

# Electro-Chemical UET Water Treatment System Achieves Sustainability Objectives for Scottsdale Fashion Square Mall.

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May 11, 2018



Owned by Macerich (NYSE:MAC), Scottsdale Fashion Square is the largest and most upscale shopping center in Arizona. It's also recognized as one of the most-visited destinations in the state. Scottsdale Fashion Square is sharply focused on integrating sustainability in its operations as part of its long-term, fully-integrated business model., as are all of the fifty-five Macerich malls located in fifteen states, coast to coast.

## The Macerich commitment to Saving water

The Macerich commitment to saving water led them to search for an innovative but proven technology that not only reduces water use, but also, eliminates chemical use and decreases costs. The cooling towers utilized in the mall's HVAC systems were the single largest user of water, so they were scrutinized in great detail, thus, prompting the discovery of a new system.

The new system utilizes Dynamic Water's UET electro-chemical reactors to speed the process of scaling within the controlled environment of tubular reactors on a basin side loop, rather than in their process piping. The controller continuously adjusts the electrolysis by examining 42 parameters every 6 milliseconds. It then sends an electric current from an anode to the cathode using the water as a medium. The DC process spurs electrolysis in the water, separating H+ and OH+ ions from their counterparts, achieving equilibrium while retaining the minerals required to maintain proper PH balance. The rapidly formed scale is soft and easy to clean out of the reactor chamber. The water leaving the reactors is in balance and no longer seeks to deposit scale in the tower or process piping and chiller.

**SCOPE:**

The purpose of this report is to show Dynamic Water's UET Reactor's efficacy as a water treatment alternative to traditional chemical treatment in Scottsdale Fashion Square. The study will take the existing site using the UET system and quantify efficacy using the following:

- Before and After Photos showing progress
- Water usage before and after UET treatment
- Corrosion control during UET treatment
- Approach Temperature during UET treatment

**Scottsdale Fashion Square Results**

**Cooling System:** 4x BAC 3985C-2 Cooling Towers @ 985 nominal tons each  
3,940 total tons of refrigeration

**UET System:** (4) 4x4 UET Reactor Systems

**UET Service Start Date:** August 21<sup>st</sup>, 2017

**Results**

**Water Savings Metrics:**

	Before UET	After UET
Cycles	3.5	6.5
Conductivity Bleed/Setpoint (µS/cm)	3,500	6,500
Annual Water Usage (gallons)	9,976,000	7,854,000 (21% savings)
Annual Blowdown (gallons) - ESTIMATE	2,850,000 (estimate)	1,208,000 (57% savings)

