RITE boilers

Steam Boiler Water Treatment Guide

for systems with water softeners

rev 1

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Glossary of Terms

Blowdown – The rapid evacuation of water from a boiler under pressure to remove impurities in the boiler. There are three types of blowdown:

A. Bottom Blowdown—accomplished by using the blowdown valve located at the bottom of the boiler vessel to remove sludge, loose scale and TDS.
B. Surface Blowdown—The surface blowdown fitting is installed just below the waterline of the boiler. Surface blowdown may either be continuous through a properly adjusted needle valve or automatically through a timer and/or conductivity controller to maintain proper TDS Levels.
C. Water Column Blowdown—The water column is the chamber that contains the primary low water cut out and water level controls. This is also the attachment point for the sight glass. The valve fitted to the bottom of the water column should be blown down daily. The primary purpose of this blowdown is to remove sediment from the chamber and check the operation of the low water cut out.

Blowdown Separator - A small vessel used to direct the boiler blown into a cold water mixing station. This uses a controlled flow of fresh water to reduce the temperature of the boiler blown to allow it to be safely discharged into building drain system.

Blowdown Tank - Similar in function to a blowdown separator except it is a larger vessel that provides a reservoir for the blowdown to cool down prior to being discharged to the drain. In most cases this does not require any cold water mixing or use any fresh water. Thus there are no moving parts.

Boiler treatment – Usually a combination of specific chemicals engineered to reduce corrosion and scaling within the boiler, steam and condensate systems.

Captive Steam – Steam that is contained in piping or in steam jackets or remains on the steam side of heat exchangers, that is ultimately returned as condensate after being collected in a steam trap.

Carbonic Acid – An acid that is created by Carbon Dioxide (CO_2) dissolving in water.

Carry Over—This is when water droplets escape the boiler along with the steam. The usual cause is either high TDS in boiler water or excessive steam velocity at steam outlet nozzle.

Condensate – Steam that has been used and converted back into water.

Condensate receiver – Designed to collect condensate and return it to the boiler feedwater tank.

Feedwater – A combination of condensate and make-up water ready to be pumped into the boiler.

Feedwater tank – Receives the condensate and make-up water, often used to preheat the water for immediate use in the boiler.

Foaming—An effect of dissolved solids in the boiler, foam is often visible in the boiler site-glass.

Heat Exchanger - A device for transferring heat from one medium to another. When used in Steam systems the steam is on one side of the heat transfer surface while the substance to be heated is on the opposite side of the heat transfer surface. For example: A steam jacketed cooking vessel

Live Steam Process – A process that utilizes steam as the steam is evolved from the boiler. E.g. Humidification, or cooking via injection of steam into the product to be cooked.

Make-up water – This is freshwater used to make-up for any steam or condensate lost out in the system.

Neutralizing Amines – A chemical in the boiler treatment compound that vaporizes along with the steam, it condenses with the steam and flows into the condensate system. These compounds are complex ammonia molecules that neutralize the carbonic acid that is created when Carbon Dioxide gas (also evolved with the steam) dissolves into the condensate.

Oxygen Pitting – Localized oyxgen corrosion, usually in the boiler tubes.

Oxygen Scavenger—Commonly referred to as sulfites. This is a chemical (generally sodium bisulfite or sodium erythorbate) which eliminates free oxygen.

Priming—This is another term referring to carryover of water with the steam.

Raw Water – Cold untreated water usually from a well or municipal water source.

Scale – Hard, fairly uniform deposits in the boiler, usually in the watertubes. Scale acts to retard the heat transfer from the boiler into the water causing inefficiency and ultimately tube failure.

Soft Water – Cold water that has passed through a water softener and has zero hardness.

Steam trap – A device that collects and evacuates the condensate while preventing steam from passing.

TDS – Total Dissolved Solids – A measurement of all the anions (negatively charged particles plus cations (positively charged particles) dissolved in a solution. This value is measured in Parts Per Million (PPM)

Under-deposit Corrosion – Corrosion in boilers and piping systems which occur under layers of scale (generally calcium deposits) which destroys piping.

Water Conductivity – The ability of water to conduct electricity from one pole to another. This is measured in “micromhos” (mMho) or in Micro-Siemens (mS). The terms TDS and Conductivity are often confused and used incorrectly. Though related they are two different measurements with the “value” of TDS is generally equal to about .7 the “value” of Conductivity in most solutions.

Water Hardness – Calcium and magnesium ions in water. The higher the content of these ions the “harder” the water. Calcium harness is inversely soluble in water. That is the hotter the water the less soluble the calcium. Calcium deposits on boiler tubes inhibit heat transfer and ultimately shorten the life of boilers.

Introduction

IMPORTANT

Proper water treatment is absolutely critical to the care and safe operation of your boiler. This treatment manual is designed to complement your water treatment package and provide guidance in the administration of a basic water treatment program. This manual does not negate our recommendation to engage a water treatment professional with experience in steam boiler systems to help you maintain your steam boiler system.

IMPORTANT

This manual is written specifically for steam boiler systems that use water softeners as their make-up water source. For systems using reverse osmosis or deionizers, please contact us for the proper manual.

During the course of performing water treatment tasks, you will be required to handle or be exposed to concentrated chemicals. It is imperative that you take the time to read and understand the safety data sheets provided with these chemicals. You must take the necessary precautions in handling, mixing and disposing of these chemicals and their containers. Always wear the proper PPE while per forming your water treatment tasks.



During the course of performing proper water treatment tasks you will be required to handle or be exposed to extremely hot water and live steam. It is imperative that you take the necessary precautions while working around and with steam. Always wear the proper PPE while performing your water treatment tasks.

Introduction

Congratulations on the purchase of your new steam boiler from Rite Engineering! With proper care these boilers will provide decades of trouble-free and efficient operation. We are excited to provide this guide as another tool in your boiler care program.

Please contact us if you have any questions regarding the care of your Rite steam boiler or any of the auxiliary equipment you see here.

1. Steam Boiler
2. Water Softener
3. Condensate /Feedwater Tank
4. Control System
5. Feedwater Pumps
6. Chemical Feed System
7. Blowdown Tank and aftercooler

A Rite pre-packaged steam system for outdoor installation.

Introduction

The purpose of the boiler chemical treatment program is to prevent the premature failure of your boiler, steam and condensate systems. Every component of your water treatment program has a known effect on the other components.

The idea is to maintain an adequate level of protection, while preventing excessive TDS in the boiler. Dissolved solids in the boiler will eventually cause foaming in the boiler and carryover in the steam. Your boiler depends on the three legs of treatment care; 1) Testing, 2) Treatment and 3) The Blowdown program.

If any of the three legs gets away from you the problems could spiral out of control taking an extraordinary amount of time and resources to get it back under control. You can see in this real life example.

ABC Brewery in XYZ City

Bill noticed the boiler water in his site glass was brown and foaming. He called his water treatment rep to come in and test the boiler. The test revealed a conductivity 3 times the recommended limit and almost no oxygen scavenger in the sample. This was a fairly new and closed steam system so the problem was quite unusual.

The recommendation was to increase the chemical feed rate and increase the blowdown. Bill did as instructed and when the rep returned the next month and tested the boiler, the conductivity was only double the limit but the scavenger was off the charts high.

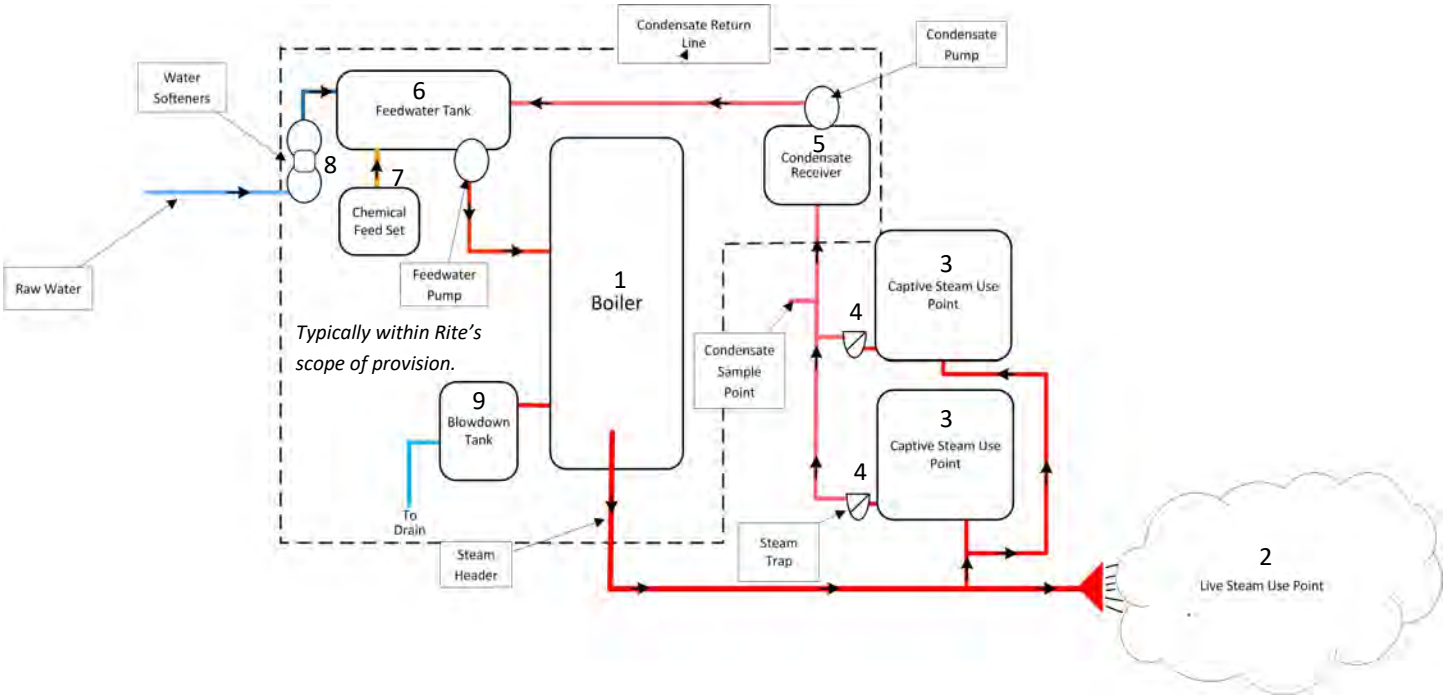
The rep reformulated the treatment solution and increased the blowdown yet again. The next month the testing revealed almost no scavenger and conductivity nearly off the charts. The treatment was reformulated again and blowdown increased. On and on it went for more than a year, never getting the boiler chemistry into specifications and the operator having to blow down his boiler 4 times a day, increasing the fuel bill, chemical cost and manhours dramatically until he contacted Rite Boilers.

