

The total cost savings that resulted from the implementation of the 3D TRASAR control included a reduction in well pumping costs, cooling tower blowdown waste treatment savings, ozone generator electrical savings, chemical inhibitor savings which was offset by the added cost of the controller and new biocide program (see chart). Total ROI after year one was \$49,000.

eROI SUMMARY

In addition, there was a significant environmental ROI and is summarized in the table. The total water and electricity savings totaled \$34,400 per year, which is equivalent to leaving 15 dorm sink faucets flowing 24/7 for a year at 1 gpm, or enough to fill an Olympic-sized swimming pool every month for a year.

Return On Investment Calculations

Savings	Total
Well Pumping Savings Due to Reduced MakeUp: 8MM Gallons saved x \$.0043/gal	\$ 34,400
Reduction in Waste Treatment of Tower Blowdown: (cost = \$.0041/gal)	\$ 4,100
Annual Ozone Service/Electrical Savings	\$ 11,500
Annual Chemical Inhibitor Reduction	\$ 15,000
TOTAL SAVINGS	\$ 65,000
Investment Costs	
One-Time Cost of Capital Equipment (3D TRASAR Controller)	\$ 15,000
Annual Cost of New Biocide Program	\$ 16,000
TOTAL INVESTMENT: \$31,000	\$ 31,000
Return on Investment After Year 1	\$ 49,000

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8 Million Gallons of Water Saved Annually

A major university in the northeastern U.S. saves 45,000 gallons of water per cooling day



CASE STUDY - INSTITUTIONAL
CH-1018




SITUATION

A major university in the northeastern U.S. experienced growth based on years of continuous improvement and best-in-class student recruitment processes. The surrounding community shares in the success of the university through employment and educational opportunities year round. The community and the university collaborates to provide students, faculty and guests with a top-notch collegiate experience.

In 2005, the university began a process of re-evaluating their water management plans due to a local well system becoming dry. This situation was exacerbated in 2007 when a natural low flow condition impacted the surrounding river area. The university was well prepared for a protracted period of dry weather, but

this second water scarcity issue raised the importance of water conservation plans to an all-time high. In a letter dated June 5, 2008, from the EPA and Department of Health to the university, both parties encouraged the school to continue to take drastic and sustainable measures to reduce water consumption and investigate alternative sources for its water needs. This opened up new opportunities for use of reclaimed wastewater and additional alternatives.

Nalco Water was contracted by the university to manage its water treatment needs along with participating in all water management plans.

CUSTOMER IMPACT	eROI™	ECONOMIC RESULTS
8 million gallons annual water reduction		\$34,400 savings per year on water and energy
281,967 kWh reduction		
169,180 pounds of CO ₂ reduced		\$1,366/year in voluntary CO ₂ credits

eROI is our exponential value: the combined outcomes of improved performance, operational efficiency and sustainable impact delivered through our services and programs.

PROGRAM

Since cooling towers are one of the largest, if not the largest consumers of water, the Nalco Water engineer began an evaluation to develop the groundwork to improve the towers' operation and reduce water consumption. Summer water usage totals were found to be 32.8 million gallons in 2007 and 33.2 million gallons in 2008 (Figure 1).

In addition, cooling degree days were measured (see Figure 2). Measuring cooling degree days is the common method for determining how much air conditioning is needed. This amount is determined by calculating the number of days above 65°F. By trending and averaging these readings, you can determine how much hotter or cooler one summer is to the next and then compare to their respective annual water usage numbers. This approach helps facility managers adjust or auto-correct water usage numbers allowing for annual comparisons. For 2007 & 2008, the number of cooling degree days were higher by +25% and +17% respectively over 2009.

With these trends in water consumption and the continually increased cooling degree days, the Nalco Water engineer decided to look at deploying 3D TRASAR™ control across the campus towers. Since 3D TRASAR technology allows the facility engineer to control and monitor the water characteristics (over 28 parameters) real time and 24/7/365, the engineer was confident that this was the ideal

