New patented 3D TRASAR™ Caster Technology helps a Major Steel Industry Player optimize its Continuous Casting Process and reduce Total Cost of Operation by 400 k$/year.

NALCO Water
An Ecolab Company

CASE STUDY – PRIMARY METALS
CH-2119E

INTRODUCTION

The steel industry is faced with enormous pressure to reduce Total Cost of Operation (TCO) and improve productivity. There is also increased effort to extend the asset life and enhance the safety of the Continuous Casters which are at the heart of steel-making operations. For steel makers, problems with productivity, quality, cost and Caster maintenance may arise due to the corrosion and scaling which often occurs in Casters, because of extreme temperatures and high acidity levels. In answer to steel industry demands, Nalco Water has developed its proprietary 3D TRASAR Caster Technology. This provides a holistic approach aimed at reducing cost linked to corrosion and scale of the structure, segments and rolls of Spray Chamber equipment, mainly in Slab/Large Blooms/Round Continuous Casters using fluoride-based mold powder.

A major player in the steel Industry, based in North Europe, is an acknowledged global leader in steel-making process innovation. They are always working to find new ways to reduce their overall TCO and meet environmental standards. Many new Nalco Water Technologies such as CAST CLEAN™, SPRAYSURE™ and PURATE™, have been developed together with this customer and further opportunities for development are a constant focus.

CUSTOMER IMPACT	eROI℠	ECONOMIC RESULTS
Reduce Maintenance cost to Segment/rolls, support structure and spray nozzles	COSTS	99 k$/yr
Increase Productivity by reducing breakouts and production stops, increasing casting speed, improving quality of steel	PRODUCTIVITY	260 k$/yr
Increase Asset life, by postponing Caster Revamping and Caster Replacement	ASSETS	39 k$/yr
Enhance safety, by protecting walkways	SAFETY	9 k$/yr

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

Nalco Water's innovative 3D TRASAR Caster Technology was applied on this customer's spray chamber for the continuous casting process and it resulted in the following improvements in cost, productivity, asset management and safety.

SITUATION

Continuous Casting is a core process used in steel making to solidify molten steel, preparing it to be shaped into a wide range of finished products. Corrosion is a major issue affecting continuous slab Casters worldwide. The customer's existing treatment systems used to ensure optimum Caster performance and slab quality were already of a high standard with regards to the control of system water quality, system component performance (sand-filters, clarifiers, cooling towers, spray nozzles, caster availability), and asset availability. However, in line with its corporate commitments to continuous improvement, the plant's management team was looking for new innovative ways to further optimize site operations, with a focus on corrosion and scale cost reduction.

To demonstrate success and to provide this customer with measurable outcomes and results, it was essential for the customer to share key steel-making operational data with Nalco Water regarding their:

- cost of caster maintenance
- cost of lost production due to scale and corrosion,
- cost to safety linked to corrosion and scale.

SOLUTION

Through various studies and laboratory experiments led by R&D based in Leiden, The Netherlands, Nalco Water's proposed solution was 3D TRASAR Caster Technology. Together with plant management, the following Key Performance Indicators (KPIs) for the implementation were agreed upon:

- The application of state-of-the-art automation systems, both to Spray Chamber and Bulk water, to support the savings tasks, and reduce operator involvement through continuous on-line system surveillance
- The ability to continuously monitor the Spray Chamber corrosion and the acidic event frequency
- The guarantee that any modified treatment and automation would not adversely influence the caster production rate
- The reduction of operating costs through savings in maintenance, production, asset life and safety.

The customer agreed to the implementation of the **3D TRASAR Caster Technology** (Figure 1) and a new chemistry approach, directly applied to the Spray Chamber water. This included treatment and control of the Spray Chamber as well as an optimization of the Bulk water Treatment.

This holistic solution included the following proprietary automation, chemistry and service (see Figure 2):

- **Proprietary equipment** to sample the water from the zero-zone environment, monitor its quality and command the local addition of the organic buffer.
- **Dual pH control** on the cooling water by means of:
  - **An organic buffer** added directly into the lines that drive the cooling water to the upper segments with the feed rate being automatically controlled by the new 3D TRASAR Caster Technology based on the acidic event inside the spray chamber.
  - **A second inorganic buffer** dosed in the bulk water to guarantee 150 ppm of Alkalinity controlled by the next generation 3D TRASAR Cooling Water Technology. This is common practice in the steel industry and can be considered an essential component of the proposed solution.
- **Best-in-class chemistry** to address both corrosion and scale control in the bulk water.
- **A CaF_2 scale inhibitor**, to minimize spray nozzles clogging and scale all around the spray chamber.

