

# Ecolab® CondenserIQ™ Program Optimizes Performance at a Combined Cycle Gas Turbine Unit, Delivering \$370K in Annual Savings

## CASE STUDY



### ▶ BACKGROUND

A large European utility company wanted to focus on enhancing the operational flexibility of their 450-megawatt (MW) combined cycle gas turbine (CCGT) unit located in the United Kingdom. A key requirement was to maintain optimal efficiency of their surface condensers, which were critical to the power plant's operations. The company operated four condenser units, each connected to a separate cooling tower, along with a gas turbine (GT), steam turbine (ST) and heat recovery steam generators (HRSGs).

The plant utilized Ecolab® CondenserIQ™, which integrates data from the power plant's data historian into the ECOLAB3D™ platform. This program applies industry-standard thermal performance calculations along with the plant's specific design information to plot various trends, helping users understand the performance of the condensers. The CondenserIQ program includes a predictive model that forecasts potential condenser issues based on current operating conditions, incorporating not only condenser data

but also cooling water data and geographical weather information.

During a routine asset health check for condenser unit 4 at the customer plant, the Ecolab Global Intelligence Center (EGIC) team identified a 10.2% increase in the condenser differential pressure between the inlet and outlet of the cooling water tube side, and a 3.28% drop in cooling water flow through the tubes over 65 days. A macrofouling issue was suspected, and a predictive alarm for this issue was triggered, prompting communication with the customer.

The EGIC team informed the Industry Technical Consultant (ITC) and field team about the issue, and added an action log in the ECOLAB3D platform to provide insights into the declining performance of the condenser. The customer reported that a damaged fire suppression system allowed high velocity flow to damage the cooling tower fill (packing). This material plugged screens and reduced the cooling water flow.

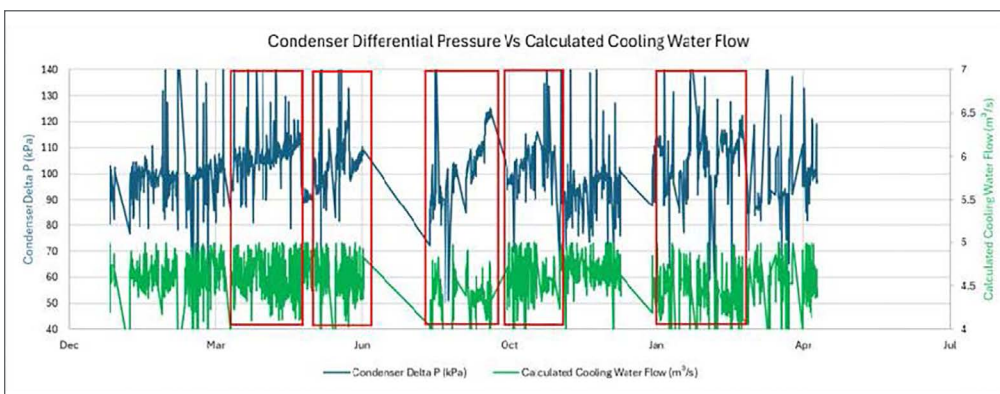


#### ANNUAL SAVINGS

 **ENERGY**  
**3,228 MW**

 **GREENHOUSE GASES**  
**1,036 tons of CO<sub>2</sub>**

 **TOTAL VALUE DELIVERED**  
**\$370,000**



**Figure 1:** Unit 4 data showing frequent macrofouling events identified utilizing the CondenserIQ Program

## ► SOLUTION

Acknowledging the Nalco Water team's observations, the customer initiated a tube pick to clear debris from the condenser tubes, successfully restoring the condenser's performance to its previous levels. With the assistance of the CondenserIQ program, similar issues were also identified in condenser unit 2 and condenser unit 3, revealing that all three units were experiencing persistent problems due to cooling tower debris obstructing the tubes, causing an average equivalent loss of 12 MW per day and a daily revenue loss of approximately \$998. This scenario would translate into an annual impact of \$276,900. While the customer could not immediately resolve the issue of the degraded cooling tower fill (packing) because it would require a long outage period, the CondenserIQ™ program insights enabled them to schedule maintenance activities strategically to clean specific condenser inlet water boxes during off-peak hours, based on the rate of increase in differential pressure and reduced cooling water flow.

## ► RESULTS

The early detection of efficiency losses due to macrofouling in units 2, 3, and 4 enabled the plant to schedule cleaning activities strategically during off-peak hours.

Had these issues gone undetected, the losses could easily have escalated exponentially if they had led to a de-rate or a unit trip due to high backpressure. By leveraging human intelligence, predictive analytics and real-time data monitoring through the ECOLAB3D™ platform, the plant was able to optimize its maintenance schedule, ultimately saving much more than the initial figures suggest. This strategic foresight underscores the value of early detection in maintaining plant efficiency and minimizing financial impact.

- ✕ **Cost savings:** Proactive detection and management of condenser issues led to improved efficiency and avoiding daily losses of about \$998
- ✕ **Environmental impact:** Preventing additional greenhouse gas emissions contributed to conservation efforts, with an estimated 2.84 tons of extra CO<sub>2</sub> emissions avoided daily

Additional data analysis and predictive modelling showed that by addressing the root cause of the cooling tower debris, the plant could improve heat rate by approximately 0.12%. This heat rate improvement would provide a fuel/energy savings of >\$220,000 per year. Armed with this information, the plant easily justified the replacement of the damaged cooling tower fill (packing) during a maintenance outage.

## ► CONCLUSION

This case illustrates the importance of continuous monitoring and maintenance in optimizing plant operations. Through the ongoing collaboration between ITC, account owners and the EGIC, the power plant was able to identify potential issues early and implement effective maintenance strategies. The collaboration enabled the customer to recognize significant savings and reverse potential losses associated with condenser inefficiencies. By connecting these losses to a heat rate penalty, the customer was able to make a more informed decision on a major capital project to upgrade the cooling towers. This continuous improvement emphasizes the critical role of predictive analytics and real-time data in sustaining plant performance and enhancing overall operational resilience.