The primary problem at this facility was simply the testing frequency. Monthly testing is not adequate for steam boilers. Rite recommends testing your boilers daily and making small changes to the treatment as required. Also in this case we recommended installing a contact head flowmeter upstream of the water softener to automate the system to add chemical only in proportion to the fresh make-up water. This added a constant to the equation greatly simplifying the treatment program.

Now the operator has only one adjustment to make when his chemistry drifts out of range. Very small changes to chemical pump volume allows him to keep his chemistry Rite.

Basic Steam System

To understand why and how to treat your steam boiler water you need to understand the basic steam system and associated components. This diagram illustrates a basic steam system:



1. **Boiler**: The purpose of your steam boiler is to turn water into vapor (steam) under pressure to perform functions as widely varied as power generation or simply providing a heat source for cooking or brewing. An important property of steam to remember is that the higher the steam pressure, the higher the steam temperature. The steam travels through the steam header and into the steam distribution piping to the point of use.

2. **Live Steam Use Point:** This is common in certain processes and building humidification. This is when steam is directly injected into a space or product. None of this steam is returned to the boiler, requiring a high volume of make-up water.

3. **Captive Steam Use Point:** This is much more common type than live steam use. Typical captive steam users include heat exchangers, mash kettles, and building heating coils. The steam condenses as it gives it energy up to the process and flows, by gravity, to the steam trap. Even though some steam and condensate will escape through leaks and some venting, this makes for a fairly closed system with low make-up water requirements.

4. **Steam Trap:** After steam is used in the captive use point the steam and condensate mixture travels to a device called a steam trap. A properly functioning steam trap will allow the condensate to flow into the condensate system while preventing steam from escaping. From there the condensate flows by gravity back to the condensate receiver or feedwater tank.

Basic Steam System

5. **Condensate Receiver:** Condensate is collected in a condensate receiver. It is then pumped to the boiler feedwater tank. The condensate pumps are controlled by the level control in the condensate receiver. In smaller systems this function may be incorporated into the feedwater tank, eliminating a separate condensate receiver and pumps.

6. **Feedwater Tank:** This is an important component of your steam and water treatment systems. This is where all of the condensate returns , the make-up water is introduced and the chemicals are injected. An often overlooked component of the feedwater tank is a tank heater. Tank heaters are normally just a steam injection nozzle with a thermo-mechanical temperature controller to preheat the feedwater. Pre-heating the feedwater will drive out most of the oxygen and allow the chemicals to work better.

7. **Water Softener:** It is imperative to have a properly functioning water softener to remove any minerals that could adhere to internal boiler surfaces as scale. Scale will severely impede heat transfer and promote the rapid formation of under-deposit corrosion. It is important to know that when the steam vapor is released by the boiler through the steam header it is "pure water" and therefore does not contain minerals. But it will contain some gases (possibly oxygen and carbon dioxide). All of the mineral content of the water is left behind in the boiler. The softener must not be bypassed for any reason.

8. **Chemical Feed System:** This is typically used to automate the boiler care somewhat. Modern boiler treatment systems will be comprised of a pump with an integral controller and a reservoir of some type. The pump control is adjusted to maintain proper flow of chemicals based on either the boiler feedwater pump controller or preferably a make-up water meter flow signal.

9. **Blowdown Tank:** A pressure vessel used that serves to safely facilitate the blowdown of boilers. A blowdown tank will receive the hot blowdown and provides a reservoir for it to cool before being discharged into the building drainage system. As an alternative to a blowdown tank you may use a blowdown separator. Instead of providing a reservoir for cooling the discharge these direct the boiler blown into a cold water mixing station. It uses a controlled flow of fresh water to reduce the temperature of the boiler blown to allow it to be safely discharged.

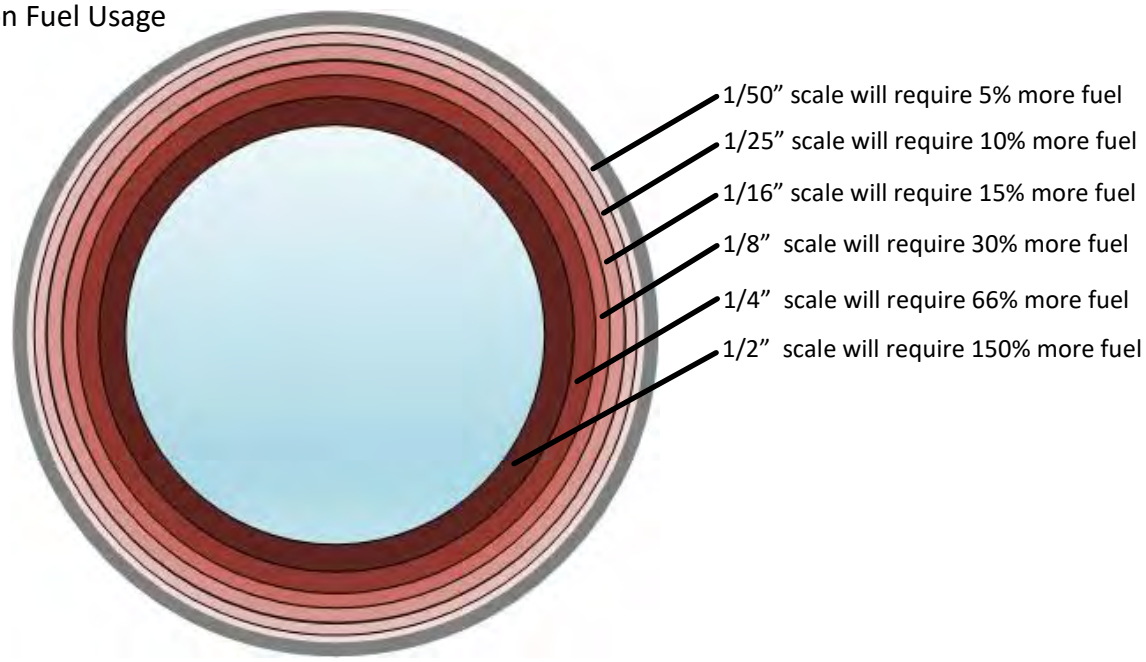
Boiler Water Chemistry

Water is one of the most "recyclable" compounds in the world. Every time you are "steaming off" your boiler and then returning the condensate you are recycling water. Every gallon of condensate that you capture and return, you are saving that water and also the BTU's that condensate holds. This reduces your energy usage since that hot water (typically 180-190^{0}F) takes less energy to heat up to above 212^{0}F than cold city or well water.

Water, whether city or well water, contains many impurities including calcium, magnesium, alkalinity, silica, and dissolved gases such as oxygen (O^2) and Carbon Dioxide (CO^2). The most troublesome of these impurities for boilers are calcium/magnesium (scaling) and dissolved oxygen (pitting).

Unlike oxygen, calcium and magnesium are not chemically treated under this program, they must be removed prior to entering the feedwater system. The way this is typically accomplished is with a water softener. The importance of a properly operating water softener cannot be overstated as it is how you prevent your boiler from scaling up. Scale build up will cost you time and money.

Scale Effect on Fuel Usage

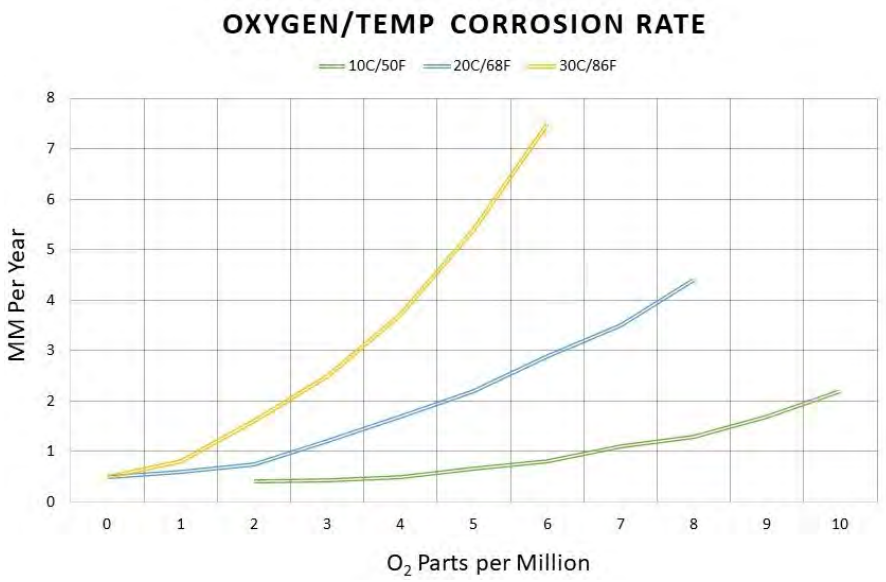


This illustration demonstrates the dramatic effect that scale can have on your boiler efficiency. What it doesn't show is that as the scale deposit grows, you lose the cooling effect of the water/steam for the tube metal, leading directly to thermal fatigue and premature failure of your boiler tubes.

If you open up your Rite boiler and find a little scale don't panic. Rite boilers are the only boilers on the market that will allow you to mechanically remove waterside deposits before they can cause serious damage.

Boiler Water Chemistry

We can't emphasize strongly enough just how important it is to heat your boiler feedwater to 180F. Rite boilers are impervious to thermal shock but no steel boiler can stand up to the amount of dissolved oxygen that is present in cold water. Heat drives out dissolved O_2 but heat also increases the corrosive effects of O_2 quite dramatically. To limit these damaging effects in the boiler, best practices require heating the water in the feedwater tank first.



