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■ HVAC Controls   ■ Electric Actuators   ■ Actuated Valves  
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## The Universal Solvent: How water quality affects your humidifier

When feeding your humidification system, whether it's isothermal or adiabatic, it is important to consider the impact the natural features of Hard, Soft and purified water types, such as RO, DI, and Ultrapure will have on your system.

### Water Types

*Hard water* is water that naturally contains a considerable amount of dissolved minerals, mainly calcium and magnesium. Rainwater, for example, is naturally soft – i.e., very low in dissolved minerals. However, as it makes its way down a mountain to a basin, running along rocks, through sediment and soil, it leeches minerals along the way thereby changing its composition. The kind of rock found in the area will determine the hardness of the water.

*Soft water* is water that is appreciably low in dissolved ions like calcium, magnesium, and iron and will be found in areas where the rock is impervious or calcium poor.

Purified waters have been mechanically processed to be free from various impurities, based on the required application.

*Deionized water*, as its name would suggest, has had all mineral ions removed;

*Reverse Osmosis* refers to a process that uses a combination of pressure and a semi-permeable membrane to remove ions, molecules and larger particles from water and;

*Ultrapure water* is completely devoid of dissolved gases, particulate matter, and ions and is achieved through an extremely stringent, three-stage process.

### Feed Water Classification:

Water types according to hardness (Hardness expressed as mg/L CaCO<sub>3</sub>)

- 0-60: very little hardness (naturally soft)
- 61-120: moderately hard
- 121 – 180: hard
- >180: very hard

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## Issues with Hard Water

Scale can be a problematic by-product of hard water in both isothermal and adiabatic humidification systems. While a small amount of scale can be beneficial to a stainless steel tank acting as a “second skin” helping to prevent corrosion, a disproportionate accumulation can:

- initiate frequent energy intensive drain cycles that will prevent the humidifier from either reaching or sustaining setpoint
- cause irreparable damage resulting in the replacement of heating elements, media or a corroded tank
- increase frequency of maintenance as a result of reduced overall performance.

This is hard on the system and substantially reduces efficiency.



*Fig. A – Hard water scale buildup on the inside of a pipe*

In the case of adiabatic humidifiers, scale will form directly on the media causing permanent damage, resulting in increased frequency of media replacements or cleaning. This can be avoided by using treated water or keeping it wet to prevent scale.

Neptronic isothermal humidifiers employ a scheduled, periodic drain and flush cycle to reduce scale buildup. RO or DI water is required for our atomizing humidifier to avoid damage such as mineral snow or clogged atomizers.

## Issues with Soft Water

In the case of soft water, foaming can occur as a consequence of the low concentration of sodium ions lowering the surface tension.

Foaming is problematic for isothermal humidifiers due to a variety of reasons:

- the potential for liquids to migrate into the AHU
- with this migration, the dissolved solids will accumulate in the manifold, duct or AHU
- In some humidification systems, level sensors will be activated more frequently, initiating drain cycles unnecessarily – this constant skimming and draining is inefficient resulting in water waste and potential pressure anomalies in the steam hose or duct. Neptronic humidifiers do not have this issue due to our designated AFEC technology.

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Fig. B – Soft water causes foaming in an evaporation chamber

Neptronic’s patented Anti-Foaming Energy Conservation (AFEC) technology drains the water only when surface foam is detected. The benefits of this system are evident in increased energy efficiency and safety levels and in reduced maintenance and cost.

Neptronic humidifiers are designed to accommodate a variety of water-specific challenges to achieve high quality and low maintenance.

Humidifier type	Water types recommended
<b>Isothermal:</b> SK300, SKE, SKE4, SKS, SKG	Tap; RO*, DI/Ultrapure**
SKR	Tap water <u>only</u>
<b>Adiabatic:</b> SKH	RO & Ultrapure <u>only</u>
<b>Adiabatic media</b> SKV	Tap; RO; Softened

\*RO treatment recommended when hard water exceeds 180ppm

\*\*DI/Ultrapure requires nickel plated tank & heating elements

For more information on the effects of hard and soft water on humidification systems, follow the sources links to our webinar series hosted by our resident water specialist, Josiah Strauss.

Sources:

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