



**Conventional challenges...**  
**Environmentally sound opportunities!**

## **eH<sub>2</sub>O History**

eH<sub>2</sub>O, LLC was developed in 1999 by two Ph. D. chemists from the University of Michigan and a metallurgist/materials scientist and engineer. With their combined knowledge, they quickly validated the precipitation process of this unique pulse powered water treatment. While demonstrating this precipitation in the laboratory, and comparing this treatment with the other non chemical systems, the eH<sub>2</sub>O treatment showed superior performance. Since 1999, all eH<sub>2</sub>O systems have been manufactured with not only pulse powered treatment, but with UV sterilization, filtration, and corrosion monitoring. In the 9 years of using this water treatment, eH<sub>2</sub>O has made dramatic advances in using all of these components as a complete water treatment system.

## **-----eH<sub>2</sub>O Advantages-----**

### **SaniTron UV Sterilization**

Not only did eH<sub>2</sub>O scientists discover that UV assisted the pulse powered water treatment with microbiological control, it was also discovered that UV destroys harmful chemicals in water. One chemical in particular that was of interest to eH<sub>2</sub>O's scientists was phthalate, and it was shown that the UV did breakdown this toxin discovered at eH<sub>2</sub>O's lab in 1999. Today, UV is widely accepted as an environmental toxin removal system.

### **Tri-Tron Pulse Powered Water Treatment**

Tri-Tron is different from all other non chemical water treatments since it is a direct pulse powered system. It also is the only system that uses a microprocessor to display the quantity of treatment that is being applied. It is important to understand that the design of this system is tailored for easy maintenance whereas other systems only claim to be maintenance free. It must be understood that a treatment area is where the precipitation process takes place and cooling towers will naturally accumulate organics and minerals on this area. In fact, the precipitation minerals themselves can impede

the performance of this treatment area. The treatment area must be free from deposits for consistent functionality, and eH<sub>2</sub>O's system has this quality control method by measuring its performance. Since Tri-Tron treatment measures the quantity of treatment, the owner will know if maintenance is to be performed before the water treatment is impeded. This offers statistical process control and is exactly why eH<sub>2</sub>O has systems still operating for 9 years on cooling towers. When cleaning is required, it normally is a 10 minute procedure.

### **MegaTron Controller**

This controller offers data accumulation on and off site to measure pH, conductivity, ORP, and water usage.



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## **Filtration**

eH<sub>2</sub>O started with filtration in 1999 and has been continuously improving and perfecting its use. In 2000, centrifugal separation with filtration was researched. In 2002, research began on media filtration improvement. In 2004, eH<sub>2</sub>O perfected a proprietary mixed bed filter media designed especially for non chemical water treatment use.

## **eH<sub>2</sub>O System Rack**

The eH<sub>2</sub>O water treatment is sidestream and operates off of the existing process pumps exactly as a chemical water treatment system. The advantages are that it is not mainstream like other pulse powered systems and does not require a separate pump to deliver an exact volume for hyperkinetic water treatment that flow water streams into each other using conical nozzles. In comparison to hyperkinetic systems, eH<sub>2</sub>O's system is silent with no moving parts, and designed to last for 20 years or longer.

## **eH<sub>2</sub>O Major Accomplishments over Competition**

- **Zero bleed water treatment for 9 years**

- **Drinking water standards for microbiological**

- **Extreme Biofilm remediation**

- **Provisional Patent consisting of:** Condenser cleaning. UV discharge for secondary use. Complete photovoltaic off grid water treatment system. Residual water treatment.

- **Chloride removal.** Chlorides which are a higher content than silica at Florence and Platte South water plants can be extremely detrimental with certain process water systems at high concentrations. The current water softening process may introduce additional chlorides into the tower water.

### **-----Omaha Nebraska example -----**

Omaha water chemistry is tailored for eH<sub>2</sub>O water treatment. Silica has been a concern with the customer since the water softening is removing the calcium and magnesium while elevating the pH. Lee Comb states: "Softening offers two advantages, The pH can be elevated, and (it is believed) that the potential for silica precipitation in the concentrate stream is minimized because of the absence of calcium, magnesium, that could serve as precipitation nuclei." *Lee Comb is vice president for business development for Osmonics Inc., Minnetonka, MN.*

Tri-Tron treatment has been proven to be very effective for removing calcium and magnesium and it elevates the pH with its electrochemical process. It is a precipitation