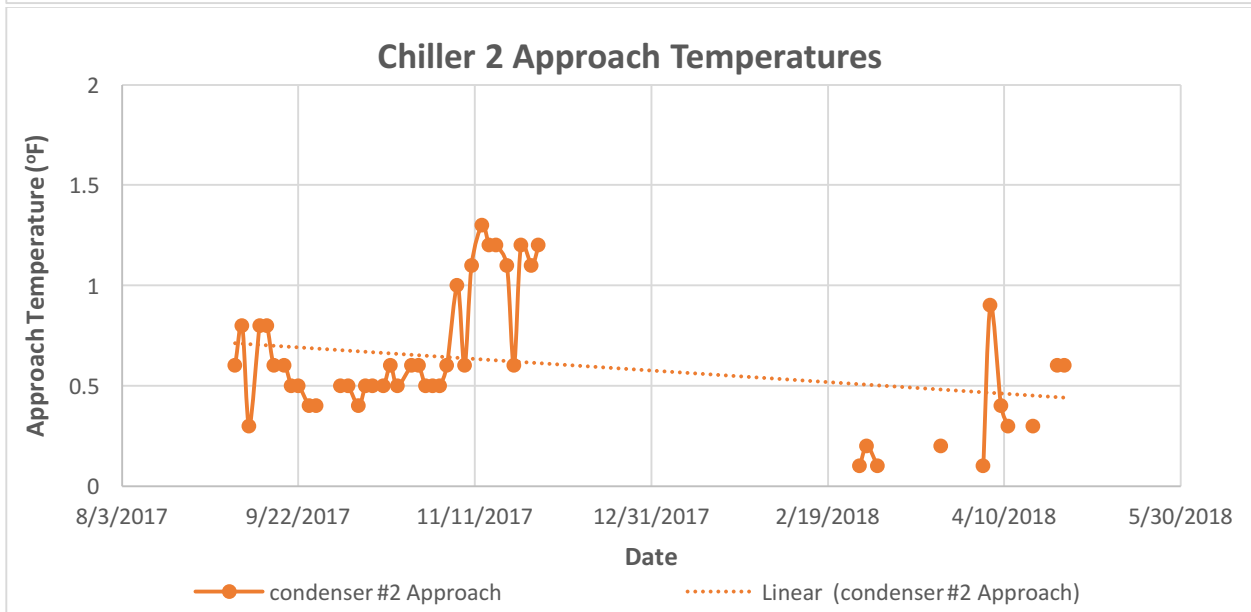
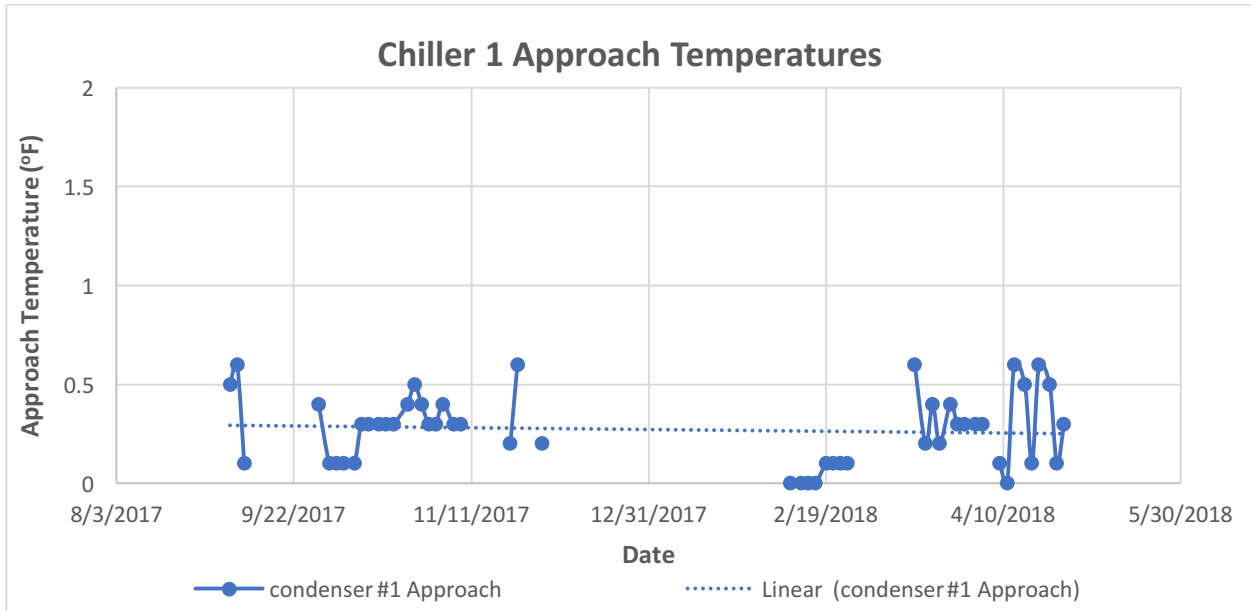
Makeup conductivity is roughly 1,000 µS/cm