By heating the feedwater you will drive out over 80% of the dissolved gasses, including oxygen, before they enter your boiler. Whatever O_2 is left is easily removed using an "oxygen scavenger" chemical. The more O_2 removed with heat, the less chemical you will have to use. If the O_2 is not removed, it will attack your boiler resulting in pitting and corrosion of the boiler tubes to the point of tube failure as shown below.

Boiler Water Chemistry

There are several types of boiler waterside corrosions. Boiler operators will likely experience one of these two types of treatment related issues:

1. Oxygen corrosion presented in the form of scabs and pitting.
2. Scale caused by hard water deposits.

Oxygen corrosion in the form of pitting is the most common cause of boiler tube leaks. Notice the rust colored blisters. Though under these blisters pinholes will occur in the tubes. Pinholes can also be formed without any blisters. This corrosion can be easily prevented with proper water treatment

This is dramatic example of a steam boiler that has been scaled up from using hard water. Notice in the close-up of the tube end that there is O2 corrosion under the scale. This is very common.

Condensate System Chemistry

The closed boiler steam system is basically a distillery. The boiler produces steam, creating a nearly pure water vapor that is eventually condensed in the system into nearly pure water.

When water is evaporated in the boiler, the pH of the water is lowered. As the boiler water is heated to produce steam, it also produces carbon dioxide (CO_2) from the carbonate alkalinity naturally present in water. The CO_2 travels with the steam into the system. The CO_2 condenses in the system with the steam, forming carbonic acid that lowers the pH of the condensate further, making it corrosive, especially to iron.

Condensate system corrosion appears as “channeling” in the condensate piping. This will eventually result in failure of the condensate return piping. Condensate has so many different points at which it enters the condensate system that it isn’t practical or effective to inject treatment into the condensate system directly.

To combat condensate system corrosion, modern boiler treatment uses a product that contains amines. These amines are volatile compounds that vaporize along with the steam. The vapor travels with the steam throughout the system. When the steam condenses, the amines condense as well, raising the pH in the condensate to make it slightly alkaline, protecting the piping.

This treated condensate is returned to the boiler and contributes to the boiler chemistry.

Here you see a general thinning of the condensate piping wall caused by carbonic acid in the untreated condensate.

Water Treatment Equipment Installation

If You purchased the Rite Chemical Treatment System, it will include the following:

1. (1) 1/4" FNPT connection stainless steel injection quill installed in Rite CR tank.
2. (1) 120/60/1 chemical metering pump with suction and discharge tubing and connections.
3. (1) 120/60/1 receptacle on feed pump electrical housing to plug in chemical metering pump:
4. (1) 48 lb. pail of Rite BT-600S boiler chemical treatment.
5. (1) test kit with instructions and chemical control parameters*.
6. (1) carbon steel body sample cooler - shipped loose or mounted on side of boiler

   (for regular tap cooling water)
7. (Optional) (1) Automatic Surface Blowdown Controller.
8. (Optional) (1) Contact head flow meter.
9. (1) Sample Port for Condensate line, to be <u>Provided by Installing Contractor</u>. This must be added to the condensate Return Line. If condensate pumping systems are used in the installation, if at all possible, do not install the sample line in a line supplied by a condensate return pump. Sample line should be installed on a non-pressurized line.

Here you see components of the treatment system installed.

Rite Boiler Sample Cooler

Water Treatment Equipment Installation

Not only is it important to purchase all of the right equipment for your boiler room, it is equally important to understand where each piece fits within the whole system and how the individual components interact with each other.

In this section we have provided schematics to illustrate the relationships between all typical boiler room equipment along with options for the control of the chemical and feedwater pumps.

Flow Meter—this is installed in the makeup water line, before the water softener. It gives you valuable data regarding the integrity of your entire steam system and parameters to act on in your treatment program.

Water Softener—It takes cold raw water and removes the impurities that would otherwise cause severe damage to your boiler.

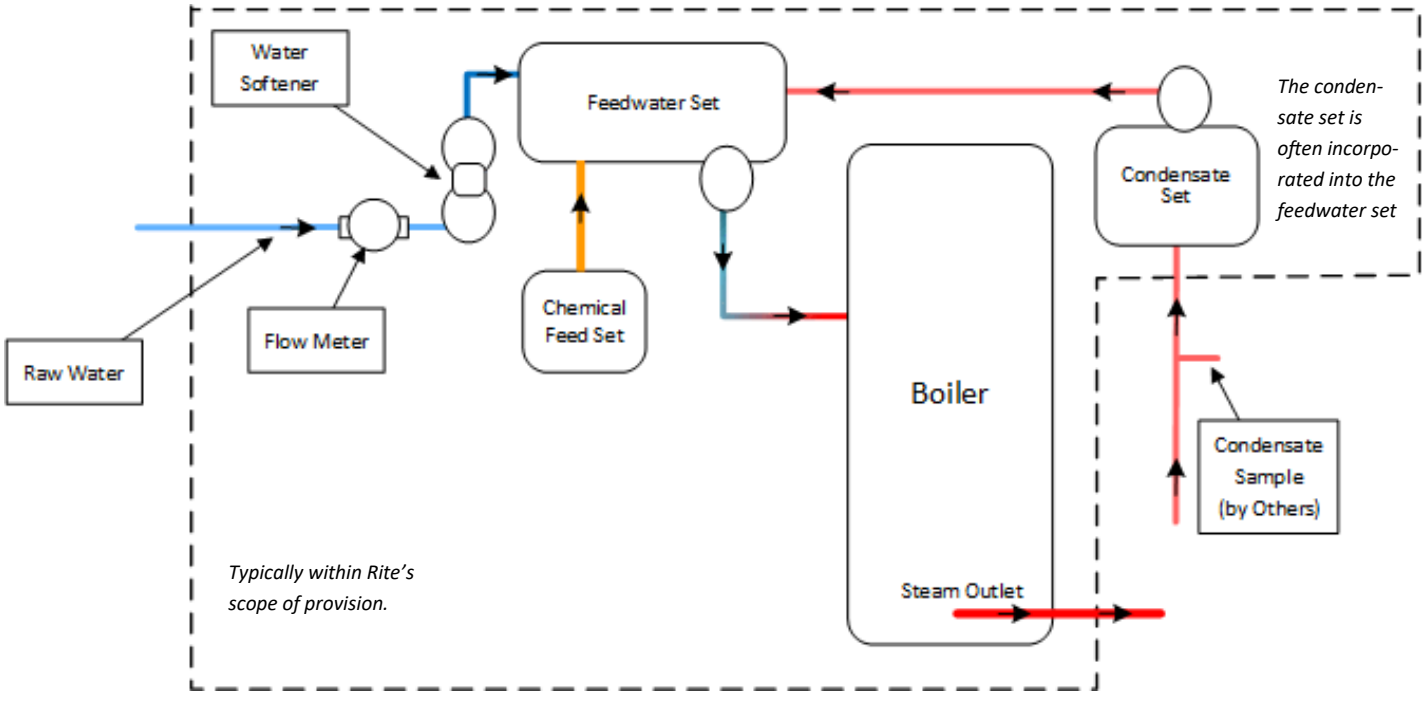
Chemical Feed Set—feeds the treatment chemical into your feedwater tank where the chemicals mix with the condensate and fresh makeup water.

Feedwater Set—consists of the tank and pump(s) to collect, treat and store feedwater for use in the boiler. The feedwater pumps have to overcome the boiler operating pressure to deliver feedwater to the boiler.

Condensate Set—The condensate tank collects condensate and pumps it into the feedwater tank. The pumps are controlled by the level control in the condensate tank. They are not always necessary in a boiler room as condensate can often be returned directly to the feedwater tank.

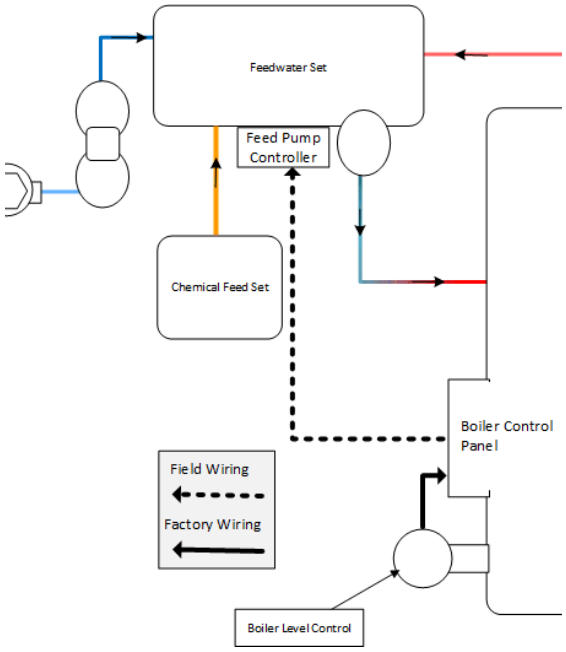
Condensate Sample Point—This is just a fitting with a valve installed by the contractor to give the operator a safe convenient way to draw routine samples for testing.

This schematic illustrates the proper flow relationship of your steam boiler system and accessories.



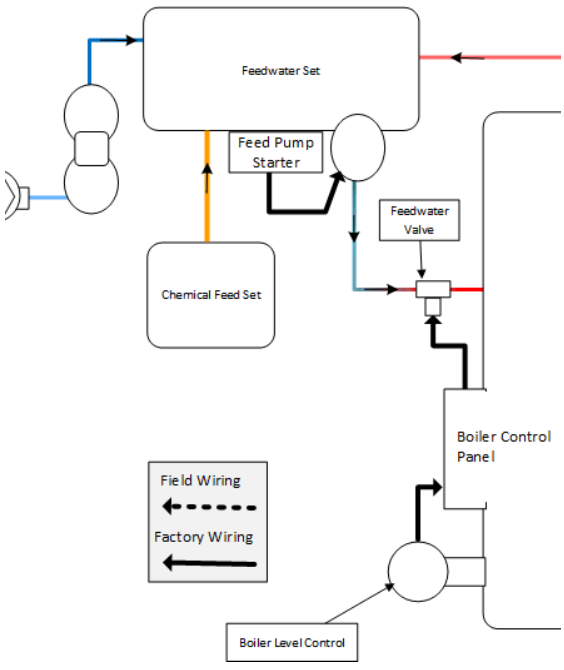
Water Treatment Equipment Installation

Each piece of water treatment equipment comes with its own installation and operation manual. This manual does not supplant that information or individual requirements. These instructions are intended to illustrate to you how the overall system goes together and how to operate it as a complete system. The previous schematic illustrates the mechanical relationship between each component, the following illustrates the control interconnectivity.



