scaling, fouling, and corrosion of your machinery**.

The best way to be sure you're boiler is running correctly is to **be aware of the boiler manufacturer's water quality recommendations and consult a boiler feed water treatment expert**. It is an extremely complex calculation that needs to be accurate in order to achieve good results.

Your boiler runs at a higher pressure

The higher the pressure a boiler runs, the more pure the water source needs to be. Again, the precise boiler feed water chemistry needs to be calculated by a boiler feed water specialist and cross-referenced with the recommendations given by the boiler manufacturer, but for a general sense of the figures you should be falling between, below are the American Society of Engineers (ASME) guidelines for various contaminants at different pressures.

Here, you can see that **as the pressure of the boilers increase, the tolerance for impurities decrease**:

ASME Guidelines for Water Quality in Modern Industrial Water Tube Boilers for Reliable Continuous Operation						
Boiler Feedwater				Boiler Water		
Drum pressure (psi)	Iron (ppm Fe)	Copper (ppm Cu)	Total hardness (ppm CaCO3)	Silica (ppm SiO2)	Total alkalinity (ppm CaCO3)	Specific conductance (micro-ohms/cm) (unneutralized)
0-300	0.100	0.050	0.300	150	700	7000
301-450	0.050	0.025	0.300	90	600	6000
451-600	0.030	0.020	0.200	40	500	5000
601-750	0.025	0.020	0.200	30	400	4000
751-900	0.020	0.015	0.100	20	300	3000
901-1000	0.020	0.015	0.050	8	200	2000
1001-1500	0.010	0.010	0.0	2	0	150
1501-2000	0.010	0.010	0.0	1	0	100

Save on excess energy costs and system replacements

When your boiler isn't running efficiently, it can use **excess energy to make up for energy loss**. For example, let's say your boiler feed water has high hardness or silica, and your boiler is experiencing greater than normal deposits and scale on internal piping. These deposits can inhibit the transfer of heat and reduce the boiler's efficiency.

In extreme cases, such deposits can lead **to corrosion, scaling, fouling, and the shutdown or replacement of equipment**. These types of issues can shut down the process and prove costly to repair and replace any worn equipment.

Avoiding these issues

When it comes to treating your boiler feed water, it's best to **jump off on the right foot to avoid any of these problematic issues from the start**. A good place to begin is by consulting someone to perform a treatability study, where a chemist can thoroughly analyze what impurities might be present in your feed water stream. From there, consider your manufacturer's boiler feed water quality recommendations and work with your boiler feed water expert to help build a system with all the technologies necessary to ensure your boiler is running as safely and efficiently as possible.

Chapter Three

COMMON BOILER FEED WATER TREATMENT ISSUES AND HOW TO AVOID THEM

COMMON BOILER FEED WATER TREATMENT PROBLEMS

What are they? How do you avoid them?

When treating boiler feed water (the combination of boiler makeup and condensate return water), several issues can arise that cause **boiler scaling, corrosion, fouling, and system failure**.

Below, we break down **the most common boiler feed water issues and how to avoid them** to help ensure system efficiency and operational safety. While treating boiler feed water is extremely unique to each individual process and boiler, these are generalized issues that typically occur. Any specific boiler feed water treatment options and/or issues should be analyzed on a case-by-case basis and discussed with your water treatment specialist.

An increase of sludge

What it means

If a boiler is seeing higher-than-normal amounts of sludge (sediment of solids or oil that are usually softer than scale but can get hard and scale after being "baked" onto the heat exchangers), there could be **an issue with filtration and/or solids removal upstream or the collected precipitants from poor water treatment**.

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Filtration and softening methods being used to treat the feed water might not being doing their job, and this could spell trouble for piping and boiler efficiency down the line.

Solids that settle in the low-flow areas of internal piping can cause an insulation layer to form, causing excessive heating of the tubes causing localized overheating and eventual blowout.

How to avoid it

The best way to combat sludge in a boiler is to **eliminate any sludge-causing contaminants before they become an issue** in addition to blowing out any sludge accumulations before they have a chance to bake onto high-heat surfaces, where they are extremely difficult to remove.

Sometimes sludge conditioners are helpful internally of the boiler (except for high-pressure boilers . . . in that case, liquid conditioners shouldn't be used), where they disperse the sludge-causing solids so they can be removed with the blowdown.

Otherwise, careful monitoring of the presence of these contaminants is key. Certain polymers and filtration methods are effective for solids removal.

Filtering the feed water for suspended solids should be considered for high-pressure boilers. Technologies such as microfiltration and ultrafiltration are excellent choices for removing suspended solids and colloidal suspensions such as colloidal silica.

