

## **Q&A Session for The Basics of Boiler Water Chemistry 10-19-16**

**Q: Is there a system to use low pressure steam now being vented or hot blowdown condensate.**

**A:** Absolutely. If the vented steam supply is from a continuous source, the steam can be piped to unit heaters, heat exchangers or the DA. These systems can also include a heat exchanger that takes the heat from the hot condensate, reclaiming much of it as preheat for whatever purpose before going to the condensate return line.

**Q: If we have condensate corrosion, what should we do about it?**

**A:** The first thing is to engage a reputable water treatment consultant. They will look at the system to determine where the cause is coming from, and then recommend the proper actions including a specific amine to be employed along with the proper injection point.

**Q: Can too much boiler chemicals cause foaming or carryover?**

**A:** Yes, it can. It will normally manifest itself as erratic sink and swell of the water level in the boiler and/or foaming as you describe. Of all chemicals fed to the boiler system, the overfeed of condensate treatment (amine) is most likely to cause foaming and carryover.

**Q: Is water treatment recommended for gas-fired domestic water heaters as well?**

**A:** No. These water heaters are for potable purposes. Normally the heaters are glass-lined or otherwise coated to mitigate corrosion and scale formation. They do need to be periodically (partially) drained to get rid of the scale at the bottom of the tank.

**Q: Wondering if you could touch on where the best place for piping soft water makeup. Our chemical rep continues to try and get us to pipe our SW to the DA because they say there's no way to get oxygen out of surge side.**

**A:** This may be a semantic issue, but I'm going to answer it as though you mean the surge tank is used for trapped condensate, and because of insufficient capacity in the DA tank, goes to this vessel. In this case, your water treatment professional is absolutely right. Adding (softened) makeup cold water to the hot surge tank will drive the oxygen out of the makeup water in the surge tank. The surge tank is not designed to separate and remove the oxygen; the deaerator is designed for this purpose.

**Q: How would you neutralize the PH level in a hot water boiler system?**

**A:** Neutralizing high pH in a hot water boiler system demands flushing water from the system. The other option is to add an organic acid, which is not normally a good option.

After flushing the high pH water, add additional inhibitor, which does not contain a strong alkaline buffer. Strong alkaline buffers include sodium hydroxide and borate.

**Q: What is the role of dealkalizers and what is their impact on the energy efficiency of boiler operation? Please also explain the term cycles of concentration.**

**A:** A dealkalizer is primarily used to remove alkalinity from the feed water as well as some other impurities. When removing much of the alkalinity, you are removing the carbonate and bi-carbonates in the feed water, which can lead to CO<sub>2</sub> generation and then the formation of carbonic acid attack in condensate return lines.

Sodium chloride dealkalizers will increase the conductivity of water going through the dealkalizing process by 10%. If conductivity is a limiting factor, demanding more blowdown, you need to be sure to take these factors into consideration.

Cycles of concentration refers to the maximum allowable conductivity level in the boiler's water, and how many times the total water content can be evaporated before this level is exceeded, requiring a surface blowdown. Each total evaporation within the boiler is considered a cycle. The more cycles before requiring a blowdown constitute energy saved.

**Q: We have a lot of return line corrosion. What can we do to minimize this?**

**A:** See Q&A above.

**Q: We mostly use hydrazine for oxygen scavenger rather than sulfites. Is that good? Also please elaborate phosphate hide out.**

**A:** Hydrazine is an effective oxygen scavenger that also volatilizes and affords some metal passivation. Hydrazine has proven to have CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA, Classified 2B (Possible for human) by IARC, Classified A2 (Suspected for human) by ACGIH, 2 (Reasonably anticipated) by NTP. It is a good oxygen scavenger, but it is not "good," and you might want to look at alternatives.

Phosphate hideout is a strange thing that sometimes occurs in high-pressure boilers, normally operating a coordinated phosphate program. Phosphate hideout is a circumstance when the phosphate in the boiler "disappears" or "reappears" due to flow or load considerations. It sometimes is dependent on startups and large variations in load; these variations result in more phosphate "disappearing," then "reappearing."

Maintaining good records of loads and chemical use will help minimize the overreactions to phosphate hideout, e.g. don't overreact when changes occur.

