

Brazilian Aluminum Plant Saves \$3.3 Million Using Nalco Water PURATE™ Technology



BACKGROUND

A leading company in aluminum production and one of the largest aluminum recyclers in the world was facing large water losses due to maintaining the consistency of the Quench. Because of this, a large amount of chemistry was being handled monthly. This chemistry occupied a large space in the warehouse which resulted in high make up water consumption and cost.

In the aluminum industry, the impact of water is very significant. The shrinkage of aluminum during solidification is around 6% which is significantly high. This factor potentiates the formation of segregation, porosity, deformation in the processed material, among others.

Small variations in Quench can lead to production losses due to defects or leakage of liquid aluminum. Therefore, the aluminum forming process must be as consistent as possible. Water is an extremely important part of this process.

The customer was looking to lower production costs, obtain higher production rates, reduce chemical handling and cut down on the amount of scrap.

SITUATION

In this plant, biocides based on sodium hypochlorite and bromine were used for microbiological control, but there was a lot of chloride generation in this process which limited the concentration cycle. Therefore, there was no effective biological control.

In addition, the use of bio dispersants was avoided because of their significant impact on Quench. In this case, the lack of bio dispersants combined with oil and grease contamination did not allow for adequate biofilm control. As 90%-95% of the microorganisms live in the biofilm, microbiological control was not effective.

Quench is the ability of water, in direct contact cooling, to extract heat from a hot molten metal surface depending on the mechanical and physical characteristics of direct contact cooling and the water quality.

ANNUAL SAVINGS



ASSETS

Reduction of cracking, improvement of good ingots and plate efficiency

\$3,032,000



ENVIRONMENTAL RESPONSIBILITY

Reduced packaging and chemical usage

\$298,000

TOTAL VALUE DELIVERED

\$3,330,000

Changing or adding components to the recirculation water can affect Quench, so this should be done slowly and with great care.

The large amount of product handled monthly, warehouse space, make-up water consumption and elevated costs were the major drivers for the implementation of the project of chlorine dioxide (ClO₂).

SOLUTION

To improve the microbiological control, the Nalco Water team used PURATE technology. This technology, unlike other programs, produces ClO_2 in a proper generator under controlled conditions, resulting in greater safety and efficiency in the application. This ensures the proper amount of biocide without causing damage to the Quench and the environment.

PURATE technology is an excellent biocide with the following advantages:

- Removal of biofilm
- Eliminates the application of sodium hypochlorite and bromine, reducing operation risks
- Does not generate organochlorines and trihalomethanes
- Less corrosive than chlorine
- Does not lose effectiveness up to pH 11
- Broad spectrum of extermination, including spores, viruses, fungi, cysts and protozoa
- Low CT^1 which results in fast action
- Reduction of operation costs: reverse logistics, cylinders, workforce safety and insurance policies

PURATE is very reactive and selective, making it a great choice. The fact that it has a lower oxidation potential than commonly used oxidizing biocides helps reduce the corrosion rate in systems, unlike other products that require high residuals (continuous dosing) or shock (large amounts at once).

RESULTS

PURATE technology enabled an increase in the concentration cycle by 15%, reduced water consumption by 20% and reduced chemical consumption by 54%.

Reducing the need of mold cleaning and replacement saved \$124K for each mold. If you include the reduction of cracking and improvement of good ingots that directly impact the plant's productivity as it incremented the plate efficiency from 97.6 to 99.1, this generates a total savings of \$3M/year.

The following photos, figures and table show the impact of the technology on the product.



Photos 1 & 2: Show the before and after of Nalco Water's PURATE technology.

¹CT: Concentration multiplied by the contact time

²NRs: Brazilian Regulatory Standards - Regulate and provide guidance on mandatory procedures related to occupational safety and health.

