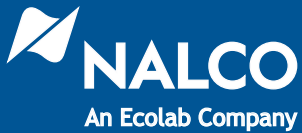


Nalco 3D TRASAR® Technology and Essential Expertise Improve Sustainability Performance at a Chemical Plant in Europe



CASE STUDY - CHEMICALS

CH-1502



INTRODUCTION

A major chemical plant located in northern Europe manufactures plastics and speciality intermediates which are then sold to a wide variety of industries. Sustainable development is at the heart of the business and operating philosophy of the parent company, which has a long history of making a positive contribution by improving the environmental performance of its global operations. The company is focused on continuously reducing its global water and energy footprint, and at the same time improving the efficiency of water and energy use.

As part of its commitment to sustainability, the company drives a continuous focus on the identification of new ways to optimise water usage, minimise wastewater emissions, and to reduce costs across its operations. At this particular manufacturing plant, a specific goal has been

established to reduce fresh (city) water consumption by 27% by the end of 2015.

BACKGROUND

Cooling systems on site were already acknowledged as large-scale users of water. As an important part of a new water management strategy designed to achieve the sustainability goal for water use reduction, new ways were being sought to reduce system makeup for these systems, and thereby reduce fresh water demand and waste water emissions for the site as a whole.

Nalco was asked to evaluate new opportunities to reduce the water consumption by these cooling systems, whilst safeguarding the operational efficiency of the critical heat exchangers. Any new programme should provide the necessary control of microbiology, and continue to prevent corrosion and scale formation in the systems.

ENVIRONMENTAL INDICATORS

Demand for fresh water reduced by 175,200 m³ per year

All data verified by the customer

eROI



ECONOMIC RESULTS

Reduced the Total Cost of Operation (TCO) by €85,000 per year

Water savings are equivalent the annual needs of 3,000 people

Nalco reports eROI values to customers to account for contributions in delivering both environmental performance and financial payback.

ACTION PLAN

Nalco and the personnel responsible for the management of utilities on site worked together to investigate an opportunity to recycle wastewater currently being collected and discharged directly from the site. This water was primarily rainwater which was being collected from the whole site and collected in a large holding basin. Samples of this water were taken over a period of time and analysed to identify any variability in quality linked to seasonal changes. In addition, the flow rate of wastewater being discharged from the basin was also measured and found to be constant at around 20 m³ per hour. The basin was located close to one specific cooling system which had a make-up rate of around 31 m³ per hour. Work was carried out to better understand the viability of using water from the basin as a major part of the make-up to the system, replacing up to two thirds of the current usage of potable water.

A Mechanical, Operational, Chemical, and Sustainability (MOCS) audit of the operation of the cooling system was carried out. The objective was to provide an assessment of the current water management application, with any required changes that would need to be made to improve the quality of the water so it could be used in place of up to 20 m³ per hour of potable water. This allowed improvements to be identified and savings in the Total Cost of Operation (TCO) to be quantified. In order to recycle the water, a number of steps were recommended to remove unwanted impurities and to make the water suitable for use as make-up to the cooling system. The treatment programme proposed is shown in Figure 1.

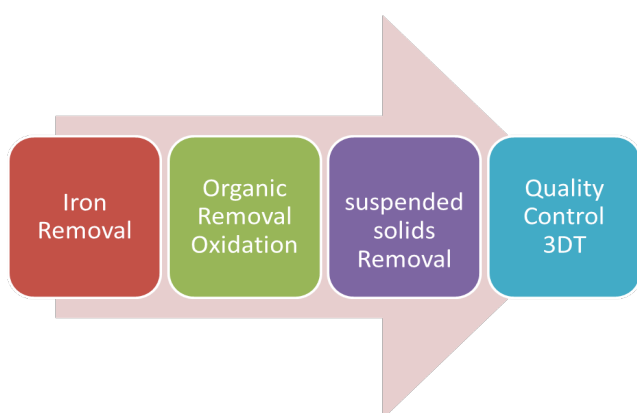


Figure 1 - Treatment strategy to recycle wastewater as cooling system make-up

This included the use of 3D TRASAR Technology and the Nalco 360™ Service.

3D TRASAR TECHNOLOGY

The 3D TRASAR cooling water management programme delivers on-demand control and optimisation of cooling water chemistry and microbiology, continuously protecting the system from corrosion, scale formation, and microbial infection



3D TRASAR control system

- Asset protection avoids premature and costly replacement of non-renewable materials.
- Scale and fouling control maximises energy efficiency and minimises CO₂ emissions and their global warming impact.
- Better water resource management minimises the demand for costly renewable resources, and safeguards public water supplies.
- The use of Nalco proprietary Phosphinosuccinic Oligomer (PSO) chemistry and tagged dispersant allow higher cycles to be achieved with lower ortho-phosphate levels

3D TRASAR technology meets the requirements of the Best Available Techniques for Industrial Cooling Systems under the EU Integrated Pollution Prevention & Control (IPPC) legislation in the categories of increasing overall energy efficiency, and reducing water use, emissions to air, and emissions to water.

3D TRASAR technology is used by thousands of corporations around the world to:

- Secure improvements in their environmental and economic performance
- Optimise cooling system efficiency
- Help them to meet their sustainability goals, specifically in the areas of water and energy use reduction.

