



## **Case Study - Hotel Cooling Tower - Scale and Bio**

Updated on December 30, 2013



### **Installer:**

Nano Tek-On, LLC. (*HydroFLOW* distributor in Hawaii).  
Phone: (808) 395-2996  
Email: [nanotekhi@hawaii.rr.com](mailto:nanotekhi@hawaii.rr.com)

### **Customer:**

Marriott Koolina Beach Club, Oahu, Hawaii, USA.

### **Application:**

500 Ton Cooling Tower.

### **Installed unit:**

*HydroFLOW* Custom 14" water conditioner on a cast iron pipe feeding the chillers.

### **Water source:**

Calcium Carbonate hardness of roughly 200 ppm and Silica hardness of roughly 50 ppm.

### **Installation date:**

September 10, 2013.

### **Success factors:**

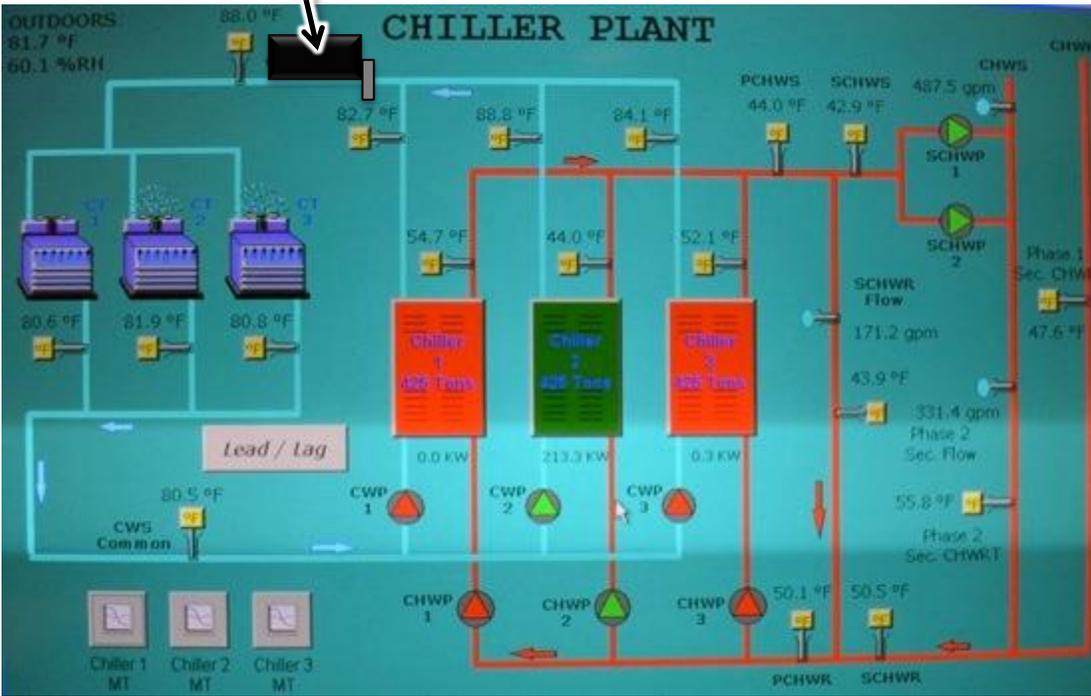
- Reduce chemical usage by up to 75% while keeping the cooling tower readings within acceptable parameters.
- Significantly reduce maintenance costs.
- Reduce blow down water usage by up to 50%.