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softening method creating a calcium and magnesium precipitate just like the other non chemical treatment devices; but it precipitates abundantly more as demonstrated with zero bleed systems running at low conductivities. It is the intention to use a proprietary filtration with proper Tri-Tron treatment to ensure this removal; to mimic the same results as the water softening. It is also important to note: A. Szkatula, M. Balanda, M. Kopec: **Magnetic treatment of industrial water. Silica activation** *European Physical Journal - Applied Physics* 18 41-49 2002

Their studies suggest that when silica is present in the water, it forms colloidal particles whose electric double layer, when distorted by an external magnetic field, tends to adsorb calcium and magnesium ions, thus inhibiting their precipitation on heat exchanger surfaces. Once formed, these adsorption complexes can remain intact for some time, thus explaining the "memory" effect that has been noted before.

eH<sub>2</sub>O has never encountered silica scale accumulation with its water treatment.

**Omaha Water Chemistry**

Mineral analysis (averages for 2007)		Platte South		
	Unit	Florence Plant	Plant	Peaking Wells
pH (in pH units)		8.72	8.79	7.20
Alkalinity (total) as CaCO <sub>3</sub>	ppm	94	140	264
Aluminum	ppm	0.24	<0.03	<0.03
Calcium	ppm	49	46	90
Chloride	ppm	23	41	8.6
Color (in cobalt platinum units)	ppm	1	4	1
Dissolved Solids (total, calculated)	ppm	457	411	574
Hardness (total) as CaCO <sub>3</sub>	grains per gallon	12	10	17
Iron	ppm	<0.02	<0.02	0.03
Magnesium	ppm	18	12	20
Manganese	ppm	<0.002	<0.002	<0.02
Phosphate	ppm	0.05	0.46	0.56
Silica	ppm	9.9	25.4	32.1
Spec. Conductance (@ 25 Deg.C.)	umhos	644	526	560
Temperature	degrees Celsius	14.6	16.1	—
Zinc	ppm	<0.002	<0.002	<0.01



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**Existing eH<sub>2</sub>O Comparison Customers (location and annual run time)**

**Design Plastics - Zero blowdown discharge.**

3550 Keystone Drive  
Omaha, Nebraska  
System Purchased: October 2005  
Season: Year round  
Satisfaction: Very Satisfied

System conductivity on July 8, 2008. 841 microsiemens conductivity. Auto blowdown set point 1500 microsiemens conductivity. Discharge bandwidth 100 microsiemens conductivity.

*Nathan Davis – Maintenance Manager* “System is performing great.” “Water is crystal clear.” As compared to chemical treatment: “we are not sending samples off to adjust chemicals.” “Paying attention to it; it is much less with eH<sub>2</sub>O.” “In the past, we had seen days with shutting down a machine (plastic injection molding) because the tower could not keep up.” “Maintenance people have been up by the tower a lot, no issues reported.”

**JMS Manufacturing - Zero Blowdown discharge in winter\***

8805 Vernon Avenue  
Omaha, Nebraska  
System Purchased: October 2006  
Season: Year Round  
Satisfaction: Very Satisfied

System conductivity on July 8, 2008. 3141 microsiemens conductivity. Auto blowdown set point 3400 microsiemens conductivity. Discharge bandwidth 100 microsiemens conductivity.

Winter Conductivity: 2400 microsiemens conductivity. Auto blowdown set point 3400. Discharge bandwidth 100 microsiemens conductivity.

**\*Note: Tower is severely undersized for load.**

Steve Kempkes – General Manager “The system cleaned up our water.” “Our corrosion rate that we used to see with chemical treatment has been cut down 75%.” “95% increase in thermal transfer in heat exchangers. Delta T has been greatly improved.” “Used to core out all of the heat exchangers, tubes are now clean.” “Not having to put in chemicals is a big plus. When you had chemically treated water and someone replaced a hose, (plastic injection mold tooling) you had a concern. We now have a piece of mind that it is just water.”



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### **Summary**

With the success of eH<sub>2</sub>O water treatment as a whole, along with the success of current users of eH<sub>2</sub>O water treatment in Omaha, (one for 2 years 10 months, and the other for nearly two years) it is evident that eH<sub>2</sub>O water treatment performs remarkably well with this water. Since both customers are enjoying zero bleed while one is undersized on their cooling tower, it can be stated that any other cooling tower in Omaha can enjoy an eH<sub>2</sub>O zero bleed water treatment system without the use of chemicals or water softening.

eH<sub>2</sub>O, LLC

Robert R. Peterson  
Metallurgist/Material Scientist