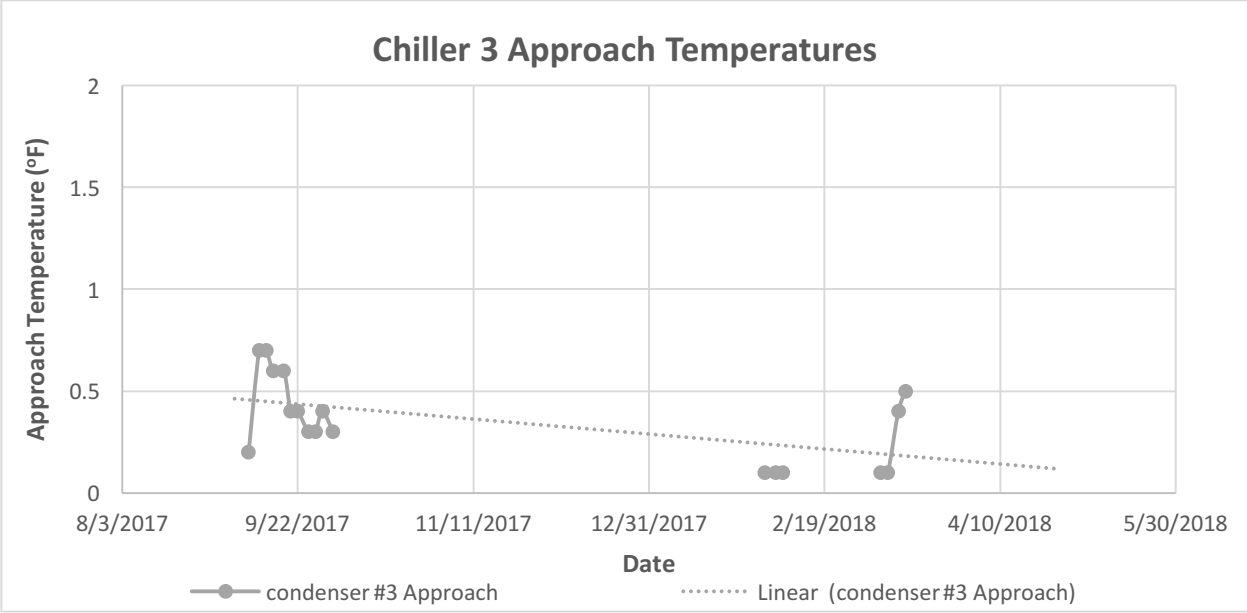
**How UET Achieved the Macerich Goals**

The UET process is a well-established technology which works with any water composition to restore water to its natural balance without adding chemicals by applying continuous partial electrolysis.

### Cooling System Efficiency:

No appreciable change in approach temperatures. All approach temperatures are trending down over time, pointing to signs of scale removal within the chiller.