Figure 1: 3D TRASAR Caster Technology Unit

RESULTS ACHIEVED

An important step of the trial was, through local automation and control, to fully assess the process and to arrive at the optimal treatment dosage level. This was only possible with the installation of the new 3D TRASAR Caster Technology and next generation 3D TRASAR Cooling Water Technology installed in the cooling system, as shown in Figure 2.

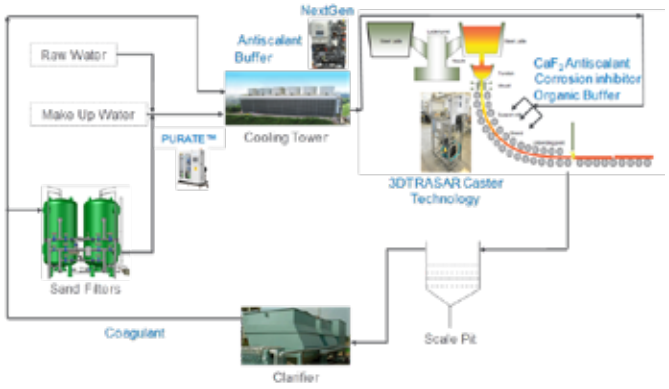

Figure 2 –3D TRASAR Caster Technology and next generation 3D TRASAR for Cooling Water, installation scheme

The trial results are detailed in Charts 1,2,3:

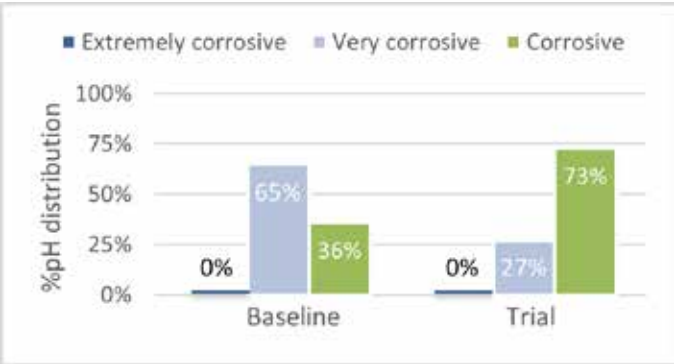

Chart 1 – pH distribution comparison: the % of time with pH >6 significantly increased during the Trial

The pH dips and corrosion rates correlate and show a significant improvement during the trial. The combined effect of the organic buffer and corrosion inhibitor enhanced the performance, reducing the corrosion rate.

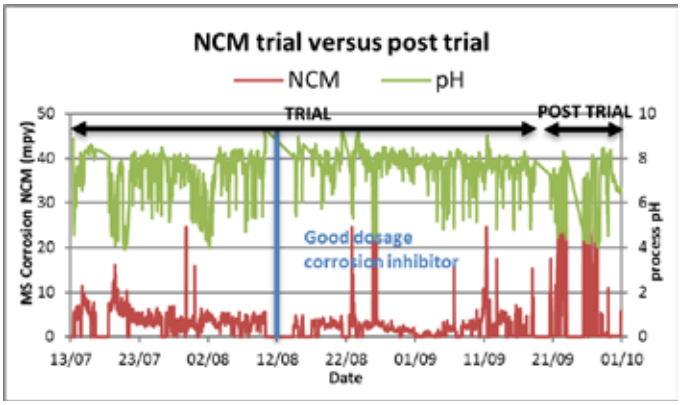

Chart 2 – process pH and Corrosion rate measured on probes

During the post-trial phase, the dosages of both organic buffer and corrosion inhibitor were stopped, while all the other chemicals were dosed at the same rate as per the trial protocol.

Chart 2 shows that without any local monitoring and treatment, bulk control is not enough to provide good protection of spray chamber corrosion.