3D TRASAR technology control systems take account of the inherent variability in system water conditions, maintaining protection from corrosion and scale by prediction of problems, and intervening before they occur. The programme controls system chemistry, dosing on-demand, and minimising the amount of materials added to the system, minimising costs without prejudicing system integrity.

Nalco 360

The Nalco 360 Service combines leading edge 3D TRASAR technology together with a team of highly trained experts to deliver peace of mind for water systems, 24 hours a day, 7 days a week, 365 days a year. The Nalco 360 Expert Centre, a team of highly trained engineers, chemists and industry experts, will consistently make recommendations for operational improvements and also take immediate action in response to any alarm conditions. Nalco ensures the highest level of expertise to monitor and defend customer assets, providing complete peace of mind. A sample 'dashboard' for system monitoring and performance is shown in Figure 2.

The Return On Investment (ROI) of the proposed programme met the customer's criteria of a three year payback, and the project received approval to proceed.

PROGRAMME IMPLEMENTATION

A Nalco 3D TRASAR system was installed to measure the Oxidation-Reduction Potential (ORP) and turbidity of the basin water, as part of the water quality control system prior to allowing the water to enter the cooling system. A second 3D TRASAR control system was installed to measure and control a range of parameters on the cooling system itself, ensuring that they are maintained in line with industry Best Practice.

To define the operating limits of the cooling system when using the new programme strategy, the 3D TRASAR Optimiser was used. This is a sophisticated process optimisation tool which identifies the advanced comprehensive treatment management programme necessary to protect a system from scale, corrosion, and microbiological fouling. As a result of this analysis, the treatment regime could be optimised using the new 3D TRASAR technology.

The Nalco programme is based upon automated real-time control of system parameters, and contains advanced chemistry to deliver comprehensive control of both corrosion and scale, and a unique polymer to deliver advanced corrosion protection. The use of the polymer also ensures good dispersancy and protection of the system at all times.

| Parameter Name | Date & Time | Latest Value | Avg. | Min. | Max. | St. Dev. | Low Critical Limit | Low Limit | High Limit | High Critical Limit | Latest Value |
|-------------------------|------------------------|--------------|---------|---------|---------|----------|--------------------|-----------|------------|---------------------|--------------|
| Ave HTI (hrs) | 11/18/2012 12:00:00 AM | 66.82 | 66.3 | 63.78 | 67.62 | 1.28 | 5 | 10 | 144 | 300 | |
| Cell Fouling (%) | 11/18/2012 8:00:00 PM | 0 | 0 | 0 | 0 | 0 | --- | --- | 50 | 100 | |
| Conductivity (µS/cm) | 11/18/2012 8:00:00 PM | 2462.8 | 2452.65 | 2407.15 | 2501.05 | 11.2 | 50 | 500 | 5000 | 20000 | |
| ORP (mV) | 11/18/2012 8:00:00 PM | 536 | 525.21 | 510 | 543 | 5.84 | 0 | 100 | 500 | 1000 | |
| pH | 11/18/2012 8:00:00 PM | 7.34 | 7.66 | 7.24 | 7.95 | 0.14 | 5 | 6 | 9 | 10 | |
| Polymer Consumption (%) | | N/A | | | | N/A | --- | --- | 50 | 90 | |
| Tagged Poly Dose (ppm) | 11/18/2012 8:00:00 PM | 48.13 | 49.84 | 47.14 | 52.73 | 1.3 | 5 | 20 | 300 | 500 | |
| TRASAR Dose (ppm) | 11/18/2012 8:00:00 PM | 18.93 | 19.89 | 18.43 | 21.61 | 0.8 | 5 | 20 | 300 | 500 | |
| Turbidity (NTU) | 11/18/2012 8:00:00 PM | 3.75 | 3.59 | 3.39 | 3.88 | 0.11 | --- | --- | 50 | 150 | |
| Steel Corr. Rate (mpy) | 11/18/2012 8:00:00 PM | 0.36 | 0.39 | 0.13 | 0.59 | 0.05 | --- | --- | 2 | 10 | |
| Copper Corr. Rate (mpy) | 11/18/2012 8:00:00 PM | 0.05 | 0.12 | 0.01 | 1.31 | 0.08 | --- | --- | 2 | 10 | |

Figure 2 - Sample 3D TRASAR data 'dashboard'

RESULTS ACHIEVED

As a result of using 3D TRASAR technology, management at the plant have been able to recycle the wastewater stream to the cooling system, and replace 65% of the current potable water demand. This has delivered a major reduction in the Total Cost of Operation (TCO) through better water resource utilisation and improved asset reliability.

By recycling 20 m³ per hour of filtered surface water from the collection basin, this has decreased the demand for potable supply by around 175,200 m³ per year, fresh potable water supplies have been conserved, the environment protected, and savings of around €85,000 per year have been realised. The overall reduction in the use of potable water on site has conserved precious water resources equivalent to the annual needs of 3,000 people.

CONCLUSIONS

The implementation of the 3D TRASAR technology has delivered tangible benefits in terms of system control, water reduction, and integrity of the assets involved, reductions in cost, and continued protection of public health. Sustainability performance has been improved through reduced demand for fresh water. The use of the Nalco 360 Service has also provided the customer with complete peace of mind in relation to programme performance, providing clear situation updates through a weekly 'Dashboard Report.' The use of the 3D TRASAR technology continues to help the customer achieve 100% compliance in terms of regulations and best practices for the control of *Legionella*.

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