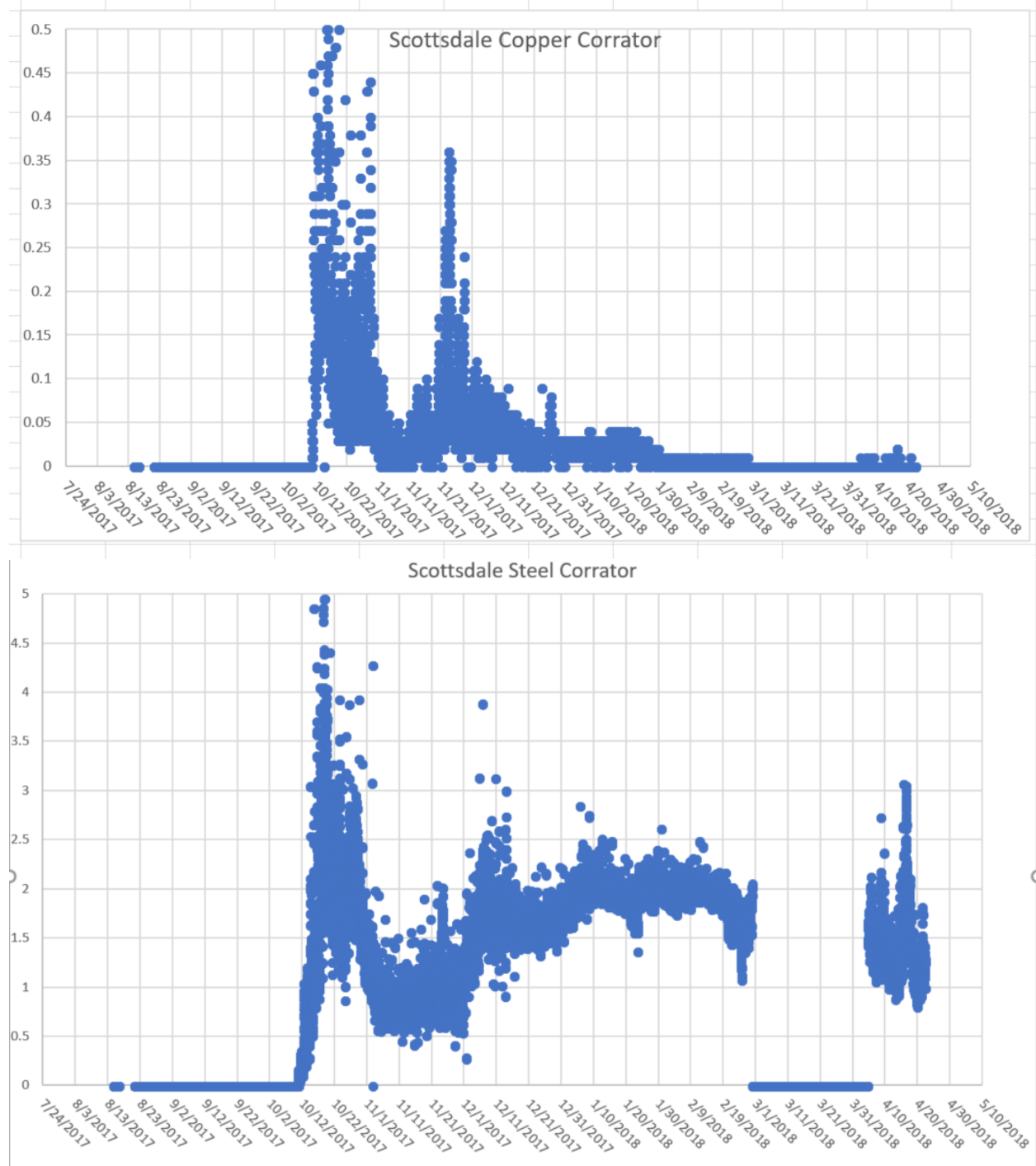




**AFTER UET (November 11 2017):**

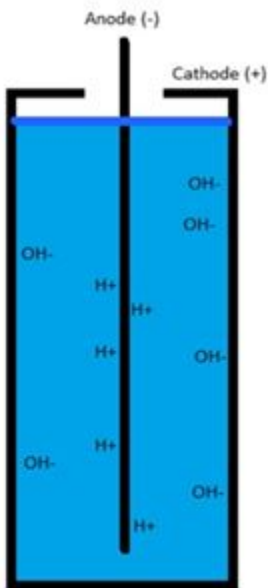


**CORRATOR RESULTS:**

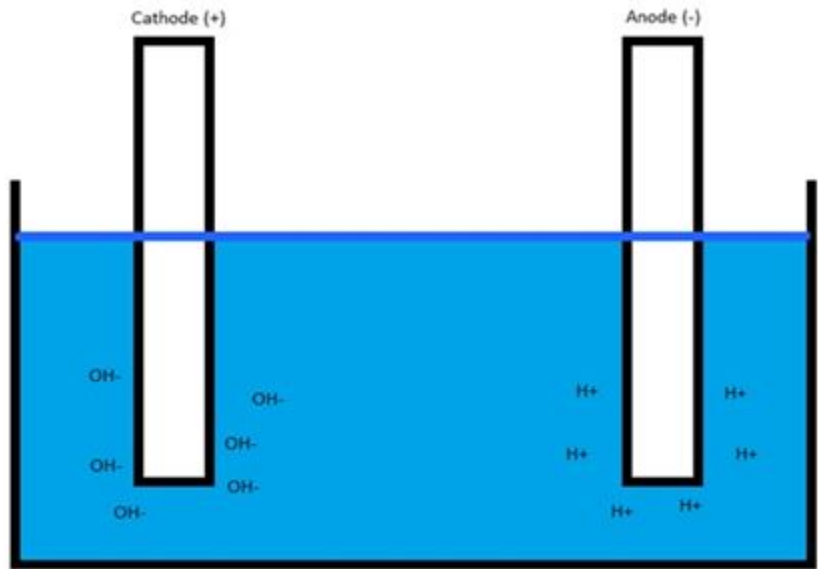


Corrator results show copper and