

HighCycle™ - Advanced Chemical Technology for Cooling Tower Blowdown Reduction

A Safe, Simple, Economic, and Environmentally Responsible
Technology for Reduction of Water Usage in Cooling Towers

TAB0611

Background



Drought conditions and increasing water usage have combined to **decrease the availability** and **increase the cost** of the good quality, low hardness water preferred for cooling tower makeup use. At the same time, stricter environmental restrictions on effluent discharge have resulted in **increased fees for disposal** of cooling tower blowdown to the sewers. Combined water and sewerage fees are currently ranging from \$5.00 to \$17.00 per 1000 gallons. Given these trends, there is a definite need to **increase the cycles of concentration (COC)** obtained in cooling tower systems so that makeup, blowdown, and chemical usage can be reduced, giving the **lowest water usage and cost** for system operation. At the same time, control of scale, corrosion, deposition, and biological growth in the cooling water system must be maintained by the water management program to prevent capital equipment damage, excess energy usage, and extra maintenance costs.

Standard cooling water treatment chemistry uses phosphonates and polymers to safely increase COC up to four (4) times over that achievable without any chemical treatment. Use of acid for pH adjustment can increase COC by two (2) over that obtained by standard treatment chemistry. Acid, however, is both a safety hazard for operating personnel and can cause severe equipment damage.

Technology Application

ProChemTech has invented a patent pending* **advanced acid free chemistry, HighCycle**, which can add two (2) COC to that obtained with standard treatment programs.

HighCycle water management programs by ProChemTech offer an economical, high COC alternative to standard chemical treatment programs or acid addition. This technology has been field proven by long term plant operations where the COC control limit is calculated by the following equation:

$$\text{COC} = 2 + \sqrt{\frac{110,000}{\text{CaH} \times \text{TA}}}$$

CaH and TA reported as CaCO₃

In cases where the makeup is hard and alkaline, a HighCycle program can often increase COC from 2 to 5 over standard treatment programs. Increasing the COC in a cooling tower has a substantial effect on water usage. For example, **doubling the COC will cut blowdown volume by 50%**, so a system with 10,000 gpd of blowdown at two (2) COC will have a blowdown of 5,000 gpd when operated at four (4) COC.

From the health & safety aspect, **HighCycle** products are DOT/OSHA/USEPA non-hazardous, in contrast to many standard chemical treatment products and acid, which are hazardous, providing further benefits in the areas of reduced health & safety liability.

Our patented* **BlueTrace** colorant product control technology is incorporated into all HighCycle products which provides substantial improvements in product dosage control. Better control of the scale and corrosion product results in lower product usage, reduced cost, and better results. In addition to being both more accurate and much faster to use than other control technologies, **BlueTrace** uses no costly chemical test reagents.

Economic Analysis

To demonstrate the economics of **HighCycle** programs, we recently performed a cost analysis on a large cooling tower system located in Phoenix, AZ. The following design data was used for this analysis:

Annual thermal load = 1000 tons
City water/sewerage cost for blowdown = \$5.50/1000 gallons

Typical City Water Analysis

Parameter	Result	Parameter	Result
pH	7.8	conductivity	1021
calcium	76.0	magnesium	26.4
total alkalinity	98	silicon	3.1
chloride	11.5	sulfate	317
total hardness	298.5	saturation index 100 F	0.4

Standard chemistry using PCT 6215 B, use = 100 mg/l, cost = \$2.25/lb, COC = 2.4

HighCycle using PCT 6218 B, use = 150 mg/l, cost = \$2.20/lb, COC = 4.4

Calculated Results	Standard Program	HighCycle Program
Evaporation, gal/yr	9,690,750	9,690,750
Blowdown, gal/yr	6,921,964	2,850,221
Makeup, gal/yr	16,612,714	12,540,971
Blowdown cost, \$/yr	\$38,060	\$15,675
Inhibitor cost, \$/yr	\$12,997	\$7,848

Bottom line cost reductions: Blowdown cost reduction of \$22,385
Scale/corrosion inhibitor cost reduction of \$5,149
Total cost reduction = \$27,534/year

Bottom line water use reduction = 4,071,743 gal/yr

It is clearly evident from this analysis that a **HighCycle** water management program provides substantial water, sewerage, and product cost reductions while substantially reducing overall fresh water use.

These benefits are generally obtained with no capital cost as the control and feed equipment used in a standard water treatment program are often reusable in a HighCycle program.

Water management program costs are generally the same, or less, dependent upon exactly which supplier is being used for the previous standard water treatment program and level of service provided. We recommend that chemical control and feed systems be inspected, and upgraded if needed, to provide reliable blowdown and chemical feed control.



Sintered metal part plants are a very difficult problem for water management in that the velocities through furnace jackets are typically low and temperatures are high, bulk water temperatures approaching 200 F with hot side temperatures of 2000 F are not uncommon. As shown by the scale being removed from this sintered metal plant furnace cooling jacket, proper water treatment is a must!

ProChemTech provides the water management programs for over 80% of the sintered metal plants in the United States. Our HighCycle technology has been proven under the most extreme water management conditions.

HighCycle water use reduction technology was developed by, and is only available from, ProChemTech International, Inc., a world leader in water management technology. HighCycle treated water is acceptable for discharge to POTW and contains no harmful heavy metals or toxic materials. Due to the reduction in blowdown obtained by use of HighCycle water management programs, it is considered a “green” technology.

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* HighCycle patent pending, application 13/098,084

* BlueTrace US Patent 7,932,091