Feedwater Control Option A

The boiler feedwater pumps are controlled by the boiler water level control. As the boiler water level drops the feedwater pumps will energize to bring the water level up to normal. The pumps will then shut off. This is the most common configuration for commercial steam applications

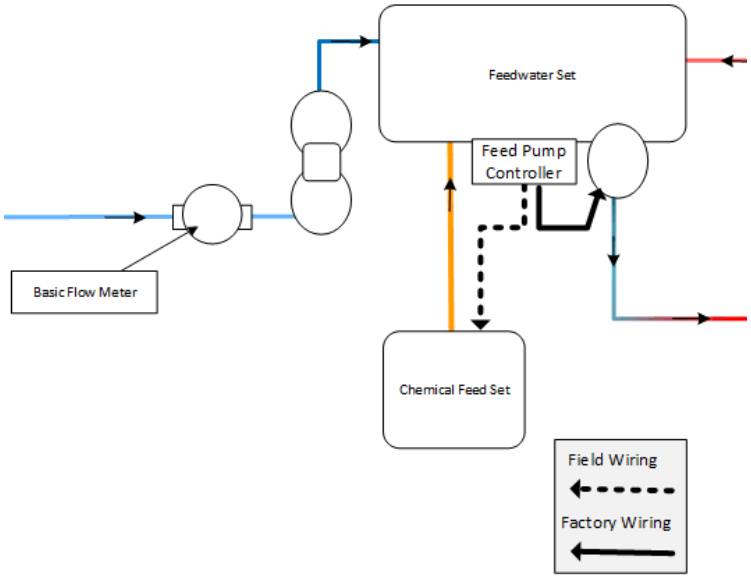


Feedwater Control Option B

The boiler feedwater pumps run continuously or are controlled by a VFD. As the boiler water level drops, the level control will open the valve to bring the water level up to normal. The valve will modulate to close as the water level approaches normal. This is the most common configuration for large industrial steam applications

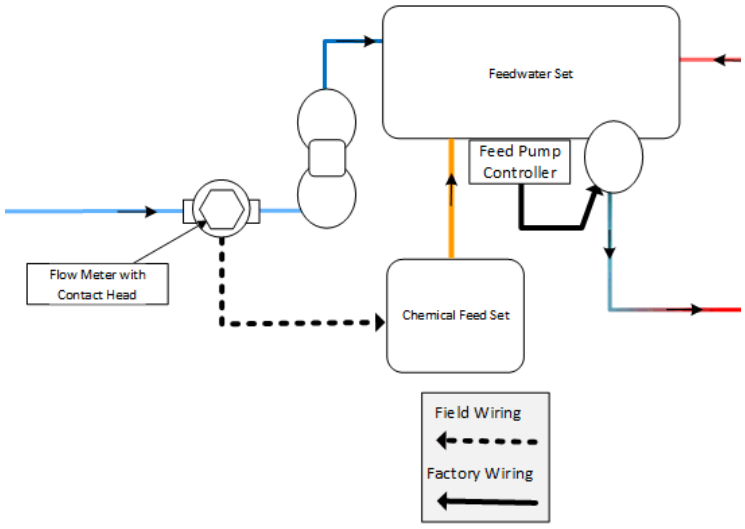
Water Treatment Equipment Installation

Make-up water is the water that actually needs to be treated, returning condensate is considered treated water. The more make-up water the system requires, the more treatment chemical and blowdown is required. Accurately monitoring your makeup water usage is the best way to anticipate chemistry requirements.



Chemical Feed Control Option A

The chemical feed pump is controlled by the feedwater pump controller. When the feed water pump is energized the chemical feed pump will be energized. This option is best suited for smaller operations where steam use is very stable and constant. It requires more vigilance in testing and control.



Chemical Feed Control Option B

The chemical feed pump is controlled by the contact head flowmeter. As the make-up water flow changes, the chemical flow changes accordingly. This is the best option for most facilities as the system is automated to treat according to the actual demand.

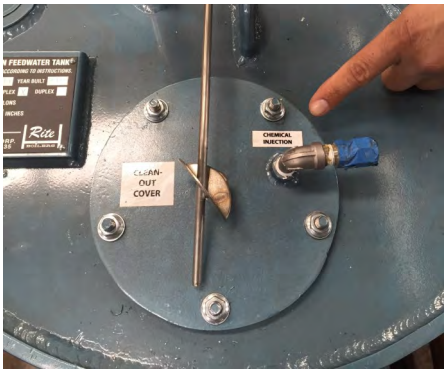
Water Treatment Equipment Installation

Chemical Feed Option C

This is the 3rd option for adding treatment chemical to your steam boiler system. It is to manually measure and pour chemical directly into your feedwater tank.
This method is typically used for one-off treatments such as preparing for a boiler lay-up or initial treatment for boil out. It is not practical for normal operations as it would require constant testing and dosing.

IMPORTANT

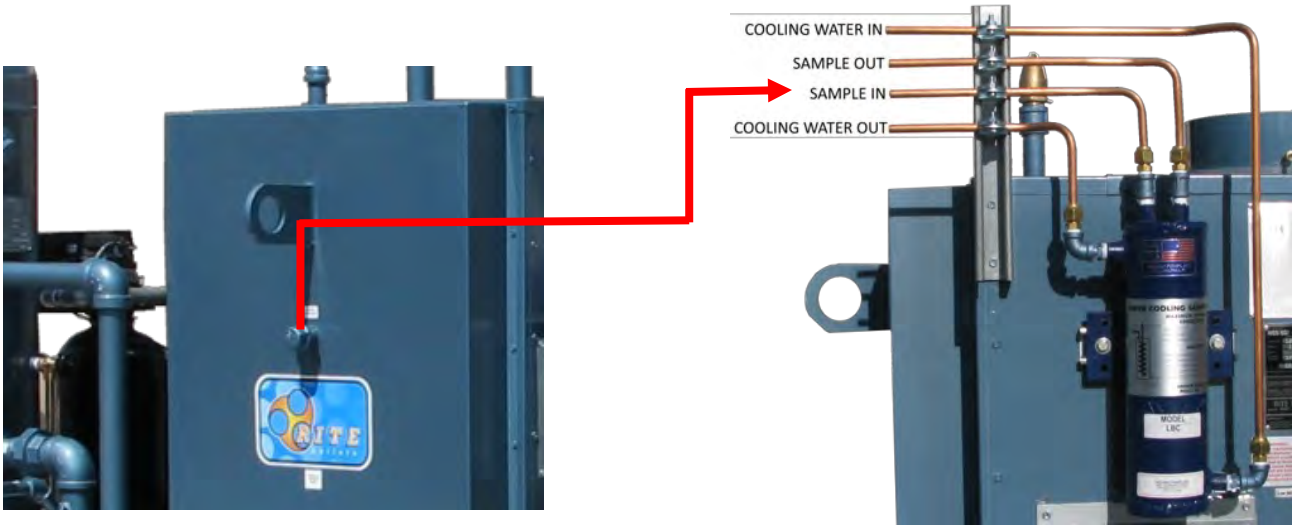
Install the chemical feed pump outlet tubing onto the stainless-steel fitting at the top of the condensate return tank. Be aware that chemicals can be highly corrosive to feedwater tanks in their concentrated form so make sure that the proper “entry point” (the stainless-steel injection port) is used to deliver the chemical to the tank. In addition, pump seals exposed to high concentrations of chemicals often fail prematurely if higher than needed chemical levels are present in the feedwater tank.



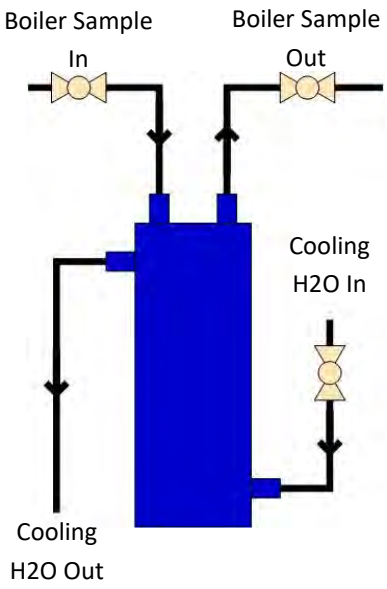
Water Treatment Equipment Installation

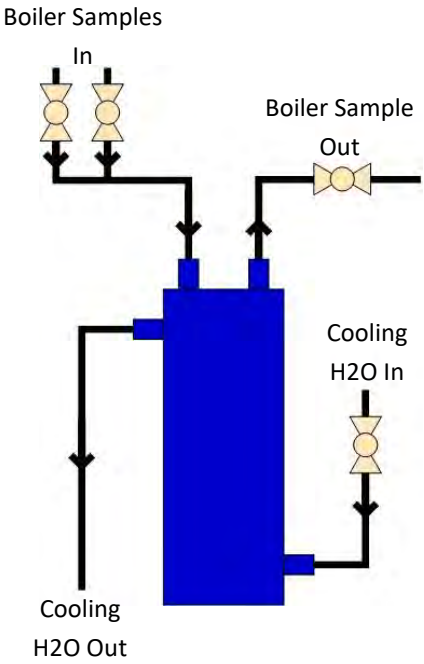
Sample Cooler

Your steam boiler is built with a piped connection on either the front or rear headplate. This connect is labeled as a surface blow connection. This is also the connection for connecting your sample cooler.



You can pipe multiple boilers to the same sample cooler as shown below. If you do this ,you must ensure that you purge the sample line sufficiently to obtain a representative sample from the intended boiler. Please notice that there is no valve on the cooling water outlet. This is intentional to prevent accidental over pressurization of the sample cooler.



