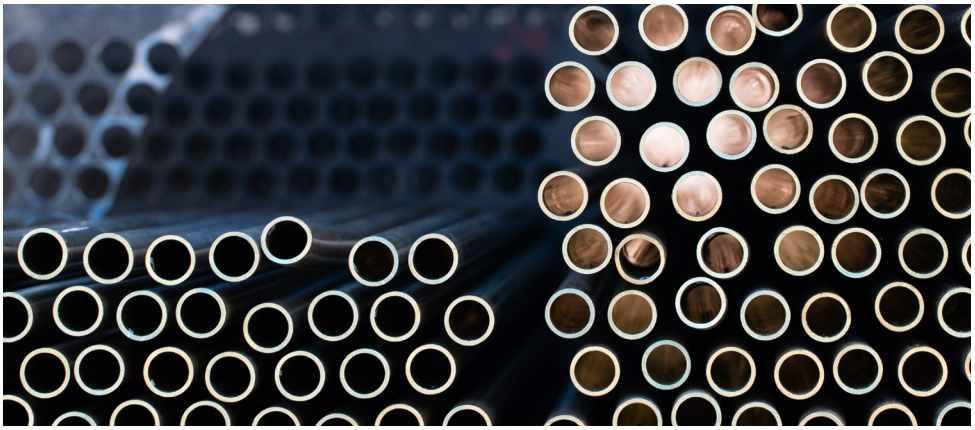
CASE STUDY

OMNI™ Air Separation Performance Reduces Energy Consumption To Help Air Separation Plant Save $259,000 Annually



BACKGROUND

An air separation plant in Malaysia consists of two main air compressors and six intercoolers with a capacity of producing 110 MMSCFD of nitrogen and liquid oxygen. Unfortunately, over the past two years, the normalized energy consumption of the nitrogen recycle compressor has risen by 3% due to a loss in thermal efficiency, as illustrated in Figure 1. This increase in energy consumption has made a significant impact on profitability and poses a potential reliability risk for the compressor, necessitating potential premature shutdowns for maintenance.

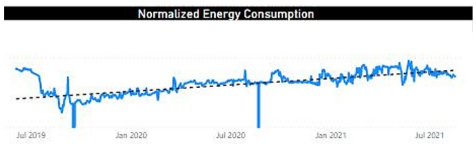


Figure 1: Normalized energy consumption increased by ~ 3% in the last 2 years

With a 3% increase in energy consumption, the plant found itself incurring an additional $200,000 annually for electricity expenses.

The primary objectives of the plant's operations were to enhance reliability and reduce overall operating costs. However, the decline in the compressor's efficiency was eroding profitability and putting significant pressure on the plant manager to take immediate action.

To address the decreasing compressor efficiency, the plant manager considered offline cleaning of the intercoolers, which would require a two-day shutdown of the unit at a cost of $100,000 per day. However, shutting down the compressor was not a viable option due to the high demand for their products, and would also lead to the shutdown of their clients' operations.

