Water Savings Achieved Through Create and Maintain Value (CMV) Philosophy in Air Separation Facility

NALCO Water
An Ecolab Company

CASE STUDY – CHEMICALS
CH-1162

BACKGROUND

In an Air Separation Facility where systems are new and conditions are almost on a design value, it is typically very difficult to find improvement projects to lead and demonstrate a supplier's differentiated value.

Using the Create and Maintain Value (CMV) Process, the Nalco Water team at this site identified the Key Business Drivers as: safety, sustainability, reliability, availability and productivity. They used the technology plan to help implement full core technology using 3D TRASAR Technology designed specifically for Cooling Water, Reverse Osmosis, Osmosis, and Boilers. Application of these technologies allowed more control and system assurance. Onsite assistance was then dedicated to achieve Sustainability and Six Sigma goals put forth by the customer.

This case study provides an overview of these efforts at one of the world's largest nitrogen facilities. During startup, a program to solve a heat exchange problem was implemented, returning all approach values to design. There was very little room for improvement in energy savings due to approach temperature and heat exchanger efficiency, so Nalco Water instead dedicated efforts to Improvement Projects.

BUSINESS SITUATION

This plant had been using three different wells as source of fresh water. These three wells had very different salt concentrations. One of the biggest concerns about these wells was that one of them had a very high silica concentration and the other two wells were high with chlorides. Therefore, there was a potential magnesium silicate scaling problem, and the use of SS304 and SS316 (stainless steel) for the heat exchangers pipes was making chlorides a limiting factor. In order to increase cycles of concentration, the plant reviewed several

ENVIRONMENTAL RESULTS	eROI℠	ECONOMIC RESULTS
Reduced water consumption by more than 150,000 m3/year	WATER	$90,000 USD per year from water savings

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

ideas, including Reverse Osmosis and a change in the heat exchanger's metallurgy. All of these ideas were costly and considered as long-term solutions. Aware of the situation and using core technology to monitoring and control of the cooling system, Nalco Water advocated reviewing all water being used in the system, including water recovered from air condensation on compressors. Results from this study guided the plant to water savings from increasing cooling tower concentration and savings not considered at the beginning by a better use of the condensate recovered.

THE SOLUTION

The CMV process led the team to perform an aggressive technology plan to differentiate from conventional programs. While the use of technology and expertise provided the opportunity to ensure results in all system, it also improved communications and alarms to signal system issues before they became problems. This technology and system visibility presented the opportunity to work in real time with the customers on their primary needs of water savings, sustain-ability projects and Six Sigma documentation.

On this site the amount of water needed for the cooling tower could only be supplied by the use of two wells. The original arrangement was to use wells with the same extraction rate with a possible system concentration of 3.07 cycles and limited by silica. When the plant was operating with the two wells with high chlorides, the system concentration needed to be reduced up to 2.78 cycles because of very high potential corrosion on SS304. The use of Sodium Hypochlorite to control organic growth increased chlorides approximately 5 ppm due to the high organic charge and the tropical weather of this region.

Nalco Water coordinated with the customer to run several water tests on the different sources of water and on all water inlets to the system. With all sources clearly identified, several simulations were performed of the system using the 3D TRASAR optimizer in order to see what water mixture could best help the customer to increase cycles and prevent scale (magnesium silicate) and /or corrosion (in SS304). Nalco Water presented the results to the customer and recommend the following concrete actions:

a) Controlling the percentage of use of each well to achieve optimal makeup water quality.

b) Configuring 3D TRASAR technology to control the system with a maximum conductivity according to salt concentration and limiting factors.

c) Installing a level control in the makeup water tank in order to control the mixture of all wells before going in to the cooling system.

d) Periodic analysis of water sources and mixture to prevent changes in this arrangement.

e) Eliminating other sources of water to the system.

