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Head Office
Neptronic[®]
400 Lebeau Blvd.
Montreal, Quebec, Canada H4N 1R6
Tel.: (514) 333-1433
Fax: (514) 333-3163
Toll Free: 1-800-361-2308

Resistive vs. Electrode Humidifiers Weighing the Pros and Cons

When selecting an electric steam humidifier for either a residential or commercial/industrial application, one of the first choices you are likely to face will be whether to opt for a *resistive* or *electrode* humidifier. Each type is notably different in 3 main categories of efficient steam production:

- Heating water in order to produce the desired steam;
- Controlling steam output, and
- Maintenance requirements

In part one of this article, we will begin the exploration of these differences with a brief overview and quick explanation of controlling steam output of electrode and resistive steam humidifiers.

Principles of Operation:

Electrode steam humidifiers bring water to a boiling point by passing an alternating current between electrodes within a disposable plastic cylinder (the defining feature) utilizing the ions dissolved in the water as the means of conduction. Potable water (which contains dissolved ions) will conduct electricity between the electrodes with substantial resistance, it will heat the water until the boiling point is reached and steam is produced. The capacity of the unit will depend on the size of the cylinder (volume of water), the surface area of the electrodes in contact with the water and the rated voltage and kW of the humidifier. A current transformer is used to monitor the current draw of the electrodes. It is the means of controlling the steam output which is accomplished by raising or lowering the water level inside the cylinder. As the cylinder fills with water, more of the electrode surfaces will be immersed allowing more current to pass between them thereby increasing the power consumed and total steam output. Reduction of steam output will occur by lowering the water level.

USA
NEP Inc.
P.O. Box 1151
Medford, Oregon
USA 97501
Tel.: (541) 531-5746

Middle East and Asia
NEP International FZE
P.O. Box 125687
Dubai, UAE
Tel.: +97155 8825487
Fax: +9714 3426772

Singapore
Neptronic Pte Ltd
Office D6, #03-38
Mountbatten Square
229 Mountbatten Road,
Singapore - 398 007
Mobile: +65 8118 4184
Tel.: (514) +65 6650 6212
Fax: (514) +65 6491 6423

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Mitigation of lime/scale:

Steam generated in an electrode cylinder is pure water (H₂O). This means that all the ions from the supply water remain in the tank in the form of scale. The resulting build-up can be mitigated by flushing the cylinder periodically, however, over time the scale will accumulate to a point where the electrodes are coated and unable to generate the capacity required. The plastic tank will then have to be removed and discarded and, a new tank acquired and installed.



Resistive electric humidifiers use electric, self-cleaning, immersion heating elements to raise the temperature of the water to the boiling point within a permanent stainless steel evaporation chamber. Each of these immersion heaters has a specific power rating (KW) at a specific voltage. This radiant heating will raise the temperature of the water within the evaporation chamber to the boiling point, independent of the ion content of the water, thus permitting equal performance in purified (de-ionized or reverse osmosis) water *or* potable water. The capacity of steam generated is controlled by switching power over time to the resistive elements. This is accomplished in most cases with SSRs (solid state relays) with integrated zero voltage crossing (SCR control).

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In potable water installations, the build-up of ions (scale) within the tank is mitigated with frequent flush cycles. Although the output of the humidifier will not be affected by the build-up of scale, the evaporation chamber will have to be removed and cleaned periodically. In pure water applications, these drain cycles may be greatly reduced or eliminated depending on the purity of the water, effectively increasing the efficiency of the humidifier and reducing the service required.



In next month's article, we will look at the total cost of ownership and the pros and cons of each on a per-application-basis.



David Wong
Technical Support - Humidifiers

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USA 97501
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About Neptronic

Founded in 1976, Neptronic is a private corporation that designs, manufactures and distributes products for the HVAC industry. The Neptronic product line includes intelligent controllers, electronic actuators, actuated valves, humidifiers and electric duct heaters.

Products are designed and manufactured by over 200 dedicated employees in an 80,000 ft² (7,500 m²) state-of-the-art facility located in Montreal, Canada. Using a vertically integrated plant model, all R&D and manufacturing capabilities are located under one roof; from software and hardware development, to SMT circuit board assembly, to sheet metal fabrication, to product testing.

Neptronic is committed to research and development, provides innovative products and technologies and exports over 75% of its sales through an exclusive distribution network for the HVAC industry worldwide

For more information visit the Neptronic website at neptronic.com

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