Scale buildup

What it means

Scaling is a deposit formed on the inside of piping and heat transfer surfaces when the water is heated and impurities precipitate or settle out leaving behind **extremely hard deposits**.

Some **common feed water contaminants that cause scaling** include:

- Silica
- Iron
- Calcium
- Magnesium
- Aluminum

How to avoid it

The level of scaling on a boiler will be determined by the amount of these impurities in relation to the pressure a boiler is run at. For example, many **higher-pressure boilers will require a higher quality of water with less contaminants than some lower-pressure boilers**. Boilers that generate steam to power turbines, for example, require high-pressure boilers and therefore more complex feed water treatment system to remove as many impurities as possible.

Again, general guidelines for feed water purity will come from the boiler manufacturer.

There are some organizations, such as the American Society of Mechanical Engineers, that have **contamination limitation recommendations based on the pressure your boiler runs**, but again, it's best to check with the boiler manufacturer for these numbers to be sure. For low-pressure boilers, simple sodium cycle water softeners will work just fine. For high-pressure boilers, advanced technologies such as reverse osmosis, electrodeionization, or deionization will be required. Your water treatment specialist should be able to evaluate what is best for your boiler and process.

System corrosion

What it means

Corrosion in boilers, or **the breakdown of the metal elements of the device**, can happen for a variety of reasons. The most common reason is the presence of dissolved oxygen and carbon dioxide, which eat away at areas of the boiler causing system stress and cracking. The higher the boiler pressures, the more severe the corrosion. When chlorides are present at an unacceptable level, chloride stress cracking can also occur.

Corrosion typically occurs in the parts of the boiler that are heated the most, where high temperatures and cracking in the metals accelerate the breakdown of the materials. There are several types of corrosion that can occur in a boiler, and the type you might encounter can depend on the proper pH, level of oxygen, amount of solids, and overall design of the boiler.

How to avoid it

High-quality oxygen scavengers can be effective in removing these dissolved gases from boiler feed water in addition to deaerators. These two methods are widely used in the removal of the harmful gases that can break down and wreak havoc on boiler tubing and equipment. Managing the internal chemistry within proper pH levels along with an overall internal chemistry program is also critical.

Foaming and priming

What it means

Foaming and priming in a boiler occurs when there are high amounts of dissolved solids present at the water surface. When the steam is generated, **these impurities bubble up (foaming) and evaporate with the steam (priming)**, latching on to superheaters and turbines, decreasing their efficiency. Foaming is the production of persistent foam or bubbles in boilers, which do not break easily. Foaming is due to presence of substances like oils (which greatly reduce the surface tension of water).

Priming and foaming usually happen simultaneously. It's best to avoid them because:

1. they can cause dissolved salts to deposit on superheater and turbine blades, reducing system efficiency
2. they might allow dissolved salts to enter other parts of the system, thereby reducing the service life of the affected machinery

How to avoid it

The best way to avoid foaming and priming is to **maintain a low level of dissolved solids and control alkalinity** in your boiler. Membrane filtration, ion exchange, and softening can be helpful, as well as making sure **pH remains between 8.5 and 9.5**.

A good overall boiler feed water treatment program includes:

1. proper pretreatment of the feed water to the boiler (the strategy is to remove harmful impurities before they enter the boiler)
2. a good program of internal chemistry control (this consists of a proper chemical feed and blowdown program to control scaling, fouling, sludge, and TDS buildup)
3. a proper treatment program to condition the steam condensate to control return line corrosion

Chapter Four

HOW TO CHOOSE THE BEST BOILER FEED WATER TREATMENT TECHNOLOGIES FOR YOUR PLANT

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CHOOSING A FACILITY'S BOILER FEED WATER TREATMENT SYSTEM

What to look for when making your decision

When it comes to choosing technology for boiler feed water treatment, knowing **the feed water source quality** in relation to the **water quality required for your specific boiler** is essential, as inadequate water treatment can lead to **the scaling, corrosion, and fouling of the boiler and downstream equipment**. We've mentioned this before in some of our previous boiler feed water treatment articles, but this bears repeating as some of these issues, if neglected, can be pretty serious.

Although the water quality and makeup quantity is a complex calculation that **needs to be analyzed by a boiler feed water treatment expert**, there are some common characteristics for boilers and their recommended feed water treatments that can indicate different technologies that might be useful in your system.

Here's **how to be sure you choose the best boiler feed water treatment technologies** for your plant.

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Know the quality of water feeding your boiler

Since water absorbs more heat than any other inorganic substance, it is often used to create energy. However, when water is being used in a boiler to create a large amount energy in the form of steam, any impurities in the water can be a detriment to the boiler itself and equipment down the line. For this reason, it's essential to know the impurities present in the water and treat them accordingly.