*Note: Cooling tower with small amounts of scale, corrosion and biofilm accumulation. The goal is to maintain these conditions while using reduced amounts of chemicals and water.*



**System diagram and installation point:**

HydroFLOW water conditioner



**Installed HydroFLOW water conditioner:**





One of the 3 chillers:



Total bacteria count in the tower's recirculating water:



Baseline measurement with 100% biocide (under 1,000 CFU)

Biocide chemicals kept CFU levels at a minimum



After 1.5 months with 50% less biocide (between 1,000 to 5,000 CFU)

Slight raise in CFU count as *HydroFLOW* began to remove biofilm from the cooling tower



After 3 months with 75% less biocide (under 1,000 CFU)

CFU count reduced back to under 1,000 CFU



**Blow down water consumption over a span of 3 months:**

Date	Conductivity	pH	Chemical reduction	Blow down rate
Sep. 10, 2013 (Baseline)	1,560 µS	9.0	100% Anti-scalant & Anti-corrosive 100% Biocide	1 gallon every 10 seconds
Sep. 24, 2013	1,562 µS	9.0	50% less Anti-scalant & Anti-corrosive 100% Biocide	1 gallon every 10 seconds
Oct. 24, 2013	1,264 µS	9.0	No Anti-scalant & Anti-corrosive 50% less Biocide	1 gallon every 10 seconds
Nov. 14, 2013*	1,082 µS	9.0	No Anti-scalant & Anti-corrosive 75% less Biocide	1 gallon every 12 seconds
Nov. 21, 2013*	1,371 µS	9.0	No Anti-scalant & Anti-corrosive 75% less Biocide	1 gallon every 13 seconds
Dec. 3, 2013*	1,449 µS	9.0	No Anti-scalant & Anti-corrosive 75% less Biocide	1 gallon every 16 seconds
Dec. 17, 2013*	1,636 µS	9.0	No Anti-scalant & Anti-corrosive 75% less Biocide	1 gallon every 20 seconds

\* Prior to the installation of *HydroFLOW*, the conductivity of the cooling tower was maintained at roughly 1,500 µS via constant blow down (opened drain valve). The goal was to maintain conductivity between 1,500 to 1,800 µS while reducing water usage by up to 50% and keeping the cooling tower free of scale accumulation.

*Note: Since the automatic blow down mechanism was not operational, blow down was reduced by slightly closing the valve every 1-2 weeks.*

**Other readings:**

Iron - Fluctuated between 0.00 to 0.07.

Alkalinity - Started at 240. One week after *HydroFLOW* was installed it reduced to 180 and remained at that value.

Nitrate - Fluctuated between 560 to 640.

**Results:**

1. Lime scale accumulation stopped as soon as *HydroFLOW* was installed.
2. Anti-scalant and Anti-corrosive chemicals were completely discontinued after 1.5 months.
3. Existing scale and biofilm deposits were gradually removed.
4. After reducing the biocide chemical by 75%, the total bacteria counts continued to be minimal.
5. Blow down was reduced by 50%. *Note: Blow down can be reduced further with 10% side stream filtration.*
6. Efficiency of chillers was maintained (no scale and biofilm accumulation in chiller tubes).
7. One year Return on Investment (ROI).

One Year Cost Savings Analysis			
	Before <i>HydroFLOW</i>	After <i>HydroFLOW</i>	Savings
Electricity	\$148,997	\$141,547	\$7,450
Blow down (make up and sewage water costs)	\$59,067	\$29,534	\$29,533
Chemicals	\$7,000	\$1,750	\$5,250
Maintenance	\$2,000	\$1,000	\$1,000
<b>Total</b>	<b>\$217,064</b>	<b>\$173,831</b>	<b>\$43,233</b>



## Commercial cooling Tower Case Study - 90 Day Evaluation

Case study updated on April 26, 2013

**Installer:** HydroFLOW Master Distributor in Hawaii.  
**Customer:** Central Pacific Plaza  
**Location:** Honolulu, Hawaii - USA  
**Application:** Two 300 ton cells and one 75 ton cell - One 300 ton cell operates during the day, one 300 ton cell is on standby and the 75 ton cells operates during the night  
**Unit:** HydroFLOW 14" Custom on a 12.78" Outer Diameter Cast Iron Pipe  
**Goal:** Keep biological growth, scale accumulation and corrosion rate under control while using minimal amounts of chemicals  
**Timeframe:** Trial began on January 22, 2013 and ended on April 22, 2013