mild steel corrosion well within acceptable range.

## The Science behind UET

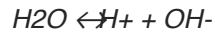


UET Representation

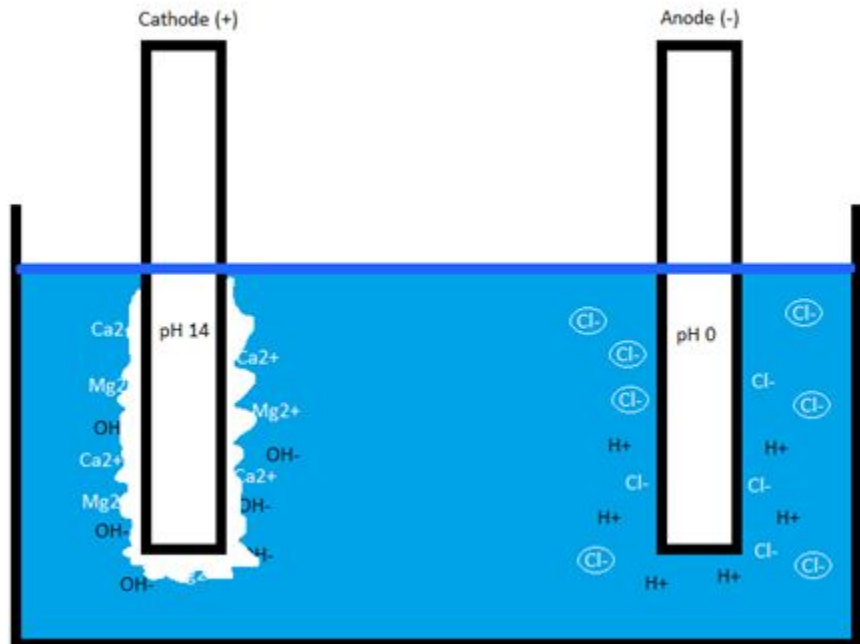
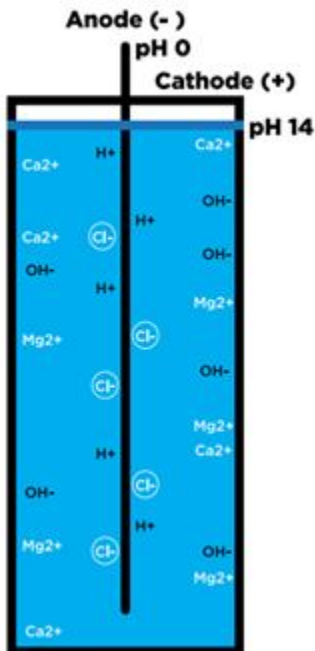