Boiler feed water is a **combination of the boiler makeup water** (what is required to replace any lost water in the boiler due to evaporation or water loss in blowdown and processing steam) **and condensate return water** (the distilled water created when the boiler is producing steam that condensates on the internal areas of the boiler):

Boiler makeup water

Depending on how often your boiler is blown down (rid of any impurities that occur as a result of the steam-making process) or how much water is lost to evaporation and steam generation, the quantity of makeup water needed to replenish this loss might fluctuate.

Pretreatment of makeup water is important, though, especially in the case of higher-pressure boilers that require extremely pure water.

Choosing your boiler makeup water source critical in determining the treatment options that will go into the makeup of your system. These sources might include **city water, city-treated effluent, in-plant wastewater recycle (cooling tower blowdown recycle), well water, or any other surface water source**.

Some common impurities include:

- Iron
- Copper
- Silica
- Calcium
- Magnesium
- Aluminum
- Hardness
- Dissolved gasses
- Total dissolved solids
- Suspended solids and organic material

The presence of these contaminants can **cause a scale to form** inside the boiler pipes and parts.

This is a hard deposit that can decrease the efficiency of the boiler, promote local overheating, and be extremely damaging to the system.

Others **promote corrosion, fouling, and loss of steam purity** and need to be removed to maintain the integrity of the system.

Some **common treatments** to remove these types of contaminants include:

- Coagulation/chemical precipitation
- filtration and ultrafiltration
- deaeration/degasification
- ion exchange/softening
- membrane processes such as reverse osmosis and nanofiltration

So, again, depending on the impurities present in your water, any combination of these treatments might best suit your facility and makeup your treatment system.

Condensate return water

When steam is produced inside the boiler, the water particles collect and condense, then are recycled and used as part of the boiler feed water again.

Technically, the condensate that the steam-making process produces is distilled, pure water, but dissolved gases such as oxygen and carbon dioxide are sometimes present. The chemical reactions due to the presence of these dissolved gases can **cause severe corrosion** on boiler pipes and parts.

The gases are typically removed with demineralization, advanced deaeration devices, or chemical scavengers, so if you have these present, chances are your boiler feed water system will incorporate some form of these technologies.

Know the quality of water needed for your boiler

The quality of feed water needed for your individual boiler depends on many factors, but the primary element to consider is **the pressure at which you need to run your boiler in relation to the amount of water you need to process per day and how fast** (this is your required peak gallons per minute, or GPM). For certain pressures, there is a maximum level of contaminants to you can feed into the boiler, and as you increase the pressure in your boiler, it becomes more critical for thorough water treatment that yields higher quality water.

- **Low-pressure boilers (600 PSI and lower) and water with a low amount of total dissolved solids.** Typically the technology used for lower-pressure boilers includes simple **filtration** to make sure no dirt gets into the boiler and a **water softener** to take out the hardness. As the water chemistry might dictate, or as the pressure increases, you might use a water softener in addition to a **dealkalizer** for a lower alkalinity feed.
- **High-pressure boilers (600 PSI and higher).** Treating your feed water for a higher-pressure boiler usually requires some type of **demineralization, ion exchange, or electrodeionization** (EDI) polishing. Resin-based sandwich or mixed-bed polishing devices can also be used, and these technologies can be permanent (regenerable in place) or portable (requiring an exchange service from an outside provider). Reverse osmosis used in combination with a polishing technology is a very popular. They are typically used on high-pressure boilers in power plants or refineries where extremely high purity water is desired.

Also note that boiler/turbine manufacturers each have their own requirements for water quality, **so be sure to check with your manufacturer what their recommendations are**.

Chapter Five

HOW MUCH DOES A BOILER FEED WATER TREATMENT SYSTEM COST?

HOW MUCH A BOILER FEED WATER TREATMENT SYSTEM COSTS

Pricing, factors, etc.

When companies come to us looking for a boiler feed water treatment system, one of the hardest questions to answer is, "**How Much Does a Boiler Feed Water Treatment System Cost?**" The costs can be complex to estimate, but it's not impossible to narrow down what you might spend based on several factors—varying boiler pressures, manufacturer recommendations, and makeup water chemistry will all contribute to the configuration of your treatment system. Here's what you need to know.

The main factors that will determine the cost of your boiler feed water system

When it comes to treating boiler feed water, knowing the water **quality** and makeup **quantity** needed is essential, as inadequate water treatment can lead to the scaling, corrosion, and fouling of the boiler and downstream equipment.

Assuming the process is beginning with properly pretreated water, these are the main factors that will determine the technologies you might need for your system, and therefore the cost:

Quality and quantity of water needed for your boiler

As mentioned in a previous chapter, the quality of feed water needed for your individual boiler depends on the **pressure** at which you need to run your boiler in relation to the amount of water you need to process per day and how fast (this is your required peak gallons per minute, or **GPM**).

