

FAQ

How Does Water Quality Affect My Water Heater?

Question: What substances affect the water quality of my domestic water system?

Answer: Most water quality issues derive from hard water scale, chlorides, and free chlorine. Ultrapure water can also harm domestic water systems.

Q: What is scale?

A: Scale is solid substance, most commonly calcium carbonate, that can form on surfaces in a domestic water system. Scale deposits can commonly be seen on fixture outlets, such as shower heads and faucets.

Q: What causes scale to form?

A: Heating water also provides heat for the chemical reaction that forms calcium carbonate. Additionally, calcium carbonate is less soluble in hot water. Therefore, as water gets heated, calcium carbonate may crystallize and attach to surfaces. Scale is also more likely to form in water that is basic (has a high pH).

Q: What issues are caused by scale?

A: Scale restricts the heat exchanger's ability to transfer heat to the domestic water, lowering heater efficiency. Also, the domestic water cannot cool the heat transfer material, which can overheat. Excessive scale can cause damage to the heat exchanger.

Q: How do you prevent scale formation?

A: Heat exchangers should be routinely examined and cleaned to prevent excessive scale buildup. There are also several proactive methods to treat scale. One method is to use OneFlow[®], which forces scale to form as microcrystals upstream of the heat exchanger. Since the scale has already formed, it will not attach or "bake" to the heat exchanger surface. These microcrystals are small enough to harmlessly flow through the system and out fixtures. Other methods include installing an ion exchange softening tank or orthophosphate water treatment.

Q: What are chloride ions?

A: Chloride ions are single-atom ions that naturally occur when salts, such as calcium chloride (used to salt roads), dissolve into water. Chloride concentrations in domestic water is location dependent.

Q: What issues are caused by chlorides?

A: Since chlorides are extremely small, they are able to pass through any heat exchanger's passivated or protective layer and cause defects in the metal. Over time, high levels of chlorides can significantly weaken the material and lead to mechanical failure by stress corrosion cracking (SCC).

Q: How can you prevent high chloride levels?

A: The most reliable way to treat chlorides is to use a reverse osmosis (RO) filtration system. RO systems must be carefully sized, since ultrapure water can also damage heat exchangers and piping.

Q: What is free chlorine?

A: Free chlorine, or hypochlorite, is a negatively charged molecule containing oxygen and chlorine. Domestic water systems are often treated with free chlorine in order to kill harmful bacteria such as legionella. Although free chlorine is antibacterial, it is also corrosive to heat exchangers. Chloramine is a popular alternative, but is even more aggressive than free chlorine.

Q: How can you prevent high levels of free chlorine?

A: Carbon block filters can be installed to decrease levels of free chlorine. Also, when dosing domestic water, free chlorine levels should be carefully monitored.

Q: How does hard water scale, chlorides, and free chlorine affect each other?

A: High levels of hardness can trap chlorides between the scale and the heat exchanger surface, increasing the rate at which chlorides weakens the heat exchanger. Free chlorine will also accelerate the effects of chlorides.

Q: What is ultrapure water?

A: Ultrapure water is purified water with an extremely low electrolytic conductivity. It is created by running natural water through a filtration process, such as reverse osmosis, where all minerals and contaminants are removed. It is commonly used in pharmaceutical, semiconductor, and nuclear applications.

Q: What issues are caused by ultrapure water?

A: Ultrapure water does not have dissolved solids, which prevent water from stealing ions from metallic system piping and components. Therefore, ultrapure water can cause corrosion in a domestic water system.

Q: How do you prevent damage from ultrapure water?

A: Mixing ultrapure water with unfiltered supply water will reintroduce dissolved solids to the system and prevent corrosion.



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