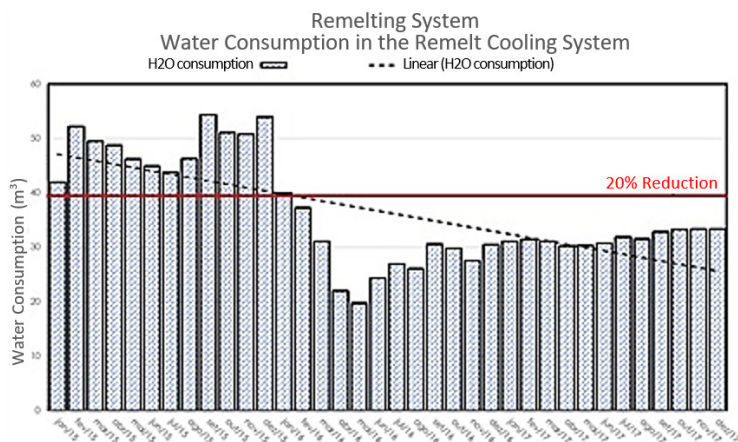


Figure 1: Concentration Cycle - Reducing water consumption.

Biocide Product	Qty ton/y	IBC Qty/y
Sodium Hypochlorite	150	130
Sodium Bromide	90	72
Purate®	36	32
H ₂ SO ₄	48	40
Reduction	-65%	-69%

Table 1: Reduction of chemical handling and direct cost

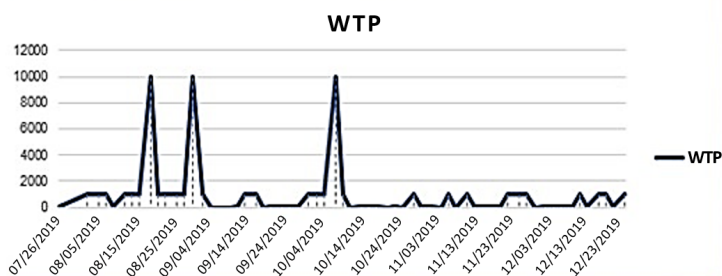


Figure 2: Microbiological Control

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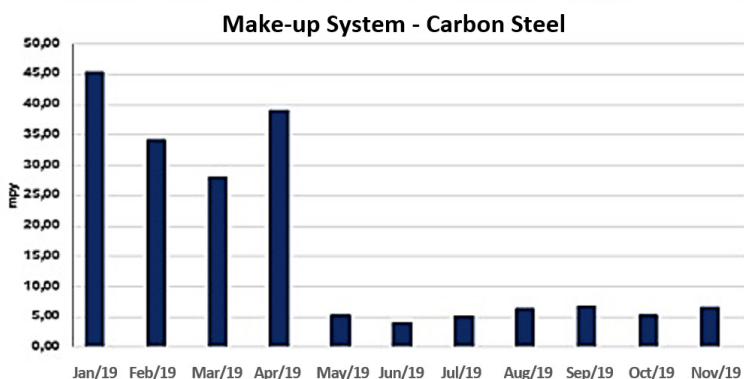


Figure 3: Carbon steel corrosion rates dropped 83% after the adoption of Nalco Water's PURATE Technology.

CONCLUSION

Due to the effectiveness of chlorine dioxide, its dosage is only necessary in the water treatment plant since it presents an indispensable residual in the cooling towers (concentration cycle).

It does not generate THM and AOX, producing a very positive impact on the environment, which provides quench stability and reduces blowdown, consequently reducing water consumption.

Therefore, we conclude that chlorine dioxide:

- Acts in a less corrosive way than hypochlorite and bromine (asset's life)
- Reduces the need for make-up water by 20%
- Is environmentally sustainable as it greatly reduces the consumption of chemicals
- Reduces costs directly impacting the plant's operation expenses in the medium and long term on the assets' life
- Removes the solids used for microbiological control by replacing dissolved bleach and bromine solids with a single dissolved gas, ClO₂
- Offers better control at a lower cost. ClO₂ is effective in controlling microbiological contamination over a broader pH range and at a lower active dose resulting in a lower cost
- Increases Production because the mold deposits reduced the casting time. The dissolved solids portion of the mold deposits is reduced by the replacement of bleach and bromine with a product that sublimates into the air instead of depositing on the surface inside the molds. Mold Life Cycle (days in service before cleaning) increased 57% (70-110 days)
- Protects Assets because of the lower corrosion protects the investment in casting molds. The concentrating mechanism of evaporating the aggressive oxidants onto the aluminum parts of the molds, driving corrosion damage, is removed. Molds last 44% longer and need less maintenance

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