Electrodes in Water Representation

UET uses Partial Electrolysis to create pH gradient

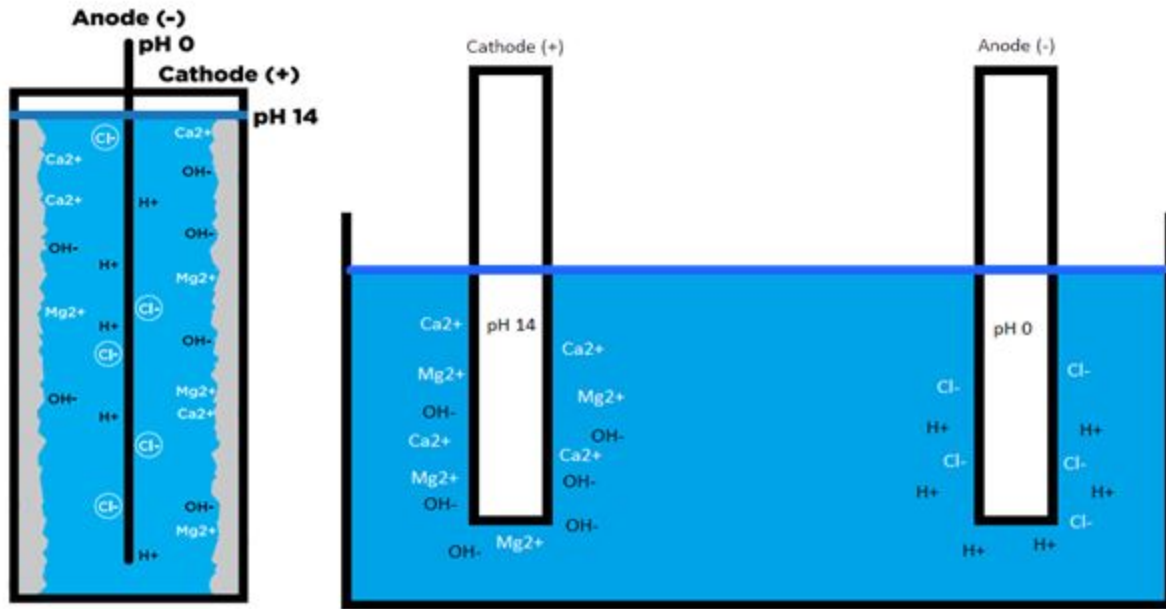


Anode has a pH of 0, Cathode has pH of 14



Due to pH gradient, ions begin aggregating in order to balance the water.

Cathode has aggregation of positive ions (calcium, magnesium). Anode has aggregation of negative ions (chlorides).



Excess calcium, silica and magnesium precipitate with carbonate and forms onto the cathode wall (scale control). Chlorides in water become activated to form HOCl and Chlorine (biocide). Water has saturated, stable Ca<sup>2+</sup> and Mg<sup>2+</sup> which acts as a corrosion inhibitor. pH of 9 is far from corrosive index (corrosion control)

## Scale, Corrosion and Bio-Contamination



Scale, corrosion, and bio-contamination are the cause of major problems with commercial and industrial process water systems. Inefficient heat transfer, plugging, and outright failure happen all the time. Treatment of all three must be simultaneous to achieve and maintain effective water treatment.

UET simultaneously controls all three problems:

**SCALE:** The unstable minerals are precipitated within the wall of the reactor, keeping it out of the system.

**CORROSION:** Stable calcium and magnesium ions are left in an aqueous state while the pH is balanced around 9. The water is well within the scale forming region, thus preventing corrosion.

**BIO-CONTAMINATION:** The UET provides continuous halogenation and is able to raise or lower chlorine level.

## Why Traditional Treatment Fails

Chemical treatment does not have an answer for changes in makeup water composition.

Many chemical treatments can go awry, oscillating between scale forming and corrosion while blooming dangerous amounts of bio-contamination.

Chemical treatment does not have an answer for silica. Typically chemical treatment programs will not go above 150 ppm silica.

