

Ecolab® CondenserIQ™ Helps a Northern European Customer Save 3 Million Euros per Year

NALCOWater
An Ecolab Company

CASE STUDY - POWER
CH-2061E

By focusing on our customers critical key business drivers, Nalco Water utilized CondenserIQ to evaluate the performance of their main condenser and developed a value-based partnership to deliver a step change in plant efficiency which delivered agreed savings of 3.5 Million Euros per year.

BACKGROUND

A 500 MWe coal-fired power station in Northern Europe supplies electricity to a fiercely competitive marketplace where production costs are critical to profitability. Market demand is variable and when demand is high the plant needs to run at maximum capacity to optimize revenue.

The customer routinely cleans the condenser and cooling tower during planned outages but frequently noticed performance decline when the system becomes fouled with biofilm. The lost performance impacts the plant's profit and loss (P&L) in terms of increased fuel consumption, increased CO₂ taxation and potential loss of revenue when market demand is high. These losses have been estimated at 3.5 million euros per annum.

Nalco Water worked with the customer to identify and quantify the impact of reduced condenser efficiency using our Condenser Performance Monitoring Tool (CPMT) and agreed a range of system upgrades.



CUSTOMER IMPACT

ECONOMIC RESULTS

Reduced 50,000 tons of CO₂ emissions per year



Improved sustainability performance and costs of carbon taxation

Reduced 22,000 tons of coal burned per year while producing the same amount of energy



Annual savings of 3 million Euros

Reduced the need for condenser and cooling tower cleaning



Savings of \$200K per year

Improved microbiological and Legionella control



Improved overall water safety and increased cleanliness

Reduced CO₂ emissions tax, coal burned, cleaning needed for the condenser and cooling tower, and improved safety



More than 3.5 million euros in operational costs saved per annum

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

SITUATION

The plant configuration includes a recirculating evaporative cooling system that feeds river water to a set of large natural draft parabolic cooling towers with a recirculation rate in excess of 50,000 m³/hr. The system has historically been treated using acid and sodium hypochlorite with limited measurable benefit in terms of improving or maintaining plant performance. The backpressure on the plant turbine typically increases noticeably a few weeks after a physical cleaning despite efforts to mechanically and chemically clean the system as biofilm builds up on the cooling tower fill and condenser heat exchange surfaces. Biofilm has a significant impact on heat transfer (thermal conductivity is five times lower than calcium carbonate scale) and six to seven weeks after a physical clean the condenser performance had deteriorated to pre-clean levels.

SOLUTION

Nalco Water's proposal was to implement CondenserIQ which comprises the following benefits:

- Condenser and cooling tower performance monitoring tools to benchmark the plant versus design and industry metrics
- Quantifying the benefits of recovering plant performance using industry standard methodology and translating this into potential annual savings
- Implementing a comprehensive cooling water treatment program to recover plant efficiency
- Measuring and quantifying the benefits associated with the treatment to justify a permanent installation
- Peace of Mind - by digitally linking the plant operating conditions and treatment of the cooling system to the Ecolab Global Intelligence Center to provide 24/7 oversight of the key performance metrics to ensure all the gains achieved are retained and corrective action taken in the event of any deterioration.

Nalco Water undertook a detailed technology and engineering survey of the site including a historical evaluation of condenser performance using the CPMT and quantified the impact of reduced condenser performance. An upgrade to the plant biocide control strategy to use Nalco Water's PURATE™ Technology was recommended (Fig.2 & Fig.3). This was combined with a project to add a selection of remote wireless plant performance monitoring equipment (temperatures, water and air flow rates, humidity) integrated along with plant Distributed Control System (DCS) data via 3D TRASAR™ Technology and the EnVision platform to manage the biocide dosing strategy and measure improvements in plant performance.

PURATE was dosed intermittently for as little as four hours per day at the condenser inlet to provide enhanced localized cleaning of the main plant heat exchanger and also providing background biocide

treatment for the main cooling system.

Over a period of several weeks an improvement in system cleanliness and a significant reduction in the overall microbiological activity in the system were recorded with slime forming bacteria counts dropping from 100,000 cfu/ml to 100 cfu/ml.

Nalco Water's online monitoring and control technology was utilized to evaluate and quantify the improvement in condenser and cooling tower cleanliness as well as to link this directly to enhanced plant fuel efficiency and reduced CO₂ emissions. This improved plant performance was a key factor in determining if the power produced from the site was sufficiently cost competitive to be bid into the power market.

RESULTS

Nalco Water's treatment effectively cleaned existing biomass from the cooling system in a carefully controlled dosing regimen over a period of two to three months (Fig.1)

This was demonstrated using the data produced from the additional monitoring and control equipment provided by Nalco Water and this information was then used to quantify the value provided to the customer.

In monetary terms, the savings in fuel and CO₂ were in excess of 3.5 million euros/year. More importantly, we were able to reduce the environmental impact for the same amount of power produced.

Nalco Water effectively demonstrated and communicated the value delivered as shown by the exponential return on investment in the form of:

- Savings in fuel used to generate power (fuel efficiency) allowing for MORE Power with LESS Fuel
- Increased power output to meet peak market demand allowing for a BOOST of Power when needed
- Managed system microbiology - especially as a component of Legionella compliance management, providing peace of mind on water safety
- Reduced CO₂ emissions to improve sustainability performance and costs of carbon taxation

This improvement in plant performance has allowed the site to establish a competitive position in their national generation portfolio and will be influential in their long-term viability as an operational plant.

The customer has asked for permanent installation of both PURATE Technology and 3D TRASAR Technology to embed the savings into their mid- to long-term forecasts.

Back Pressure and ClO2 Set Rate

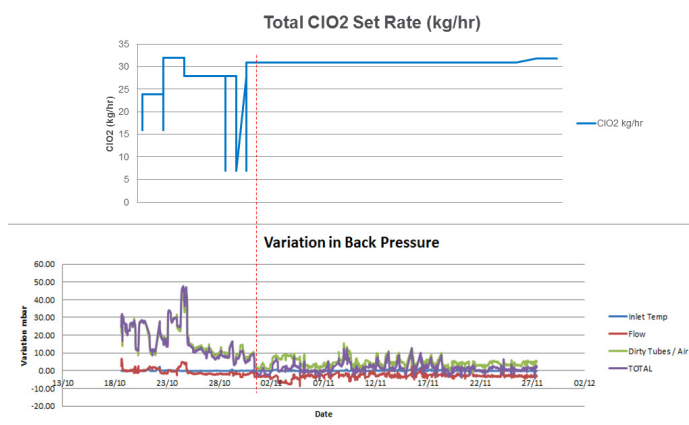


Fig.1 - Data correlating the dose rate of Nalco Water's PURATE with the condenser back pressure showing improvements in plant performance



Fig.2 - Fully containerized PURATE Generator installed on customer site



Fig.3 - Inside view of PURATE container showing control panel and chemical storage tanks