For certain pressures, there is a maximum level of contaminants to you can feed into the boiler, and as you increase the pressure in your boiler, it becomes more critical for thorough water treatment that yields higher quality water:

- **Low pressure boilers (600 PSI and lower).** In general, the cost for a lower pressure boiler feed water treatment system (using properly pretreated water) can run you about **$50,000–$100,000** at 100 GPM for equipment, **$100,000–$250,000** if you need a softener and dealkalizer.
- **High pressure boilers (600 PSI and higher).** A typical prepackaged 100 GPM system for a high pressure boiler can be anywhere in the **$500,000–$1 million** range for equipment, depending on the quality of your pretreated water. At 200 GPM, you can expect the numbers to be **$1–$1.5 million.**

Also note that boiler/turbine manufacturers each have their own requirements for water quality, so always check with your manufacturer what their recommendations are.

Boiler makeup and chemistry

Your boiler makeup/chemistry is a complex calculation, but this will help dictate the technology you need to treat your feed water. SAMCO has years of experience helping our customers understand this complex chemistry. If you have questions about how your boiler's specific makeup might affect your treatment system, feel free to contact us and set up a call with one of our engineers.

Other important factors to consider when pricing a boiler feed water treatment system

- ***Feed water sourcing.*** Choosing your feed water source is a critical parameter to minimizing your capex and opex costs. While city water sources might reduce your system cost overall, keep in mind that the charge for incoming water can be high. SAMCO can help you evaluate the various sources available to your site and recommend the best options for your plant. These sources might include city water, city treated effluent, in-plant wastewater recycle (cooling tower blowdown recycle), well water, or any other surface water source.
- ***Upfront planning.*** There are costs associated with developing the concepts, designs, and regulatory requirements for boiler feed system projects. Typically, the cost of engineering for a project like this will be about 10–15% of the entire project cost. This cost is usually phased in over the course of the project.

- ***Installation rates.*** Installation rates for a boiler feed water treatment system will usually run you 15–25% of the project. In general they have a smaller footprint and don't require as much civil work. Another thing to keep in mind is the installation rates in your area, which may fluctuate by location. Since the boiler feed water treatment systems are usually prepackaged, their footprint is typically smaller (about 100 x 100 feet is the average size). SAMCO specializes in these types of turnkey, prepackaged systems, and for more information about what we offer, you can visit our website here.
- ***Shipping the system to your plant*.** When you are coordinating the shipping details of your system, you usually want to factor in about 5–10% of the cost of the equipment for freight. This can vary widely depending upon the time of year you are purchasing your system in addition to where your plant is located in relation to the manufacturing facility.
- ***The need for higher-end materials.*** A basic boiler feed water system may have multiport valves, plastic piping, and plastic vessels. Industrial facilities such as power plants and refineries require a more robust treatment system, rubber-lined vessels, stainless steel piping with industrial valve nests, and these industrial standards can increase the cost of the system 50–100%.

- ***Off-site regeneration services.*** Many companies that need a polishing component in their boiler feed water treatment system outsource resin regeneration. This minimizes the amount of labor required and keeps your capital cost down. It also eliminates the need for you to keep certain chemicals on hand, such as acid and caustic, and therefore you won't have to worry about discharge regulations. SAMCO is experienced in this type of resin regeneration, so if this is a service you might need, feel free to reach out to us for more information or visit our off-site regeneration page on our website here.
- ***Other possible costs and fees.*** When purchasing a boiler feed water treatment system, you might also want to keep in mind what other hidden costs and fees might be. For example: Will there be any taxes on the system or additional purchasing fees? What are your possible utility costs to the installation area? Will there be any environmental regulatory fees and/or permits? Any ongoing analytical compliance testing you need to pay for? Also consider that there will be costs to treating the secondary waste produced by the system. With stringent environmental regulations, you will need to either treat the waste for discharge or solidify and transport to third party disposal firm.

Although figuring out what your boiler feed water treatment system needs might be can seem complex, SAMCO has over 40 years' experience custom-designing and manufacturing these types of systems, so please feel free to reach out to us with your questions. For more pricing information or to get in touch, contact us here to set up a consultation with an engineer or request a quote. We can walk you through the steps for developing the proper solution and realistic cost for your boiler feed water treatment system needs.

HOW CAN SAMCO HELP?

SAMCO has over 40 years' experience helping design and engineer some of the most complex boiler feed water treatment systems in the water industry. For more information about what we offer and how we can help, please visit our website or contact us to schedule a consultation with one of our skilled engineers.

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