**Q: Can too much bottom blowdown cause stress to the boiler tubes?**

**A:** Only if you overly blow down the boiler, causing boiler tubes to be exposed under fire, and the low water cutoff fails to shut the burner off. Remember, the boiler only needs a short burst under pressure to affect the intent.

**Q: Is there any method for online cleaning the boiler if we have a scale problem? We have a continuous load and no time for shutdown.**

**A:** No, there is no sure-fire online cleaning that can be done.

1. You don't know the component deposits.
2. You cannot acid-clean the boiler while it is running.
3. If you do begin to chemically remove the scale in the boiler, it is not dissolving – it is peeling off, or delaminating. It will fall between the tubes in a firetube boiler or flow down the tubes in a watertube boiler, AND it must be removed mechanically. If not removed, it will build up and cause problems.

The boiler must have increased bottom blowdown, and it must be shut down and inspected and have the bottom cleaned out to prevent the cleaning process from being a bigger problem.

But sometimes, you can clean a boiler online over time by changing the water treatment program, increasing the OH in the boiler and the strength of the sludge conditioner. Without knowing the makeup of the deposits, choosing the best sludge conditioner is more difficult. Again, see above.

**Q: Is there a minimum OH alkalinity that should be maintained? Does higher OH alkalinity reduce the amount of sulfite needed?**

**A:** Minimum OH should be 200 in 200 psi boilers. OH will not directly affect sulfite demand.

**Q: What differences are there for hot water boilers vs. steam boilers regarding water treatments?**

**A:** Hot water heating systems are closed, and once treated, may not need any more added treatment. The chemicals employed are normally nitrite, molybdenum and organics. Problem is, these systems though "billed as closed" often incur unwanted entry of untreated makeup water due to leaks, over-pressure, etc. Therefore, it is very important that a water meter be installed in the water line leading to the heating system, and that it be routinely checked for possible dilution of the system and consequential corrosion and/or scaling.

**Q: How we can find the distribution ratio of amine, like morpho and other type of amines to be used?**

**A:** Your water treatment professional can help you to understand distribution ratios and neutralizing capacity in varying amines used to protect condensate systems.

**Q: If a customer has hard water entering the boiler and will not replace the softener, what are methods to take to prevent scale? Generally we increase blowdown and include a stronger dispersant. Are there other methods we should take?**

**A:** Replacing the water softener is far more cost-effective than providing chemicals and increasing blowdown. It is the responsible thing to do or recommend.

**Q: Un-neutralize or neutralize boiler water sample: which is better for testing?**

**A:** Testing un-neutralized boiler water includes the OH alkalinity in the boiler. This is "false" conductivity OH is desired. You can control based on un-neutralized conductivity, but you should consider this in setting up limits. I recommend neutralized conductivity for operator control; if more OH alkalinity is desirable, it might result in more unneeded blowdown.

**Q: If chlorides enter the boiler due to salt from the softener flowing into the boiler, what methods should you take to reduce the corrosivity of the water?**

**A:** If a water softener is passing chlorides into the feed water stream during normal operation, the water softener's resin bed is fouled or damaged as the chloride should be amassing on the beads along with the calcium and magnesium. The chloride should be going to drain during regeneration along with the hardness formers. This is known as cation exchange.

**Q: You mentioned the two most popular hot water piping systems today are primary/secondary and variable flow primary with variable flow primary only used with high mass-condensing boilers. Why?**

**A:** Variable flow primary system eliminates the primary loop entirely and its related pumps. A low mass-condensing boiler does not have the capacity to hold much thermal mass (sometimes only about 10 gallons of water per 1MM BTU/HR) and therefore, needs a circulating pump and most likely a buffer tank to provide the heat sink mass and flow to keep the boiler from steaming and/or going out on nuisance high-limit shutdowns. The high mass boiler has enough steel and liquid mass capacity to handle a no- to very low-flow caused by the VFD pumping, prohibiting these occurrences, saving fuel, electrical and installation costs.

**Q: You talk a lot about getting rid of oxygen in the boiler water. Where does it come from?**

**A:** Actually several places. First from sucking air in due to leaking pumps, traps, vacuum systems and vented receivers. Then there's inefficient DA systems, and also from cold water intrusion due to leaking pump seals, heat exchangers and wasting condensate. These are all area checkpoints that need to be included in your regular maintenance SOPs.

Dissolved oxygen in water can be tested pretty easily.