SITUATION
A global plastic blow molder company has a commitment to implement sustainability initiatives that reduce the company’s impact on the environment. One of their plants, located in the state of Nevada, USA, was challenged to find a way to reduce plant water consumption while maintaining optimum plant production. Process cooling accounted for the majority of water used in this manufacturing plant. Extreme hot and dry weather in the area had resulted in this plant using cooling water with relatively high dissolved solids leading to increased system scaling potential and additional costs. This company had already implemented Nalco’s 3D TRASAR chemistry and automation, and they were using industry best practice to optimize their cooling water treatment including feeding acid to allow for increased cycles of concentration and reduced water use. This program had helped improve cooling system operations significantly but the plant was looking to take their cooling water treatment to the next level in order to increase water savings and end acid feed.

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<th>Customer Impact</th>
<th>eROI</th>
<th>Economic Results</th>
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<tr>
<td>83% reduction in blowdown water saving 1.07M gallons on HVAC cooling with extrapolated total plant savings of 3.84M gallons</td>
<td></td>
<td>Annualized savings of $1,535</td>
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<tr>
<td>24% reduction in make up water saving 1.07M gallons on HVAC cooling with extrapolated total plant savings of 3.84M gallons</td>
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<td>Annualized savings of $14,592</td>
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<td>Eliminated acid handling</td>
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<td>Annualized acid savings of $9,000</td>
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<td>Eliminated bleach handling</td>
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<td>Annualized bleach savings of $5,400</td>
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<td>Total annualized gross savings</td>
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<td>$30,527</td>
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eROI is our exponential value: the combined outcomes of improved performance, operational efficiency and sustainable impact delivered through our services and programs.
BACKGROUND
The targeted cooling system consisted of a single, 1 cell, Marley galvanized cooling tower used to provide HVAC cooling for the plant. System volume was approximately 10,000 gals, and it cooled two 400 ton, tube and shell, centrifugal chillers (one operational). This system operates about 200 days per year during the summer months when outdoor temperatures routinely reach >100°F or 38°C.

As with most cooling water systems, there are three main concerns that the treatment strategy needs to address – prevention of corrosion, scaling, and microbial fouling. If not managed correctly, each of these concerns will reduce asset life and increase operating costs via increased energy and water consumption.

The system had been operating with Nalco 3D TRASAR technology and was optimized for each of these concerns with the following parameters:

- Cycles of concentration = 4.5 with acid. Without acid, they would have run 3 cycles of concentration.
- Blowdown water = 1.3 M gals/yr. or 4.5 gpm. (calculated)
- Mild Steel Corrosion = 2.3 mpy
- Copper Corrosion < 0.05 mpy
- Microbial Counts = $10^4$ to $10^5$ cfu/ml
- Scale – The tower and chiller were considered relatively clean although some old deposition was present.

The challenge was to increase cycles of concentration, thereby reducing blowdown and saving water without increasing corrosion, scale, or microbial activity.

SOLUTION
To address this sustainability challenge, Nalco 3D TRASAR Water Saver technology was recommended as part of a fully integrated solution that included 3D TRASAR automation technology, Nalco 360 24/7 engineering service, and Nalco chemistries. This technology was in operation for a full year through one of the most intense cooling seasons on record in this geography.

RESULTS
During the operating period, cycles of concentration were gradually increased and blowdown was reduced. All key performance indicators were monitored. Here are the results that were achieved:

- Cycles of concentration = 14 with no acid feed.
- Blowdown water = 220 K gals/yr. or 0.76 gpm (calculated - 83% reduction)
- Mild Steel Corrosion = 2.0 mpy
- Copper Corrosion < 0.05 mpy
- Microbial Counts = $10^4$ cfu/ml
- Scale – The tower and chiller were considered to be clean upon inspection.
Microbial Activity in the cooling system was maintained under excellent control even during the highest temperatures of the cooling season as evidenced by microbial analysis reports and dip slides. See Figure 4.

Conductivity/Cycles of Concentration:
Conductivity went from approximately 4600 umhos to 9400 umhos which equated to 14 cycles of concentration. Blowdown was reduced by 83% resulting in significant water savings. See Figure 2.

3D TRASAR Water Saver tube deposit was analyzed to confirm the presence of expected hardness minerals – Figure 5 shows the inside of a scaled 3D TRASAR Water Saver tube and Figure 6 documents the deposit analysis results. This data clearly confirmed the removal of hardness minerals from the system cooling water.

The net achievement was that cooling system makeup was reduced by 1.077M gals/yr, saving approximately $4524/yr. The plant was able to stop using acid in their cooling water improving safety at the plant and saving an additional $9,000/yr. Corrosion, microbial, and scaling were all controlled below published industry standard guidelines.
CONCLUSION

By implementing a fully integrated Nalco 3D TRASAR Water Saver solution, the company was able to reach their goal of reducing water usage on this cooling system maintaining the peace of mind that their assets were being protected and operated in a safe and effective manner.

Annual MU saved = 1,077,000 gals (metered) – 24% reduction of cooling system make up water

Annual BD saved = 1,077,000 gals (calculated) – 83% reduction in blowdown

Figure 6 - Deposit analysis of deposition from scaled 3D TRASAR Water Saver Tubes