

Client:

Pinal Energy, located in Maricopa, AZ, is the first ethanol production facility in Arizona. Beginning production in 2008, the plan provides a local source of ethanol available at a rate of 50 million gallons from roughly 18 million bushels of grain acquired from local producers and from the Midwest. As a zero liquid discharge facility, everything at the site is recycled. The CO₂ is even captured and recycled for soft drink, dry ice, and hydroponics. The Dynamic Water UET was installed in February of 2018.



Cooling Tower:

Site Built 25,000 gpm recirculation Cooling Tower
Stainless Steel Heat Exchangers

Dynamic Water Treatment:

8x 4x4 UET Reactors
Post-Treatment Softener
Calcium Chloride brine injection
Sodium Hypochlorite biocide injection

Objective:

The client was trying to find an alternative method to water treatment for their cooling tower. Their legacy chemical regimen consisted of:

- Sodium Hypochlorite
- Sulfuric Acid
- Sodium Chlorite
- PhosZero Corrosion Inhibitor

The site feeds pre-treated softened water into the cooling tower. Pre-treatment includes nitrate removal and complete removal of any hardness (<10 ppm total hardness).

After the cooling process, blowdown water is then rerouted to the system. Pre-treatment is necessary for this purpose.

Pinal Energy had been unsuccessful with previous biocide treatment, and had to occasionally dose the tower with hydrogen peroxide in order to oxidize the water to clean levels. Due to the high pH nature of the tower and water, Chlorine Dioxide (ClO₂) was the only thing that was proven effective. However, the constituents needed to make ClO₂ were costly, consisting of sulfuric acid, sodium chlorite, and sodium hypochlorite.

In that effort, Pinal Energy turned to Dynamic Water Technologies (DWT) for a more cost effective solution to treating cooling water without the use of expensive ClO₂ treatment or PhosZero corrosion inhibitor.



Dynamic Water's Treatment Program:

Bio-Control:

- Sodium Hypochlorite, also known as bleach, is cheap and effective in acidic pHs. However, it is largely ineffective at higher pHs common in cooling tower water.
- The Dynamic Water UET reactor generates a pH gradient, 70% of which is acidic.
- By recirculating the basin water through the reactor, and introducing sodium hypochlorite into an acidic region within the reactor, Dynamic Water can utilize sodium hypochlorite to great effect.
- The result is effective bio-contamination control utilizing cheap and readily available bleach.



Corrosion Control:

- Normally, the Dynamic Water UET controls corrosion by utilizing calcium and magnesium ions present in raw water to act as corrosion inhibitor buffers, working at higher LSIs.
- Because all water is treated prior to entering the facility, DWT was unable to use the softened water to control corrosion.
- Raw water was not able to be added, due to the nitrate removal requirements for reintroduction of the blowdown back into the process.
- The solution DWT elected to use was to dose Calcium Chloride brine into the cooling water system at the Dynamic Water reactor.
 - o The extra chlorides would aid in hypochlorous acid production for biocide.
 - o The calcium brine would give the water just enough needed hardness to prevent corrosion within the heat exchangers.
 - o The hardness would then be subsequently removed in the UET to prevent scaling.
- Post treatment softening was added to ensure that the water was perfectly soft before reintroducing it to the process at the facility.



Scale Control:

- Because there is no hardness in water being used in the cooling water except what is being put in with the brine (a very low amount relative to water composition), there was no scale problem to begin with.
- All hardness added using the brine is kept in equilibrium by the energy added by the UET reactors. The reactors remove just enough hardness to keep the water from scaling at higher LSI.
- The hardness continues into the heat exchanger, where it acts as a buffer for corrosion.



October 22, 2018

To Whom It May Concern:

Dynamic Water Technologies has been a partner with Pinal Energy dealing in water treatment since the spring of 2017. In this short time period Dynamic has proven to be a great partner that stands behind their technology and are willing to put in the needed effort for a project to succeed.

Pinal Energy has a challenging and production sensitive utility water system that has been a leading issue since the facilities beginning in 2007. Chemical costs at this facility were extremely high to combat the microbiological and corrosive nature of the cooling water. Chemical safety was an ongoing concern due to the amount of interface our operations and maintenance teams had with these products.

Chemical usage at this facility has been reduced greatly with only a low cost and much less hazardous product being used for microbiological control. Our cooling tower performance and the facilities process, once we got over a few adjustments, has been remarkably consistent with the UET system in place. The Dynamic system has been a true value-added technology on multiple fronts for Pinal Energy.

In my opinion, Dynamic Water Technologies success comes from two sources. Their sound technology and their group of individuals that understand how to make a challenging project succeed when others would shy away from the pressure. The project at Pinal Energy is well on its way to being a huge benefit for both groups involved. Pinal Energy looks forward to continuing to work alongside of Dynamic Water Technologies.

Sincerely,



Matt Rynearson
General Manager
Pinal Energy LLC