PURATE™ Chlorine Dioxide Technology Delivers on Performance Improvements and Total Cost of Operation at North America Nitrogen Processing Plant

NALCO Water
An Ecolab Company

CASE STUDY - HEAVY

CH-2088

Background

A North American nitrogen processing plant operates one ammonia plant, one nitric acid plant and one urea granulation plant, producing in total more than 5,000 tons of nitrogen-related product.

The facility is committed to providing the lowest unit costs in the industry and strives to utilize leading edge technology to ensure that its operation is streamlined, efficient and cost-effective.

The plant's technical team reviewed its microbial program with its cooling water systems. The site was utilizing chlorine gas cylinders and bromine as oxidants, non-oxidizing shocks once a month, and bio-dispersant shock once every two weeks. While these measures provided adequate control, site engineers recognized the potential benefits of further optimizing their microbial water management program. Those benefits included plant efficiency, cost, and safety.

The team made the decision to convert to on-site chlorine dioxide production using Nalco Water's PURATE™ Chlorine Dioxide Technology as their primary method of microbial control.

Environmental Impact	eROI™	Business Impact
Reduced non-oxidizing biocide consumption by 70% and biodispersant consumption by 75%	COSTS	More than $145,000 in savings annually
Blowdown reduction or increased in cycles saved 40,000 m^3 make-up water and 6,000 m^3 of wastewater reduction	WATER	Saved $100,000 annual savings
Reduced corrosion results in potential reduced equipment maintenance and increased asset life	ASSETS	
Reduced heat exchanger biofilm (88%) results in potential for improved heat transfer efficiency	ENERGY	$170,000 of potential savings or cost avoidance due to increased energy efficiency and asset protection
Eliminated operator handling of chlorine gas	SAFETY	

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

The following project goals were established:

- Reduce biological growth in the cooling water system
- Reduce overall chloride contribution in the cooling towers
- Minimize the use of non-oxidizing biocides
- Reduce cooling water blowdown going to neutralization tank/evaporation ponds during biocide treatment
- Reduce overall corrosion in the cooling water system

Solution

The PURATE process generates chlorine dioxide (ClO_2) using two precursors, one of which is sulfuric acid. The on-site generator technology has been engineered for reliable and efficient operation, generating ClO_2 at greater than 95% efficiency. As a result, PURATE has proven more cost-effective than traditional three-precursor systems that use sodium chlorite, bleach and hydrochloric acid. In additional, the PURATE program does not contribute potentially corrosive chlorides like traditional halogen treatments, helping protect vital investments for operations.

Results

After eight months of operation, key performance indicators showed significant improvement. Measurements gathered prior to and post PURATE installment showed reductions in chloride, microbiological activity and corrosion rates. During the period the plant realized significant reduction of non-oxidizing biocide use, reduced biodispersant use, increased cycles of concentration, and reduced freshwater consumption and blowdown. As outlined above, these factors resulted in the immediate cost reduction related to biocide and water consumption as well as potential savings and cost avoidance from asset efficiency, maintenance costs, and asset life.

Specifically, the average chloride levels reduced by 36% and 21% post install in the NH3 and Urea plants, respectively, helping reduce freshwater consumption and blowdown and associated costs.

In addition, biofilm formation can cause up to 10 times more insulation for heat transfer than scale formation. With the installation of PURATE technology, biocounts decreased by 77% and 88% in the NH3 and Urea plants, respectively, helping optimize heat transfer coefficient in critical heat exchangers.

With respect to corrosion, post PURATE installation and pH control showed corrosion potential reduce to nearly zero for NH3 and Urea assets. This data suggests the potential to reduce maintenance costs, extend critical asset life and assure expected turnaround times. The Nalco Water team collaborated with the plant's technical team to further optimize the system by exercising pH control to minimize corrosivity of water, further declining or eliminating any indication of corrosion potential.

Conclusion

Overall, the nitrogen processing plant continued its commitment to providing the lowest unit costs in the industry. With the implementation of PURATE Chlorine Dioxide Technology, the facility realizes the benefits of reduced overall microbial costs and peace of mind that its microbiological activity is under control, further helping optimize production and plant profitability.

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