The original reason to eliminate other sources of water was to avoid negative impacts or contaminations. However, the detected source was generated by air condensate coming from the air compressor on the process. This 60 m^3/day source of water was designed to be wasted in the cooling tower. Nalco Water also made a recommendation to use this source of water as makeup water for the heat recovery steam generators (HRSG) to generate steam, because this water has the same quality as demineralized water.

ENVIRONMENTAL/ECONOMIC RESULTS

The facility realized the following results:

1. By using this approach the plant increased cycles from 3.0 to 3.5 cycles and reduced water consumption by 7%. This represented savings of US $44,962 /year and 131,365 m^3/year. See Figure 1.

2. Using condensed water from an air compressor as feed water for HRSG's instead of wasting on cooling tower, there were savings of 21,900 m^3/year of demineralized water that represented savings of US$44,937 / year. There were also additional savings on cartridge filters, membrane cleaning products and frequency, etc. See Figure 2.

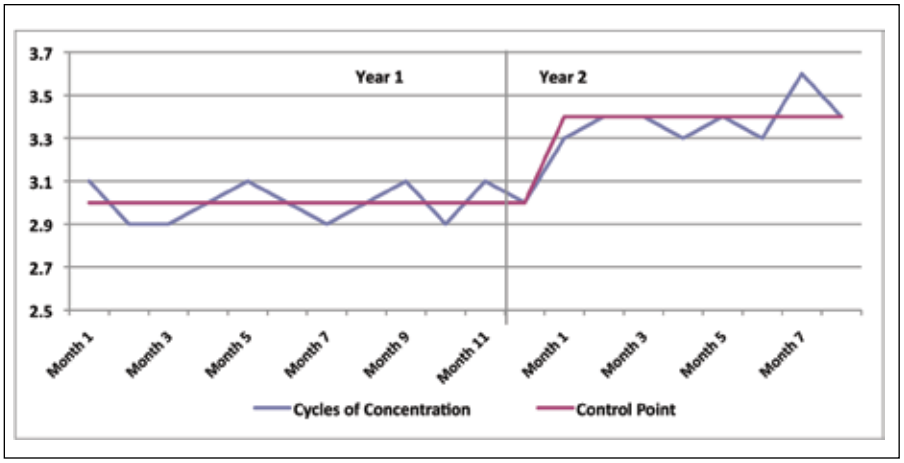

Figure 1 – *Increase of cycles of concentration from 3 to 3.5.*

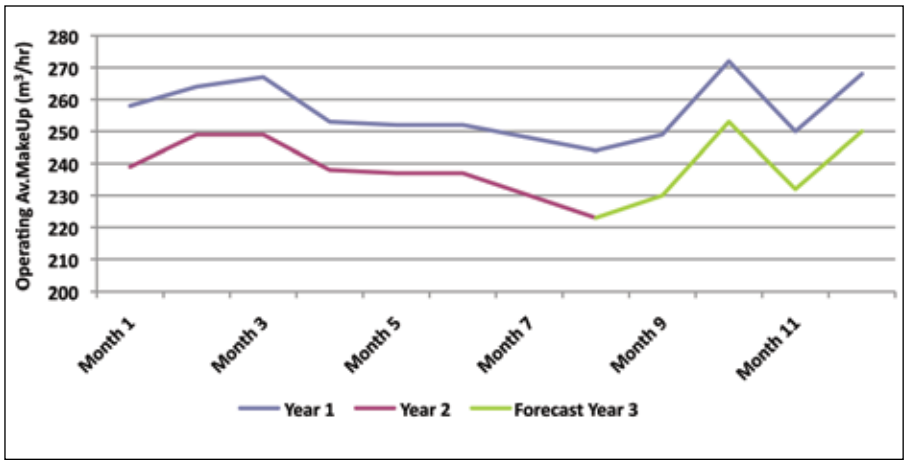

Figure 2 – *Decrease of demineralized water by 21,900 m^3/year.*

Nalco Water reports Environmental Return on Investment (eROI) values to customers to account for contributions in delivering both environmental performance and financial payback.

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