## Why Dynamic Water Technology Succeeded

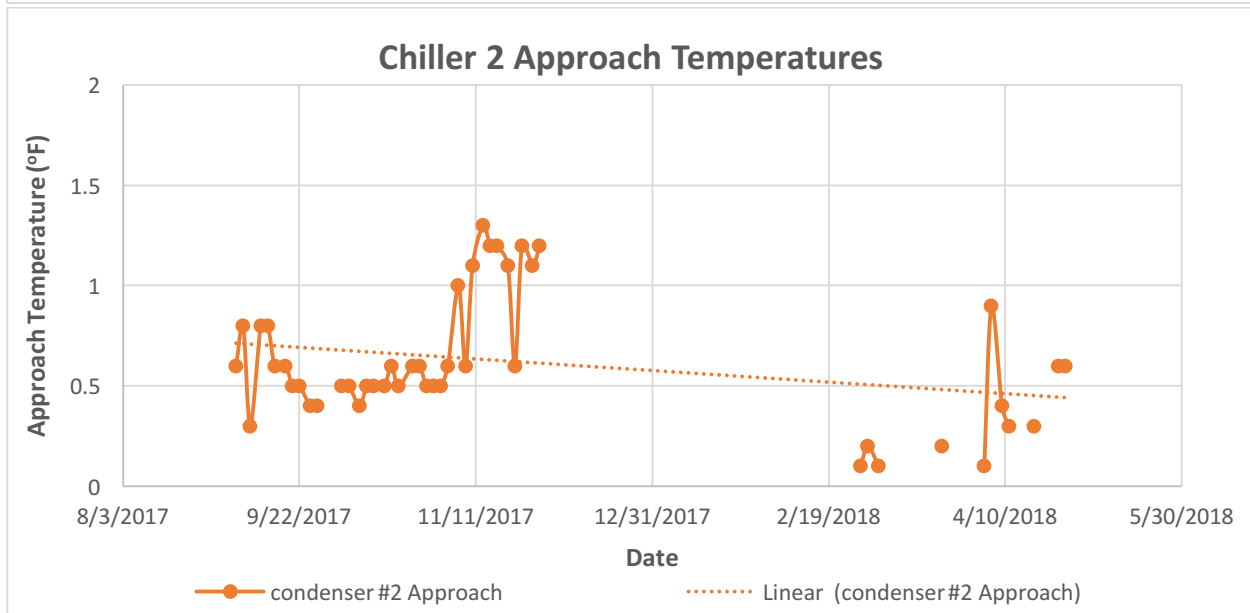
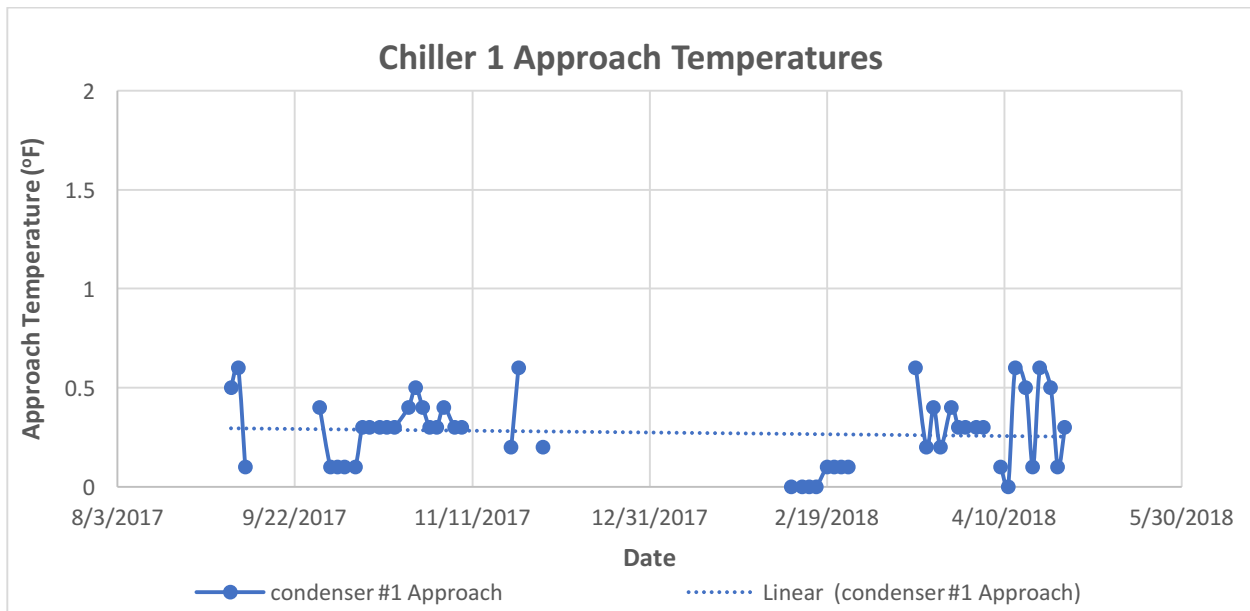
UET is a patented technology that utilizes controlled electrolysis to manage scaling, corrosion and bio-contamination instead of chemicals. The system speeds the process of scaling within the controlled environment of tubular reactors on a basin side loop, rather than in the process piping.