The submerged Coupons directly installed on Segment 1 of the Spray Chamber show a 40% reduction in the corrosion rate. This confirms the validity of the implemented solution (see chart 3)

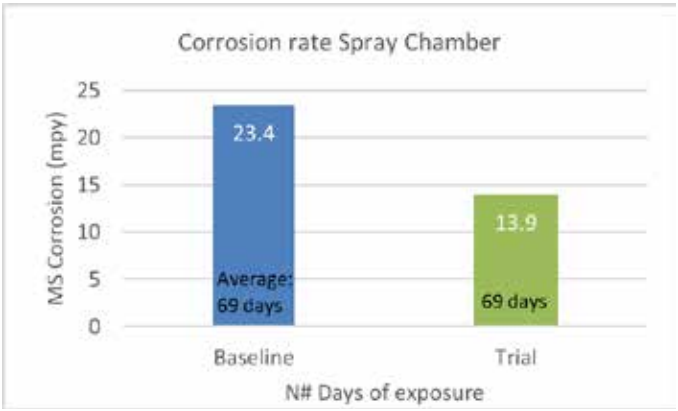

Chart 3 – Corrosion rates measured on 3D TRASAR coupons installed on Segment 1

As a consequent effect of the local treatment, the bulk water also showed a 18% reduction in the corrosion rate (see chart 4):

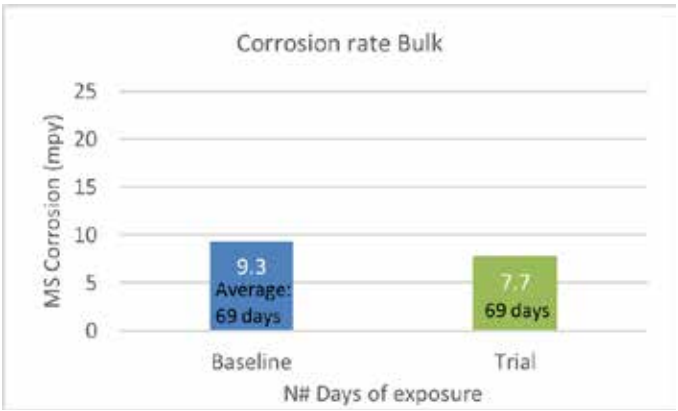

Chart 4 – corrosion rate on coupons installed on Bulk water

CONCLUSIONS

The main results delivered by 3D TRASAR Caster Technology can be summarized as follows:

- Certified TCO savings of 400 k$/year
- eROI: 167%
- 3D TRASAR Caster Technology proved effective in providing consistent information on spray chamber corrosivity, pH and water temperature.
- Corrosion rates on the spray chamber environment (Zone 1) were reduced by 40%
- No evidence of scale and fouling on the spray nozzles during the trial
- The data logging capabilities of 3D TRASAR Caster Technology, allows Nalco Water to provide customers with actionable insights regarding the performance of their treatment.
- Machine availability, structure integrity and safety were improved, and peace of mind was delivered to the customer

The customer's trust of Nalco Water and their willingness to openly share key steel-making operational data regarding cost of maintenance, cost of lost production due to scale and corrosion, cost of safety measures linked to corrosion and scale were crucial to the success of this project.

The combination of Nalco Water's problem-solving approach, on-site expertise, and the application of new innovative digitally-enabled technology delivered improvements and allowed the customer to meet their goals.

Nalco Water's 3D TRASAR Caster Technology provides steel-making customers with a valuable proposition. It allows them to minimize their Caster Maintenance due to reduced corrosion, to maximize their Caster asset life as well as offering them the chance to maximize their production due to less downtime. Additionally, it results in considerable safety enhancement, due to the added protection, gained by maintaining the strength and integrity of the Walkways and Structures.

With this case Nalco Water was able to prove that its new patented 3D TRASAR Caster Technology, offers significant game-changing improvements for the continuous casting process, as well as providing substantial benefits and best in class digital technology for the steel-making industry overall.

Nalco Water, an Ecolab Company

North America: 1601 West Diehl Road • Naperville, Illinois 60563 • USA
Europe: Richtistrasse 7 • 8304 Wallisellen • Switzerland
Asia Pacific: 2 International Business Park • #02-20 The Strategy Tower 2 • Singapore 609930
Greater China: 18G • Lane 168 • Da Du He Road • Shanghai China • 200062
Latin America: Av. Francisco Matarazzo • nº 1350 • Sao Paulo – SP Brazil • CEP: 05001-100
Middle East and Africa: Street 1010, Near Container Terminal 3, Jebel Ali Free Zone, PO BOX 262015, Dubai UAE

ecolab.com/nalco-water

NALCO Water
An Ecolab Company