### **Evaluation Protocol:**

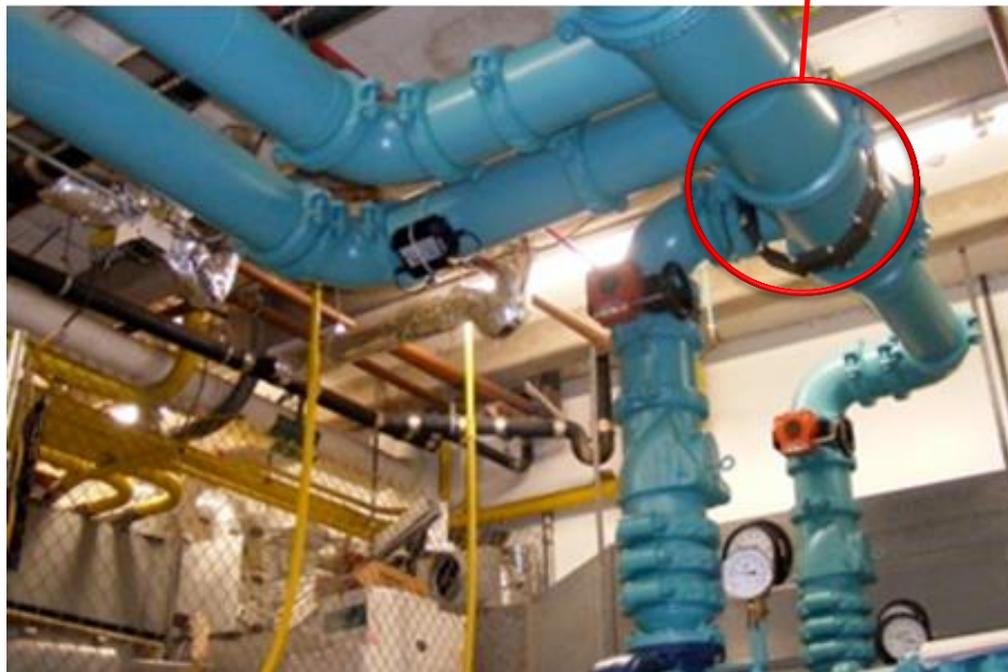
- Weeks 1-2: No chemical reduction. Biological water tests to be compared to baseline data after 15 days. Scale and bio accumulation to be compared to baseline pictures.
- Weeks 3-5: Scale/corrosion inhibitors and biocide to be reduced to 75% (25% reduction). Biological water tests to be compared to baseline results after 5 weeks. Scale and bio accumulation to be compared to baseline pictures.
- Weeks 6-9: Scale/corrosion inhibitors and biocide to be reduced to 50%. Biological water tests to be compared to baseline results after 9 weeks. Scale and bio accumulation to be compared to baseline pictures.
- Weeks 10-12: Customer to decide if scale/corrosion inhibitor and biocide can be reduced to 25% (75% reduction). Biological water tests to be compared to baseline results after 12 weeks. Scale and bio accumulation to be compared to baseline pictures.

### Cooling Tower Cells





**Installation Location - After Sump Pumps (Before the Chillers)**





### **Results after 90 days**

- Lime scale and corrosion buildup inside the cooling tower and chillers remained under control even though anti-scalant and anti-corrosive chemicals were discontinued
- Biocide chemical was reduced by 85% and bacteria levels reduced from 100,000 CFU to 1,000 CFU
- Blow-down reduced by 50%
- Conductivity remained stable at 1245 ~ 1295 Micro Siemens

### **Before and After Pictures**

**Before**



**After**



Lime scale and corrosion buildup remained under control even though anti-scalant and anti-corrosive chemicals were discontinued



[Dip slides were used to monitor biological count]

Before

After



Biocide chemical was reduced by 85% and bacteria levels reduced from 100,000 CFU to 1,000 CFU