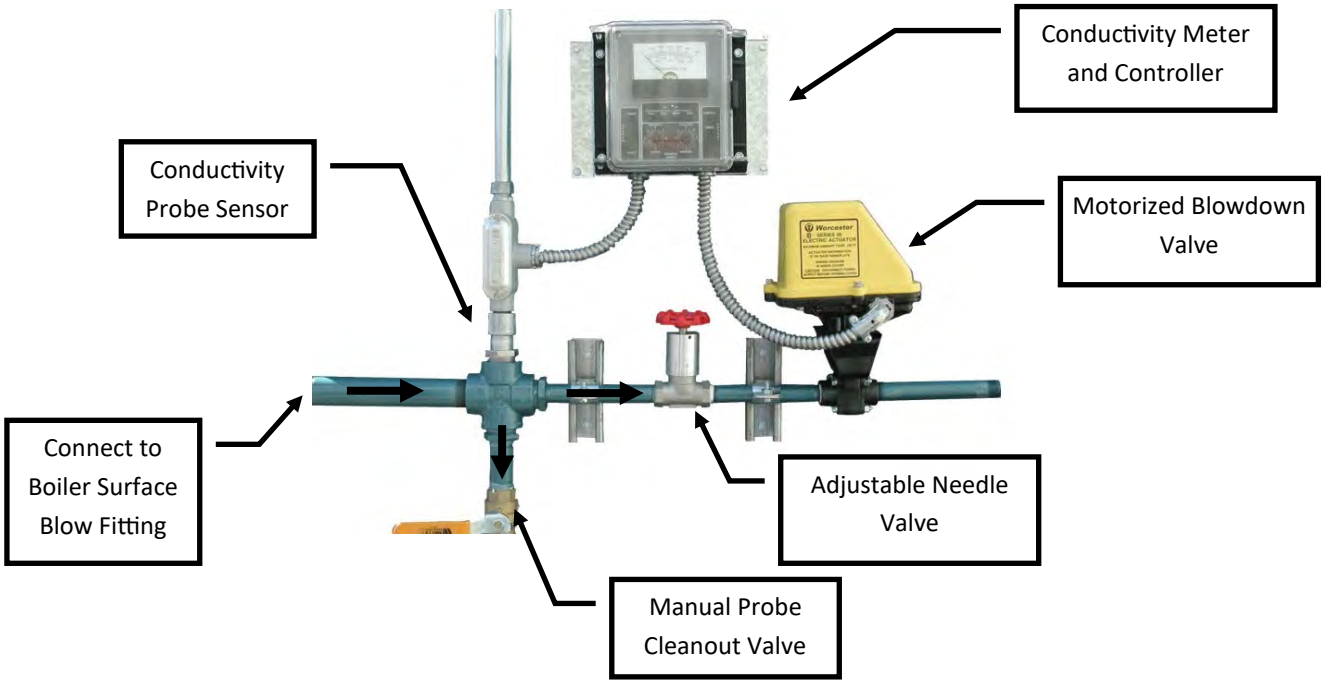


Water Treatment Equipment Installation

Automatic Surface Blowdown Option

The assembly is connected to the surface blow fitting located just below the normal water level of the boiler. It is set up on a timer to automatically open the valve and blow-down a small sample of water. If the conductivity of the boiler water is above the set point on the controller, the valve will remain open until it clears the lower limit. It will then close the valve until the next timed interval is reached.

If your fresh water makeup is more than 20% of total boiler water input, you should consider a conductivity controlled automatic surface blowdown unit. These devices will automatically measure boiler water conductivity and blowdown the boiler to maintain boiler acceptable limits.



The assembly is connected to the surface blow fitting located just below the normal water level of the boiler. It is set up on a timer to automatically open the valve and blow-down a small sample of water. If the conductivity of the boiler water is above the set point on the controller, the valve will remain open until it clears the lower limit. It will then close the valve until the next timed interval is reached.

Water Treatment Equipment Start-up

During the course of performing water treatment tasks, you will be required to handle or be exposed to concentrated chemicals. It is imperative that you take the time to read and understand the safety data sheets provided with these chemicals. You must take the necessary precautions in handling, mixing and disposing of these chemicals and their containers. Always wear the proper PPE while per forming your water treatment tasks.

Read and follow the Safety Data Sheet (SDS) which is supplied with the chemical products delivered for your job. Familiarize yourself with the Safety Data Sheet, including Safe Handling, Safe Storage, Fire Fighting Procedures, etc.

Water Softener Start-up

Using the manual that was supplied with the Water Softener, ensure that the softener is operating properly and delivering "0" hardness water. If it is not, regenerate the softener manually and go through the troubleshooting steps in the Water Softener Manual.

Rite Treatment Products

We provide a complete water treatment product which is a blend of scale and corrosion inhibitors it also contains sodium sulfite, an oxygen scavenger for controlling the presence of oxygen in the boiler as well as a neutralizing amine that flashes off (evaporates) with the steam. This carries along with the steam so that when the steam reverts back to its water phase out in the piping system it re duces its naturally acidic tendency by raising its pH.

Chemical Feed Start-up

1. Prime the Chemical Feed Pump - Prior to placing the drop tube (pump suction line) into the actu-al chemical treatment product, you should prime the pump with clean water.
   a. Place the drop tube, with foot valve, into a bucket of clean water.
   b. Temporarily remove the discharge line at the Feedwater tank if it has been installed and place the discharge line into a bucket or near a drain.
   c. Plug the pump electrical cord into an energized 110VAC outlet.
   d. Carefully adjust the pump stroke and speed to 100%.
   e. Run the pump until a steady stream of water runs out of the discharge line. The pump is now primed.
   f. Unplug the pump electrical cord.
   g. Water should remain in the tubing if the foot valve has been properly placed at the bottom of the suction side of the line.
   h. Reassemble the discharge line by installing the tubing into the chemical injection port on top of the Feedwater Tank .

Water Treatment Equipment Start-up

2. Initial Treatment Dose
    a. Measure the required amount of chemical treatment product into a clean plastic container according to the Initial Treatment Dose chart (Table A) .
    b. Ensuring that the Feedwater Tank is at normal water level (i.e. the makeup valve is no longer adding water via the automatic float operated valve).
    c. Add the Initial Chemical Treatment dose to the Feedwater Tank.
    d. Plug the pump electrical cord into an energized 110VAC outlet to start pumping the chemicals into the feedwater tank. The pump settings should still be at 100% .
    e. As the level of treatment chemical in the container drops and approaches the foot valve add clean water to the container to ensure all of the treatment product is used.
    f. As the level in the bucket approaches the foot valve again, add more water and carefully adjust the pump stroke and speed to 50%.
    g. Run the water level back down to the foot valve, careful not to expose the valve completely and lose the pump prime.
    h. Unplug the pump electrical cord to deenergize the pump.

Table 1 - initial treatment dosage

Feedwater Normal Water Level	Treatment Product (oz.)	Feedwater Normal Water Level	Treatment Product (oz.)	Feedwater Normal Water Level	Treatment Product (oz.)	Feedwater Normal Water Level	Treatment Product (oz.)
10	1.7	150	24.6	290	47.6	430	70.6
20	3.3	160	26.3	300	49.2	440	72.2
30	5	170	27.9	310	50.9	450	73.8
40	6.6	180	29.6	320	52.5	460	75.5
50	8.2	190	31.2	330	54.2	470	77.1
60	9.9	200	32.8	340	55.8	480	78.8
70	11.5	210	34.5	350	57.4	490	80.4
80	13.2	220	36.1	360	59.1	500	82
90	14.8	230	37.8	370	60.7	510	83.7
100	16.4	240	39.4	380	62.4	520	85.3
110	18.1	250	41	390	64	530	87
120	19.7	260	42.7	400	65.6	540	88.6
130	21.4	270	44.3	410	67.3	550	90.2
140	23	280	46	420	68.9	560	91.9

3. Restoring the chemical feed system to normal.
    a. Remove the suction line from the plastic container then insert the drop tube with foot valve into the full chemical treatment product pail.
    b. Plug the pump electrical cord into the chemical feed pump outlet. The pump should only be energized upon demand signal.
    c. Energize the feedwater pump and allow the boiler to fill up with treated water.
    d. Test the boiler water to ensure that all parameters are within the target range.
    e. If the parameters are out of range, make small adjustments to the pump stroke or speed to work towards establishing normal chemistry. These adjustments must be made while the pump is actually running. This process can take several days depending on plant operations.
    f. If hardness is out of range, inspect water softening system immediately to ensure it is operating correctly.

Table 2- treatment target range

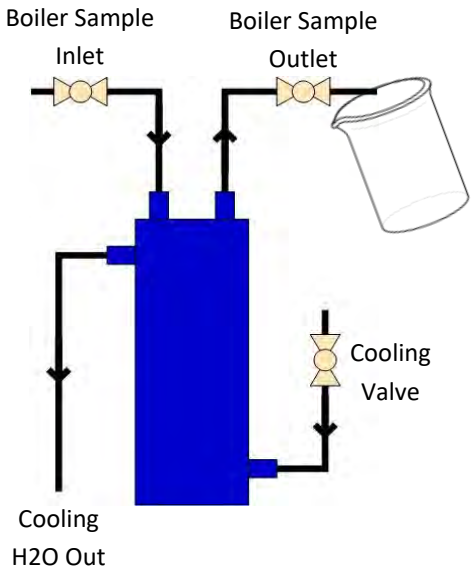
Constituent	Target Range
Boiler Water pH	10.5 – 11.5
P" Alkalinity	200 – 400
Sulfite (SO_3)	40 – 80
Conductivity	3000 – 3500 µS (or µMhos)
Hardness	0-trace (<2) ppm
Condensate Return PH	8.0-9.0
Condensate Return Conductivity	< 50 µS (or µMhos)
Condensate Return Iron	< 1ppm

Water Treatment System Start-up

It is imperative that All Water Treatment Equipment be set up as described in the Installation Manual. For a Summary of Daily, Weekly Monthly, Semi-annual and Annual Tasks see Appendix *"Recommended Testing and System Checks*."