The controller continuously adjusts the electrolysis. It then sends an electric current from an anode to the cathode using the water as a medium. The DC process spurs partial electrolysis in the water, splitting H<sup>+</sup> and OH<sup>-</sup> ions. The rapidly formed scale is soft and easy to clean out of the reactor chamber. The water leaving the reactors is in balance and no longer seeks to deposit scale in the tower or process piping and chiller.

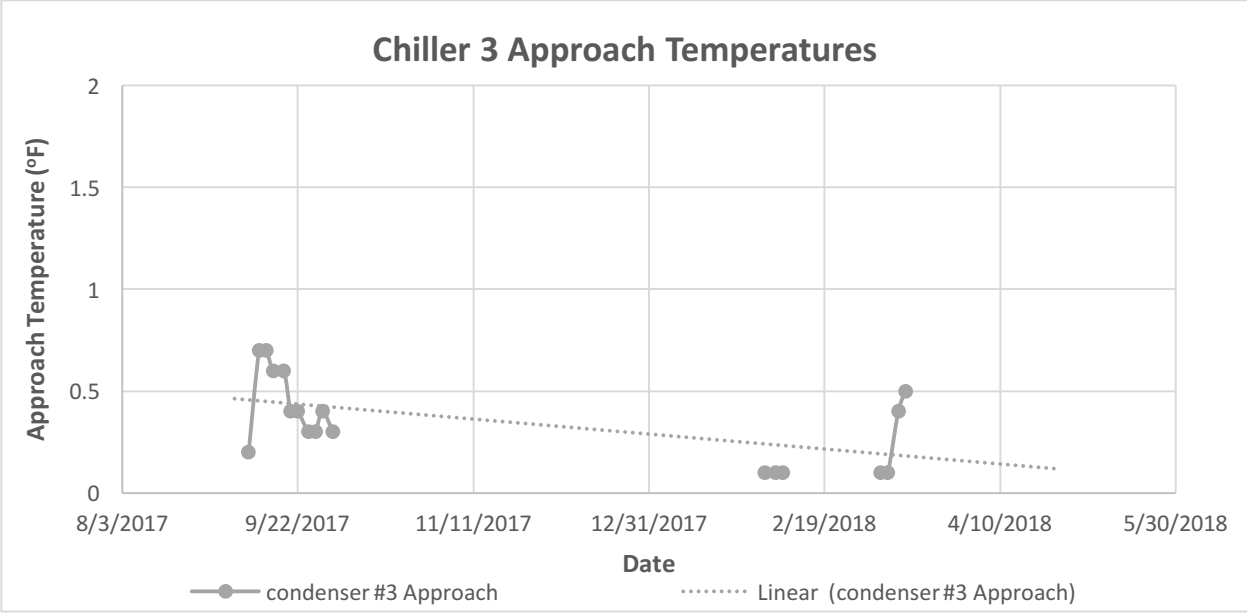
The reactor also generates measurable chlorine, despite not adding any chemicals. The biocide level is adjustable and disinfects the process water, killing algae and bacteria, including the pathogenic legionella.

### Cooling System Efficiency:

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**AFTER UET (November 11 2017):**