ANNUAL SAVINGS

ENERGY

Reduced consumption by
4,194,300 kWh

GREENHOUSE GASES

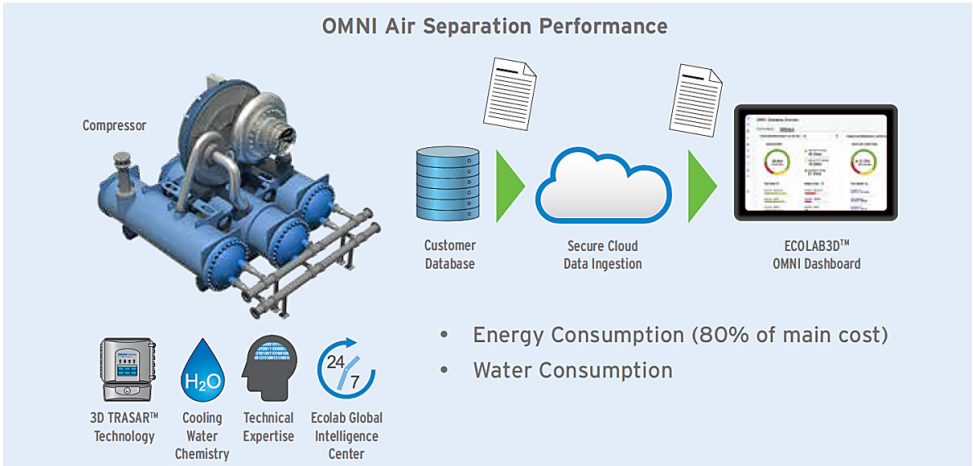
Reduced CO_2e by
1,698 metric tons

TOTAL VALUE DELIVERED

$259,000

SOLUTION

The Nalco Water team proposed a proprietary, digital service — OMNI Air Separation Performance, powered by ECOLAB3D™. This innovative platform includes secure data assimilation, cloud analytics, and a remote expert center—all with unique diagnostic tools that increase visibility and correlate information to critical plant Key Performance Indicators (KPIs).



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The platform ensures the right program decisions are made, thereby improving the reliability of the water-cooled heat exchanger and reducing electricity consumption on main air compressors.

The program enabled implementation of cloud analytics and obtained additional performance indicators, including water velocity, skin temperature, heat transfer coefficient (U value) and cleanliness factor. OMNI Air Separation Performance models the electrical consumption by compressor stage on a continuous basis and correlates its variations with critical chemistry variables. As a first step, the plant compiled one year of data from main air compressors and its intercoolers. This allowed the experts to retroactively identify specific events in time where the chemistry variables impacted overall performance.

RESULTS

Through the implementation of OMNI Air Separation Performance, various issues were uncovered at the customer's plant that were affecting the normalized energy consumption. Notably, these included higher cooling water supply temperatures, resulting from the inefficient performance of the cooling tower compared to its design. Additionally, there were problems with uneven water distribution in the compressor intercoolers, and the customer's inability to continuously monitor the intercooler U value, which hindered their ability to respond quickly to changes. Based on these discoveries, the cooling tower fill pack was replaced during the turnaround, leading to a remarkable reduction in cooling water supply temperatures by 1.6° Celsius. As a direct consequence, the compressor gas inlet temperatures experienced an average decrease of 1.4° Celsius. The lower inlet temperatures resulted in an increased nitrogen mass flowrate that could be compressed, leading to a substantial 10% boost in production capacity.

Furthermore, the data monitoring trend results provided by OMNI Air Separation Performance helps customer identify U values and intercooler cooling water flow online. The data obtained shows that U values decreasing related with uneven water distribution and chemistry-related concerns. With this information, our customer and the Nalco Water team were able to fine-tune water flow, enhance oxidizing biocide, and optimize corrosion inhibitor injection. As a result, intercooler performance saw a remarkable average 7% increase in cleanliness factor across all heat exchangers.

The combined improvements and actions taken based on OMNI Air Separation Performance identification have resulted in a remarkable reduction in normalized energy consumption, leading to a total plant energy savings of 4,194,300 kWh annually, equivalent to $259,000 USD per year. These energy-saving endeavors have not only bolstered the plant's financial performance but also delivered substantial environmental benefits, including a significant reduction of approximately 1,698 tons of CO_2 emissions per year. This commitment to sustainability aligns perfectly with Nalco Water's dedication to supporting customers in their pursuit of achieving Environmental, Social, Governance (ESG) objectives.

CONCLUSION

OMNI Air Separation Performance provided critical insights into the customer's operations, allowing the Nalco Water team to detect poor trends in key stress indicators that directly impact reliability. With the support of Nalco Water subject matter experts and years of experience in heat exchanger monitoring, these insights led to actions that reduced customer energy consumption equivalent to $259,0000 USD per year. Overall, these efforts helped the plant operations become cleaner by reducing greenhouse gases and contributing to their sustainability goals.

Figure 2: Normalized energy consumption reduction after implementing OMNI Air Separation Performance

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