Using the Sample Cooler

1. Open the cooling water valves fully to begin running the cooling water until the water to drain runs cool and sample cooler is cool to the touch.
2. Ensure boiler sample outlet valve is closed, slowly open the inlet valve fully.
3. Slowly open the boiler sample outlet valve until you have a slow steady flow of boiler water. This water should be cool with no steam visible. You can increase this flow until the sample warms to ambient temperature, but do not exceed 90^0F. The test for Sulfite will read a false positive if the temperature exceeds 90^0F.
4. Allow enough water to flow to ensure the sample is representative of the boiler being operated. We recommend at least 10-15 seconds of flow per foot of 3/8" sample tubing.
5. Using your PPE place your sample vial under the boiler water sample outlet and fill to about 1/4 full. Rinse the beaker out carefully with the sample water and repeat two more times.
6. Fill the vial to level listed on each specific test. Your first and immediate test should be the sulfite test. With time the atmospheric O_2 will be absorbed as it sits and affect the test result.
7. Shut the boiler sample line valves and allow the cooling water to run cool (drawing away residual heat).
8. Shut the cooling water valves.
9. When testing is complete dump out the remaining sample and cap the bottle to keep it clean.



Initial System Cleaning

IMPORTANT

Rite Boilers are supplied clean from the factory. Though Rite does not require a boil-out your steam system or other components may. If you are unsure, contact a water treatment specialist and/or the specific equipment manufacturer.

Every new installation will have some cutting oil, grease, weld slag, pipe dope or other contaminants inside the system piping. Your particular job may call out a specific cleaning procedure before the steam system is put into operation. Contact your water treatment company or the manufacturer for specific instructions.

IMPORTANT

Care must be taken when piping the steam and condensate return piping that new clean pipe be used to minimize contaminants from entering the feedwater tank and boiler. Considering that there may be contaminants (pipe dope, mill oils, etc.) in the piping system, it is best to dump the condensate to drain for the first few weeks of operation.

IMPORTANT

Dumping condensate to drain will increase the makeup water demand for the boiler significantly. The chemical feed pump, and boiler blowdowns must be adjusted accordingly. Check condensate return water quality daily looking for visible contaminants (e.g. oil floating on surface, particulate, etc.). When condensate is clean and clear, return it back to the system and set the chemical pump to normal dosage.

Initial Dump and Flush

1. After initial start-up and refractory curing has been completed, operate the boiler for 3 - 4 hours at normal operating pressures after making sure the feed pump has fed the treated water from the return tank into the boiler.
2. With the boiler under low pressure, turn the boiler off and completely blow down the boiler allowing treated, soft water to fill the boiler.
3. Perform this function three times, and then turn the feed pump off and completely blowdown the boiler and drain the return tank.
4. Refill the return tank from the soft water supply and add the initial product dosage as indicated in table A to the water in the feedwater tank.

System Operation

Blowdown

Bottom blowdowns are required to maintain TDS (Total Dissolved Solids) levels below 3500 µS. The goal is to maintain the TDS between 3000 AND 3500 µS. As the conductivity drops under 3,000µS you are beginning to waste chemical, heat and feedwater through blowdown. As the conductivity increases over 3500 µS you will start to generate carryover of water with the steam.

1. Follow these instructions to ensure a proper bottom blowdown.

    a. Ensure that the feedwater pumps are in a state to be energized when the water level drops during blowdown.
    b. Fully open the secondary blowdown valve if applicable.
    c. Slowly open the primary blow-down valve for approximately 3 seconds, then slowly close the valve. We call this a 1x3 (1 cycle, 3 seconds each) blowdown. This allows the solids to remain suspended for more uniform removal during the blow-down procedure.

2. Water column blowdown is a primary safety check for steam boilers. This must be done at least once per day. This keeps the low water cutout bowl and fittings clear of sludge and debris. It also allows the operator to verify the proper operation of the low water cut-offs and the pump start controls as well as the affected circuits. Follow these instructions to ensure a proper water column blowdown.

    a. Ensure that the feedwater pumps are in a state to be energized when the water level drops during blowdown.
    b. Fully open the secondary blowdown valve if applicable.
    c. Slowly open the primary blow-down valve for approximately 2 to 5 seconds, then slowly close the valve. The feed pumps should start and the boiler should shut down during this procedure.
    d. Reset the low water cut out if necessary and note the blowdown in your boiler log and in your treatment log.

System Operation

The water treatment system and chemical product(s) supplied by Rite Boilers are designed to control corrosion, conductivity, alkalinity and pH in the boiler as well as raise the pH of condensate return water to help maintain a solid condensate system. This program should be followed based on the information, and guidelines set forth in this manual as well as good engineering practices.

This manual addresses two different modes of operations:

1. Continuous—The boiler is operated 24 hours/day for 3 or more days straight.
2. Intermittent—The boiler is shut down and allowed to cool and remain at ambient temperature frequently throughout the week.

Continuous Operations:

1. Prior to starting a cold boiler, blow down the water column and check the condition of the water in the site glass. It is expected that the water may be lightly tinted reddish brown, this is normal. If the water is darker than a light tint you should dump the boiler and refill with soft treated water.
2. The boiler water level should be near normal. Drain the boiler down to normal water level if needed.
3. Bring the boiler up to pressure and test the boiler water and condensate within an hour or two after putting the system on line.
4. Perform a 1x2 bottom blowdown on the boiler unless previous experience dictates otherwise.
5. Perform a water column blowdown.
6. Test the boiler water and condensate daily and adjust the treatment (and blowdown) accordingly. Remember to make small adjustments.
7. Log all of these actions and results in your water treatment log.

Intermittent Operations:

1. Prior to starting a cold boiler, blow down the water column and check the condition of the water in the site glass. It is expected that the water may be lightly tinted reddish brown, this is normal. If the water is darker than a light tint, you should dump the boiler and refill with soft treated water per initial dosage table.
2. The boiler water level should be near normal. Drain the boiler down to normal water level if needed.
3. Bring the boiler up to pressure and test the boiler water and condensate within an hour or two after putting the system on line.
4. Perform a 1x2 bottom blowdown on the boiler unless previous experience dictates otherwise.
5. Perform a water column blowdown.
6. Test the boiler water and condensate daily and adjust the treatment (and blowdown) accordingly. Remember to make small adjustments.
7. If the boiler is shut off and boiler steam pressure drops to “0 psi” the boiler should be filled completely with soft treated water, using the boiler feedwater pumps. (refer to wet lay-up)
8. Log all of these actions and results in your water treatment log.

System Operation

Testing is the only way to ensure that your water treatment program is effective. Testing and logging the results allows you to determine trends in your plant operations. The results will tell you if your chemical pump is working and the settings are correct. You'll also be able to detect any changes in your condensate and make-up water systems including your water softener.

Testing, recording and understanding the results is also the only way of measuring the cause and effect from changes to your treatment protocol or changes in your system.

> For example...if when you run your tests and see that your sulfites are low, typically the first reac tion is to increase your chemical dosage to raise the sulfites. But had you been logging the daily results, including your feedwater tank temperature, you would have seen that your tank temperature has dropped from 180^0F to 90^0F, indicating the problem is with your tank heater not your chemical dosage. The lower temperature water holds much more dissolved O_2 which consumes the sulfites at a much higher rate.

Using these tools also gives you continuity between shifts and operators. Part of the shift turnover should include a review of the daily logs and any abnormalities or changes in your treatment program. When used in conjunction with our troubleshooting guide, most operators should be able to maintain their boiler system chemistry satisfactorily.

You will find a treatment log page in the appendix. You can order printed log books from Rite Boilers, make copies from this manual or download and print the logbook pages from our website, www.riteboiler.com.

This is the recommended testing and inspection schedule for your water treatment program:

Table 3- boiler in operation schedule

Daily	Weekly	Monthly	Semi-Annually	Annually
Record boiler water level	Check gauge glass for leaks, dirt buildup	Review daily water treatment log	Clean low – water cutoff	Open, inspect and clean fireside and waterside
Blowdown water column	Record treatment chemical container level		*First year—Open, inspect and clean fireside and waterside	
Bottom blowdown boiler	Record salt level in water softener			
Test boiler water chemistry				
Test condensate chemistry				
Record makeup water use				
Record boiler operating pressure				
Record feedwater tank temperature				

Troubleshooting Guide

Table 2- treatment target range

Constituent	Target Range
Boiler Water pH	10.5 – 11.5
P" Alkalinity	200 – 400
Sulfite (SO_3)	40 – 80
Conductivity	3000 – 3500 µS (or µMhos)
Hardness	0-trace (<2) ppm
Condensate Return PH	8.0-9.0
Condensate Return Conductivity	< 50 µS (or µMhos)
Condensate Return Iron	< 1ppm

The following corrective actions are guidelines, the actual results of your post adjustment testing will determine how effective the changes were and lead you to further adjust your treatment and blowdown program.

There are five common out of range scenarios that you may find in administering your boiler water treatment program. These scenarios are as follows:

1. All water treatment numbers are consistently high.
   Likely Cause—Insufficient bottom blowdown.
   Corrective Action—Increase the blowdown and test as follows:
   a. Conductivity from 3500µS —4000µS add 2-3 extra seconds to blowdown
   b. Conductivity from 4000µS —5000µS add 1 extra cycle
   c. Conductivity from 5000µS—6000µS add 2-3 extra seconds and increase frequency of blowdown to twice per day.
   d. Conductivity over 6000µS without foaming in site glass, continue with line "c".
   e. Conductivity over 6000µS **with** foaming in site glass, dump and flush boiler, refill system using initial treatment dosage per table 1.

2. All water treatment numbers are low.
   Likely Cause—Too MUCH bottom blowdown
   Corrective Action—Decrease bottom blowdown and test as follows
   a. Conductivity from 2000µS —3000µS decrease blowdown by 25%
   b. Conductivity from 1000µS —2000µS decrease blowdown by 50%
   c. Conductivity from 0µS —1000µS decrease blowdown by 75%

3. Conductivity is high, but sulfite is low

   Likely Cause—Insufficient chemical treatment for the temperature or volume of makeup water. This increases the conductivity compared to the amount of sulfites in the system.