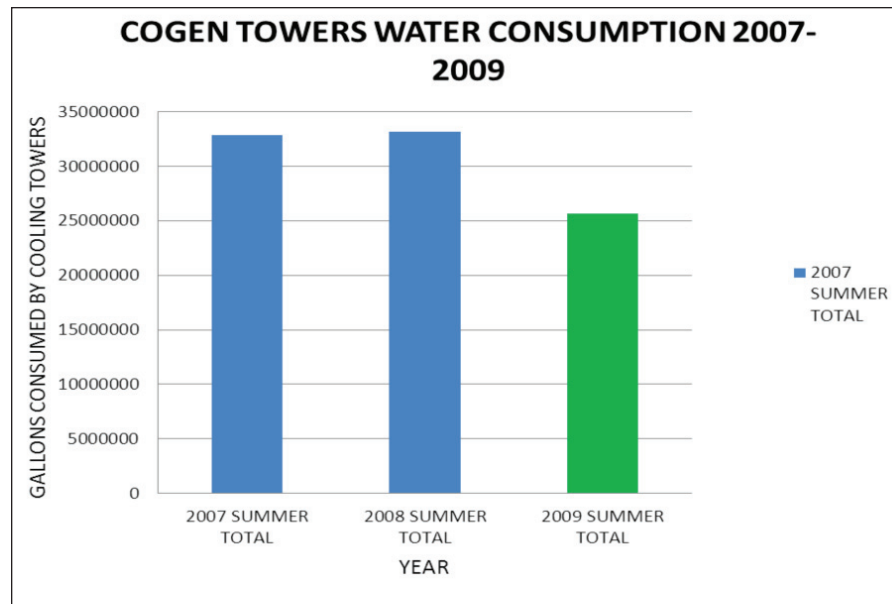


Figure 1

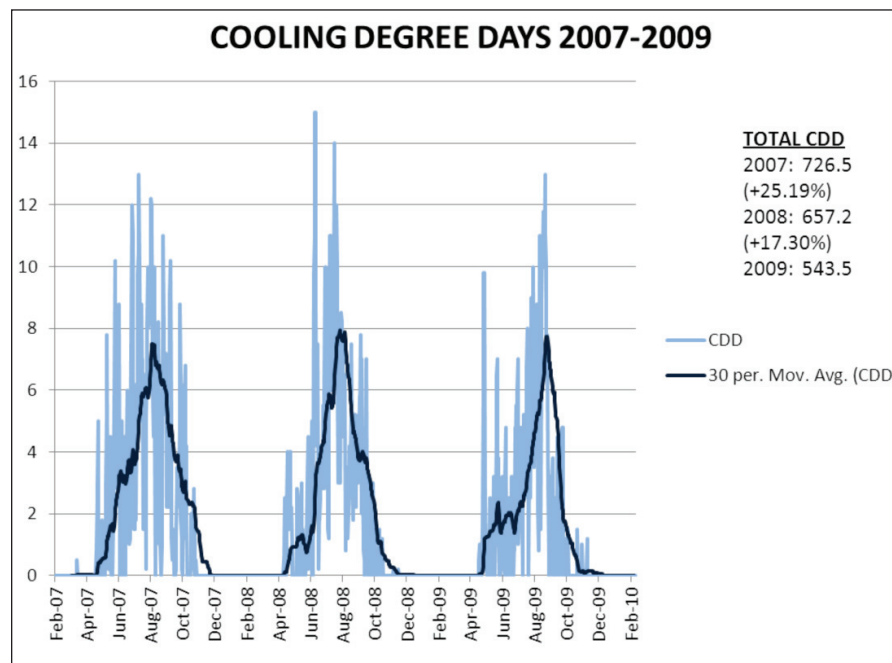


Figure 2

control strategy to reuse the water and increase cycles. In addition, this real time control and monitoring strategy would provide early warning to prevent damage to expensive HVAC equipment (i.e. towers and chillers) if there were issues while cycles were increased.

DETAILS

Upon further review, the micro-biological control strategy employed at that time (onsite Ozone generation) was found to be detrimental to the corrosion control program. The biocide actually degraded the precious corrosion inhibitor and increased corrosion rates. The first step to regain control of the biocide and corrosion inhibitor program was to eliminate the Ozone generator and replace it with a stabilized bromine and DBNPA combination program. Immediately, the facility gained precious electrical savings and saw a reduction in inhibitor use while maintaining good microbial control.

Next, cycles were reviewed and the process to increase them automatically through 3D TRASAR cycle control was turned on. Since the tower inhibitor was no longer being chewed up by the ozone program, which resulted in better protection of the tower and chiller, the tower cycles were allowed to be increased. The 3D TRASAR controller monitored

and managed all the contaminant stress on the tower water and began to raise the cycles in order to achieve valuable water savings. During this time, various alarms were triggered during routine control that required attention by an operator. Since the alarms were automatically sent to the operator(s) through the wireless gateway communication, precious man hours were alleviated in the water treatment area and cycle control was more immediate. This immediate real time alarm and guidance program saved operators countless hours of trouble shooting while gaining water savings faster. The engineers documented 7 man-hours per week of savings from these improvements.

ENVIRONMENTAL/ECONOMIC RESULTS

The university concluded their 2009 cooling season, the Nalco Water engineer compiled total water usage numbers. The 2009 cooling tower total water savings was 8 million gallons when compared to 2008. But more work had to be done since there were fewer cooling degree days in 2009 which means less cooling was required. Once the numbers were normalized, the annual water savings was 6 million gallons when compared to 2008 (cooling degree days incorporated). The results of

this exercise are listed in Figure 3 and resulted in >18% reduction of water over the previous 2 years.

These 6 million gallons of water saved was attributed to the 3D TRASAR control strategy implemented by the Nalco Water engineer. The strategy included:

1. Implementation of liquid biocide program to eliminate need for Ozone which is hazardous to produce and store on-site as well as detrimental to system corrosion performance.
2. Tower Cycle Management: Improving tower cycles by modeling system operating chemistry through our 3D TRASAR Optimizer software, which allowed us to improve from 4.5 cycles of concentration under manual control to 8.5 cycles of concentration with 3D TRASAR cycle control.
3. Alarm and Monitoring of Key Parameters: Close monitoring of key system parameters such as chiller approach temperatures and head pressures to assure increased cycles was not detrimental to equipment.

Savings Adjusted for Cooling Degree Days
 2007 vs. 2009 = 18.4% Water Reduction
 2008 vs. 2009 = 18.0% Water Reduction

Figure 3