Mexican brewer significantly reduces water and energy in their steam generation system

NALCO Water
An Ecolab Company

CASE STUDY – FOOD & BEVERAGE

CH-2137

BACKGROUND

A leading Mexican brewing plant is committed to environmental protection and the optimization of natural resources, working continuously to reduce water, energy and greenhouse gas emissions. It's located in a city with limited water resources.

At this brewery, the steam generation system is accountable for supplying the production process, as well as producing steam for the electric power generation turbines. A few years ago, internal boiler treatment was based on solid products that precipitated sludges to inhibit carbonate deposits into the boiler pipes. This necessitated discharge by the bottom sludge blowdown valve thereby increasing the consumption of discharge water and makeup and increasing fuel consumption.

SITUATION

This brewery produces 4.6 million hectoliters of beer per year and has a steam system composed of three boilers with a nominal production of 60 tons of steam per hour and other two boilers of 30 tons of steam per hour, operating at 35 kg/cm2 of pressure. With two deaerators, one dedicated to the largest boiler and a second that operates for the two smaller boilers, this generated steam goes to two turbines with condensation of 7 MW each. The dosing of all the treatment products is done within the boiler drum, so it is not possible to verify the concentrations of the products or adjust their concentration according to process changes. The measurement of physicochemical water

ENVIRONMENTAL IMPACT	eROI℠	ECONOMIC IMPACT
Conserved 4660 m^3/year in make up water	WATER	Savings of $9,074 annually with a unit cost $1.95/$m^3$
14,614,372 MJ/year fuel energy	ENERGY	Savings of $73,071 annually with a unit cost $0.005/MJ
803 tons/year of CO_2	AIR	Savings of $4,577 annually with a unit cost $5.7/TON

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

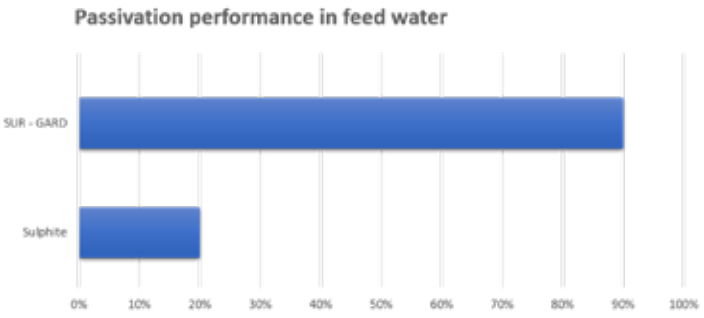
conditions of water is done manually; results are obtained with system deviations and delayed detection. As a result, the brewery experiences:

- High water blowdown consumption related to the handling of low concentration cycles (10-12) due to the contribution of solids and purging of precipitated sludge inherent to the conventional treatment type
- Contaminations in supply water quality not detected real-time
- Deposits in generation equipment and steam turbine fouling due to instability in the attemperation water

SOLUTION

Based on water quality, operational system issues, and the customer's operating objectives, Nalco Water's NexGuard™ boiler water program was implemented. The program manages hardness dispersion of the salts that can cause scaling, keeping them soluble without precipitating sludge and decreasing blowdown. In addition to inhibiting incrustation, through an adequate alkalinity balance, it´s possible to protect boiler metallurgy against corrosion.

To protect against corrosion, the Nalco Water SurGuard™ program was included, which is an organic inhibitor used for oxygen scavenging and additional passivation of the system. This program can be fed into water used for attemperation with a minimum of water input solids protecting the entire pre-heating area and the metallurgy. This decreases the total solids to the steam generator and increases concentration cycles.



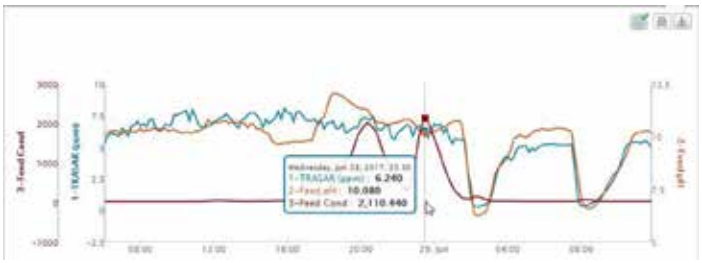
In addition, Nalco Water's 3D TRASAR™ technology, through the trace molecule which is a NexGuard component, has been monitoring and delivering the exact concentration needed for the boilers, as well as sending alerts about any deviation in the quality of feed water due to possible process contamination.

Graphics 1 and 2 verify that, at the beginning of the monitoring with the 3D TRASAR technology, drastic pH drops are observed, such as high salt intake measured as conductivity. Subsequently, a significant improvement in feed water control is obtained and an adjustment in the range of conductivity and pH is achieved. Real-time alarms are necessitating adjustments to the process or the diversion of harmful currents to the boiler, that can even reach the turbine in the attemperation water or as dragging.

Corrosion control by the Nalco Corrosion Stress Monitor (NCSM) helps maintain an environment that limits oxidation of metallurgy, protecting the system, as shown in Graphic 3.

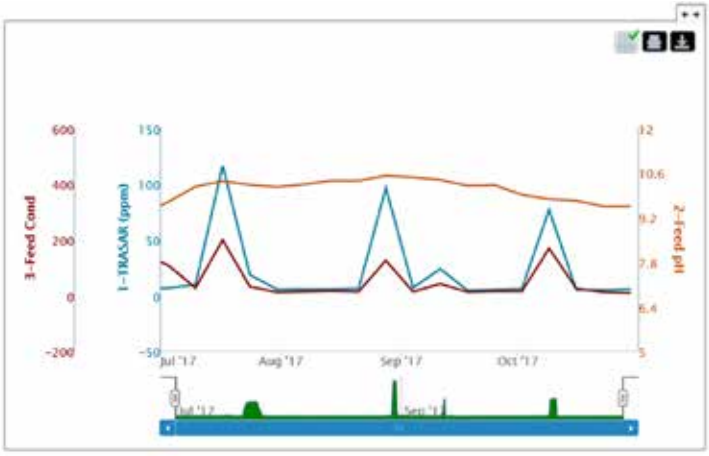
Initial graphs of 3D TRASAR monitoring, peaks of high conductivity and low pH in the feedwater

Picture 1



Subsequent graphics with implemented improvements, stable pH and better controlled conductivity in response to product increase when there is salt increment in the feed water

Picture 2



Picture 3: NCSM control chart, oxide potential reduction ORP <0mV at all times

CONCLUSION

With the implementation of the NexGuard program, and the continuous work to optimize process conditions via 3D TRASAR technology, boiler cycles were increased to more than double (10 to 30 CR), eliminating the incrustation potential.

Only two and a half months after the beginning of the program, replacement water consumption was significantly reduced, and an optimization of the fuel consumption system was registered in the system. Months later, it could be verified through the technology and the constant delivery of results via data dashboards that the whole operation has improved significantly, generating less equipment exposure, significant water and fuel savings, a reduction in total cost of operation reduction and improved environmental performance.

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