   Corrective Action— Check your make-up water use, chemical feed system then your steam and condensate systems.

   a. Compare your feedwater take temperature to historical data, if the temperature has dropped check your tank heater (if applicable).
   b. Compare your make up water usage to historical data, if it has increased significantly proceed to step "c".
   c. Verify that your chemical feed pump is working and that you have sufficient amount of treatment chemical in its container.
   d. Check for steam leaks, make sure condensate system valve alignment is correct and if you have condensate return tanks, they are not overflowing.
   e. If everything checks out but condition exists please contact factory.

4. Conductivity is low but sulfite is high

   Likely Cause—You are probably adding too much chemical to the boiler.

   Corrective Action—

   a. Reduce the chemical feed pump speed by 10%, wait for at least 15 feedwater pump cycles and retest for sulfites. Repeat until the sulfites are within target range.

5. High hardness level

   Likely Cause—the water softener is not operating properly.

   Corrective Action

   a. Make sure there is salt in the brine tank and, if there is, that it hasn't bridged. Add salt and/or break up the bridging.Check Softener for proper operation according to the instructions provided with the softener.

Other Water Chemistry Scenarios

1. Rusty Water

   Likely Cause—The boiler was not properly shutdown or layed-up.

   Corrective action

   a. If all of the chemistry is within the target range and there is no visible foaming in the site glass then no other action is required. The color will clear up over time.
   b. If the chemistry is out of range or you see foaming in the site glass then you should dump the boiler and refill with soft treated water per initial dosage table.

Boiler Lay-up; Removing a Boiler from Service

There are two types of lay-ups: wet or dry, they are defined as follows.

1. Wet Lay-up—The boiler is shutdown and flooded with treated water. The water chemistry is checked weekly and chemicals added should the chemistry go out of target range. The boiler must be kept flooded, ideally under positive pressure for the duration of the lay-up. We recommend that a boiler only be kept under a wet lay-up for less than 30 days.

2. Dry Lay-up—The boiler is shut down and all water surfaces and passages are cleaned according to manufacturer's instructions and dried. Desiccant is added to the boiler wet and dry sides and the boiler is sealed up. The desiccant should be inspected regularly to ensure its effectiveness. Due to the work involved, this is typically a longer term lay-up and, if applied properly, can protect a boiler for years.

A short term lay-up could be considered anywhere from a few days up to 1 month. A long-term lay-up is anything over 1 month. The primary goal of a lay-up is to prevent oxygen corrosion in the boiler. A secondary goal, in some installations is to protect the offline boiler from freezing in cold weather.

A wet lay-up is generally recommended for short term for two reasons: The boiler can be brought back on-line quickly and it is also less labor intensive than a "dry" lay-up. If the boiler is to be laid-up wet in potentially freezing weather, the boiler must be protected from freezing with an external heat source. Freezing a boiler can absolutely destroy it. If there is any possibility that it could freeze then a dry lay-up is your best choice.

Note that in cases of both wet layup and dry layup, care must be taken to re-establish proper water levels within the boiler as well as the proper chemical levels. So when starting up after a wet layup, the boiler will need to be drained and refilled with the proper chemical dose for "ongoing treatment" as described in the Startup section of this Manual.

5832 Garfield Ave. Commerce, CA 90040, p 562-862-2135, f 562-861-9821, support@riteboiler.com

Name		Phone	
Boiler #		Email	

DATE	Water Meter Reading	Feedwater Temp.	Boiler Pressure (psi)	Component Test	SOFTENER	BOILER					CONDENSATE			Tested By
					Hardness	Hardness	Alkalinity	Sulfite	Cond.	pH	Cond.	pH	Iron	
				Ranges	**< 2 PPM**	**< 2 PPM**	**200-400**	**40-80 PPM**	**< 3500**	**9.0-11.8**	**< 50**	**8.0- 9.0**	**< 1 PPM**	Init.

Notes and Comments:

DATE:	

Treatment Testing Tips

Keep your test kit in a cool and dry place. Boiler rooms are not generally suitable for storing boiler test kits as they tend to be very not an often very humid due to the humidity created by blow down.

Testing Procedures Safety – Remember that when you are testing that you are testing treated boiler water as well as using chemical reagents that carry their own unique hazards with regards to skin and eye contact. Read and follow the guidelines on the Safety Data Sheets (SDS) that are packaged with the Test Kit.

When you are running “drop tests” (tests that require the addition of drops of a reagent to get an endpoint).

1. Hold the bottle upright and squeeze a little of the air out of the bottle
2. While maintaining pressure on the bottle slowly invert it until it is vertical.
3. Gently apply more pressure in order to slowly squeeze it drop by drop.

With this method the drops will be of a consistent size and you can control the “drop rate” so that you do not “over shoot” your end point.

Remember that when running those “drop tests” you want to swirl the beaker into which you are dropping the reagent after each drop to assure thorough mixing.

Alkalinity (P/T) Test Kit

TK1018-Z

1 drop = 10 ppm as $CaCO_3$ / 25 mL

red caps

KIT COMPONENTS:

SA1555-B	Alkalinity Titrant Low, 60 mL
PH1605-A	Phenolphthalein Indicator, 30 mL
AI6925-A	Total Alkalinity Indicator, 30 mL
VL-1005-V	Vial, 10-50 mL

SAFETY TIPS:


Wear Gloves


Use Eye Protection

Read SDS

TESTING TIPS:


Collect Accurate Sample

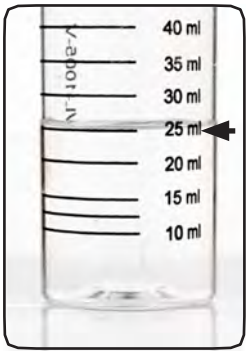

Hold Bottles Vertically


Ensure Proper Lighting

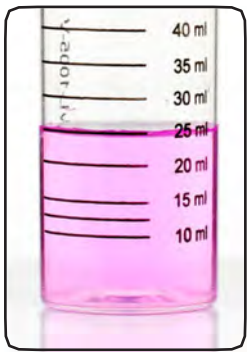
INTERFERENCES: Turbid samples may mask the color change at the endpoint. Use a pH meter for these samples titrating for the phenolphthalein alkalinity and for total alkalinity.

ATTENTION: As necessary, calibrate this kit against a known standard made with plant / make-up water. Be sure to collect a representative sample.

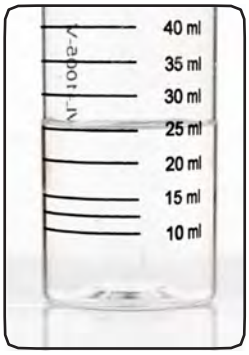
1 Rinse vial three times with sample to be tested. Fill vial to 25 mL.



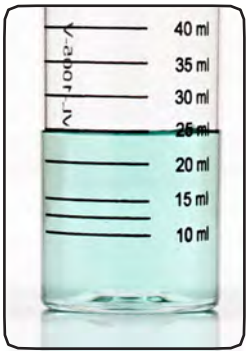
2 Add 3 drops of Phenolphthalein Indicator (PH1605) and swirl to mix. The sample should turn pink.



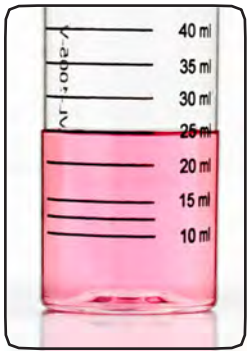
3 Add Alkalinity Titrant (SA1555) one drop at a time while swirling. Count the number of drops until the sample color changes from pink to colorless. Record the number of drops as P-Alkalinity.



4 Add 3 drops of Total Alkalinity Indicator (AI6925) and swirl to mix. The sample should turn green.



5 Add Alkalinity Titrant (SA1555) one drop at a time while swirling. Count the number of drops until the sample color changes from green to red. Record the total number of drops (from step 3 & 5) as T-Alkalinity.



drops x 10 = ppm as $CaCO_3$

OH Alkalinity = (2xP) – M

EndPoint ID® Test Procedure +PLUS

Sulfite Test Kit

1 drop = 2 or 10 ppm as Na_2SO_3 / 25 mL

TK3502-Z

orange caps

KIT COMPONENTS:

PI8056-B	Sulfite Titrant Low, 60 mL
PI8063-B	Sulfite Titrant High, 60 mL
PH1605-A	Phenolphthalein Indicator, 30 mL
ST5205-H	Starch Acid Powder, 10g
VL-1005-V	Vial, 10-50 mL

SAFETY TIPS:


Wear Gloves


Use Eye Protection

Read SDS

TESTING TIPS:


Collect Accurate Sample


Hold Bottles Vertically

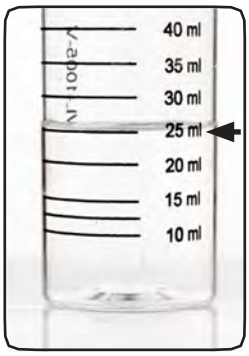

Ensure Proper Lighting

INTERFERENCES: All oxidizable substances such as Organic Matter, Sulfides and Nitrites, are positive interferences. Metals, namely copper, can stop or slow the chemical reaction. Adding one Sulfamic Acid powder pillow to the sample immediately following collection will minimize the interference. Sample should be covered and cooled to room temperature before testing. Exposure to air can be a negative interference.

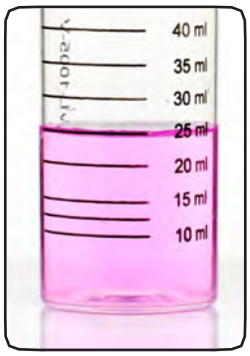
ATTENTION: As necessary, calibrate this kit against a known standard made with plant / make-up water. Be sure to collect a representative sample.

- *Cool the sample to room temperature*
- *Run test immediately after collecting and cooling the sample.*

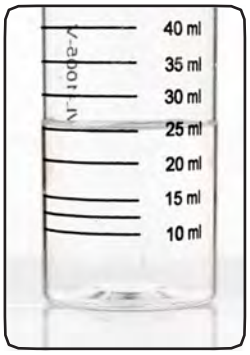
1 Rinse vial three times with sample to be tested. Fill vial to 25 mL.



2 Add 1 drop of Phenolphthalein Indicator (PH1605) and swirl to mix. The sample should turn pink.



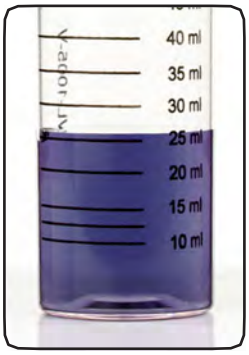
3 Add Starch Acid Powder (ST5205) one scoop at a time, swirling after each scoop, until the sample color changes from pink to colorless. Then, add two more scoops.



4 Add Sulfite Titrant one drop at a time while swirling. Count the number of drops until the sample color changes from colorless to blue.

Sulfite Titrant Low (PI8056)
drops x 2 = ppm as Na_2SO_3

Sulfite Titrant High (PI8063)
drops x 10 = ppm as Na_2SO_3



Video Procedure

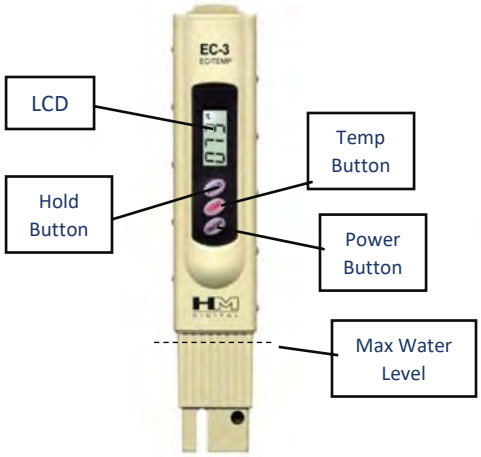
EndPoint ID® Test Procedure +PLUS

Specific Conductivity

The EC-3 Digital Conductivity Meter is used to measure the conductivity of Boiler Water as well as Condensate Return Water.

Taking Measurements:

1. Remove EC Cap
2. Turn EC Meter to the ON Position
3. Immerse the Meter in to the Water/Solution up to the Maximum Water Level.
4. Lightly stir the meter to dislodge any air bubbles
5. Wait until the display stabilizes. One the display stabilizes (approx. 10 Seconds) push the “Hold” button to view the reading
6. If the display flashes “X-10,) Multiply the reading by 10
7. After usage, shake off any excess water and replace the cap



NOTE: For further information on the device and for Calibration Information please review the literature in the device carrying case.

Hardness (Total) Test Kit

1 drop = 2 ppm as $CaCO_3$ / 25 mL

TK 3038 Z

Blue Caps

KIT COMPONENTS:

ED 2073-B	Hardness Titrant Low, 60 mL
EB 1775B	Hardness Indicator
VL-1005-V	Vial, 10-50 mL

SAFETY TIPS:


Wear Gloves


Use Eye Protection

Read SDS

TESTING TIPS:


Collect Accurate Sample

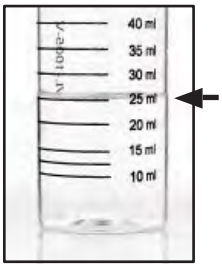

Hold Bottles Vertically


Ensure Proper Lighting

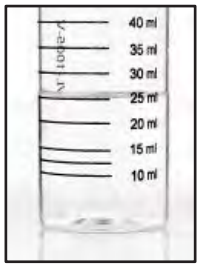
INTERFERENCES: Metals may cause difficulty in seeing the endpoint. If metal interference is presumed, add one drop of Hardness Titrant to the sample before adding buffer or indicator. Include this drop of titrant when calculating your results. Additional Hardness Buffer may be necessary to view a clean endpoint.

ATTENTION: As necessary, calibrate this kit against a known standard made with plant / make-up water. Be sure to collect a representative sample.

1 Rinse vial three times with sample to be tested. Fill vial to 25 mL.

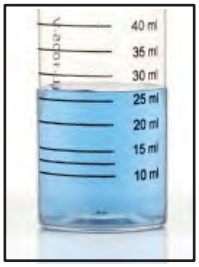


2 Add 5 drops of EB 1775B.



3 *Note: The sample will turn red if hardness is present and blue if there is no hardness.*

4 If Red: Add Hardness Titrant Low (ED2073) one drop at a time while swirling. Count the number of drops until the sample color changes from red to blue.



drops x 2 = ppm as $CaCO_3$

EndPoint ID® Test Procedure +PLUS

pH Test Strips

pH 7.0 – 14.0

KIT COMPONENTS:
pH Test Strips 100 PK

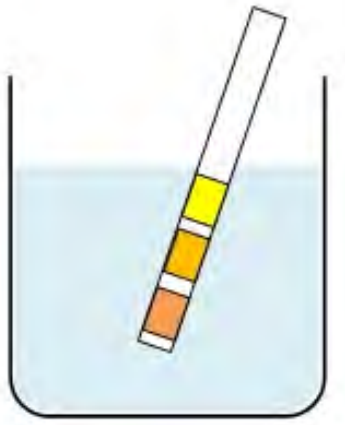
INTERFERENCES: Turbid or highly colored samples may mask the color change at the endpoint.

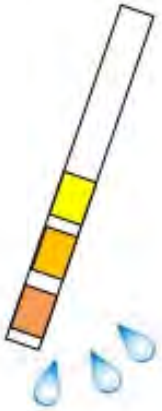
SAFETY TIPS: Wear Gloves

Use Eye Protection

Read SDS

TESTING TIPS: Ensure Proper Lighting





Instructions for Use:

1. Dip test strip for 1 s with all test fields in the sample solution.
2. Shake off excess sample solution.
3. Compare with color scale and read off the corresponding pH-value.

Iron Test Kit **IR-18 (146400)**

pH 6.0 – 7.4 (0.2 increments)

CAUTION: Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

SAFETY TIPS:


Wear Gloves


Use Eye Protection

Read SDS

TESTING TIPS:

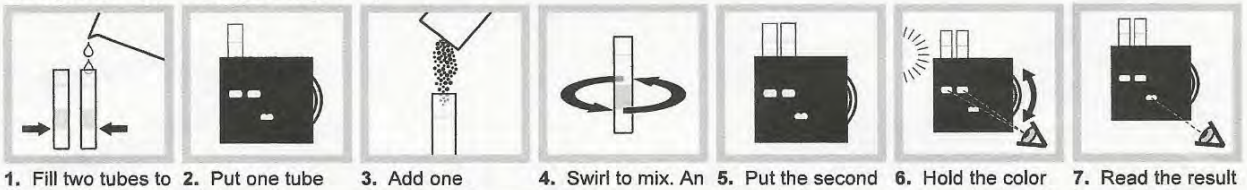

Collect Accurate Sample


Hold Pillow Vertically


Ensure Proper Lighting

- Put the color disc on the center pin in the color comparator box (numbers to the front).
- Use the indoor light color disc when the light source is fluorescent light. Use the outdoor light color disc when the light source is sunlight.
- Rinse the tubes with sample before the test. Rinse the tubes with deionized water after the test.
- If the color match is between two segments, use the value that is in the middle of the two segments.
- If the color disc becomes wet internally, pull apart the flat plastic sides to open the color disc. Remove the thin inner disc. Dry all parts with a soft cloth. Assemble when fully dry.
- Undissolved reagent does not influence test accuracy.
- To verify the test accuracy, use a standard solution as the sample.
- If the sample contains rust or precipitated iron, fully mix the sample and then fill the tubes. Wait 2–5 minutes after the reagent is added. Dissolved iron develops a color immediately.
- Samples that contain more than 4 mg/L iron can give low results. If high iron levels are possible, dilute the sample as follows. Use a 3-mL syringe to add 2.5 mL of sample to each tube. Dilute the sample to the 5-mL

Test procedure—Iron (0–4 mg/L Fe)



1. Fill two tubes to the first line (5 mL) with sample.

2. Put one tube into the left opening of the color comparator box.

3. Add one FerroVer Iron Reagent Powder Pillow to the second tube.

4. Swirl to mix. An orange color develops.

5. Put the second tube into the color comparator box.

6. Hold the color comparator box in front of a light source. Turn the color disc to find the color match.

7. Read the result in mg/L in the scale window.

Chemical Products and Approvals

Chemical products contain ingredients that control scaling, corrosion and oxygen pitting in boilers as well as ingredients to help reduce corrosion in condensate return lines. The use of these products must be approved and carry some restrictions when it comes to their use in food producing plants.

The Federal Regulations regarding the use of boiler treatment products are found in the Code of Federal Regulations. They cover products that are **G**enerally **R**egarded **A**s **S**afe (GRAS List) as well as those that can be used in food processing facilities that produce certified organic products.

The products provided by Rite Engineering and Manufacturing, BT 600S is approved for use in USDA inspected facilities. These products are in compliance with Title 21 of the Code of Federal Regulations §173.310, regarding boiler water additives coming in direct contact with food products.

In addition, boiler water treatments meet requirements for 3-A Accepted Practices for a Method of Producing Steam of Culinary Quality for food processing. Please ensure all products are used according to label instructions. Should you have any questions on your application please contact us.

Additional Definitions:

1. Certified Organic - Organic certification is a certification process for producers of organic food and other organic agricultural products. For purposes of boiler water treatment this means any product or products that are approved for use under the Code of Federal Regulations: Title 7: Agriculture PART 205—NATIONAL ORGANIC PROGRAM, Subpart G—Administrative §205.605 Nonagricultural (nonorganic) substances allowed as ingredients in or on processed products labeled as "organic" or "made with organic (specified ingredients or food group(s))." https://www.ecfr.gov/cgi-bin/text-idx?SID=6bf091edba50ee4dc7fdb724bf9d7867&mc=true&node=se7.3.205_1605&rgn=div8

2. GRAS - **G**enerally **R**egarded **A**s **S**afe is a United States Food and Drug Administration (FDA) designation that a chemical or substance added to food is considered safe by experts, and so is exempted from the usual Federal Food, Drug, and Cosmetic Act (FFDCA) food additive tolerance requirements. Some Boiler treatment products can be used in food processing plants that contain ingredients that may or may not have direct contact with food products. https://www.fda.gov/food/food-ingredients-packaging/generally-recognized-safe-gras

3. PMO - The Grade "A" Pasteurized Milk Ordinance (PMO) is a set of minimum standards and requirements that are established by the Food and Drug Administration (FDA) for regulating the production, processing and packaging of Grade A milk. https://www.fda.gov/media/114169/download

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