Minnesota Specialty Yeast

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Organization Background

Minnesota Specialty Yeast (MSY) is a subsidiary of the Canadian company Lallemand and develops specialty yeast products for the food and agriculture industries. Their facility in Hutchinson, MN, uses a continuous fermentation process to produce 7.5 million tons of yeast cream per year.

"My MnTAP internship at MSY helped bridge the gap between academic theory and practical application. Collaborating with existing staff and bringing in engineering insights aided MSY in their pursuit of greener yeast production and rewarded me with in-depth discussion and firsthand troubleshooting at scale. My experiences at MSY give me an edge both in the classroom and in my career by exploring a dynamic industrial system." ~ ML

Project Background

MSY uses privately owned wells to supply water at up to 1,300 gallons per minute for cooling needs with additional process water supplemented from the City of Hutchinson. The facility typically discharges approximately 1.2 million gallons per day of well water to the Crow River. Wanting to preserve the longevity of their water supply while reducing their discharge output, MSY sought a MnTAP intern to help evaluate options to reduce cooling water usage. The facility was able to explore multiple alternative cooling options with support of the intern, who began by mapping out the water flow paths and heat loads of equipment throughout the facility.

In addition to water conservation, MSY wanted to decrease their phosphorus output by reevaluating their process SOPs. Phosphorus is a water pollutant that can be harmful to aquatic life in excess amounts and costly for wastewater treatment plants to remove. Phosphoric acid is used at Minnesota Specialty Yeast as a macronutrient for the yeast, as well as for pH regulation of their fermenters. The intern assessed the opportunity to reduce the phosphorus consumption and output and quantified the potential cost savings for the chemical reduction and sewer charges.

Incentives To Change

With environmental regulatory limits in wastewater effluent tightening in many locations across the state, both publicly owned treatment works (POTWs) and industrial businesses throughout Minnesota are closely monitoring phosphorus levels in waterways. This project built upon previous work MnTAP had done with MSY to explore opportunities for phosphorus reduction. Decreasing phosphorus loading would conserve phosphoric acid, reduce the treatment burden on the downstream Hutchinson POTW, and lower sanitary sewer charges.

MSY also sought for opportunities to conserve water usage and decrease demand on their wells. This would save on operation and maintenance costs, preserve the lifetime of the wells, and combat microbial growth in their aquifers. Additionally, lower water consumption would offer the facility the flexibility to meet any potential future permitting restrictions on water pumping or discharge limits.

"In addition to Matthew applying his knowledge and skills to the summer's projects, he learned business and manufacturing plant operations, process knowledge and capex planning. Plant personnel working with Matthew appreciated his dedication and what they learned from interacting with him. We will definitely be applying for the program again."
~ Scott Sederstrom, HSE Manager

Solutions

Optimize pH Procedure by Prioritizing Sulfuric Acid Usage

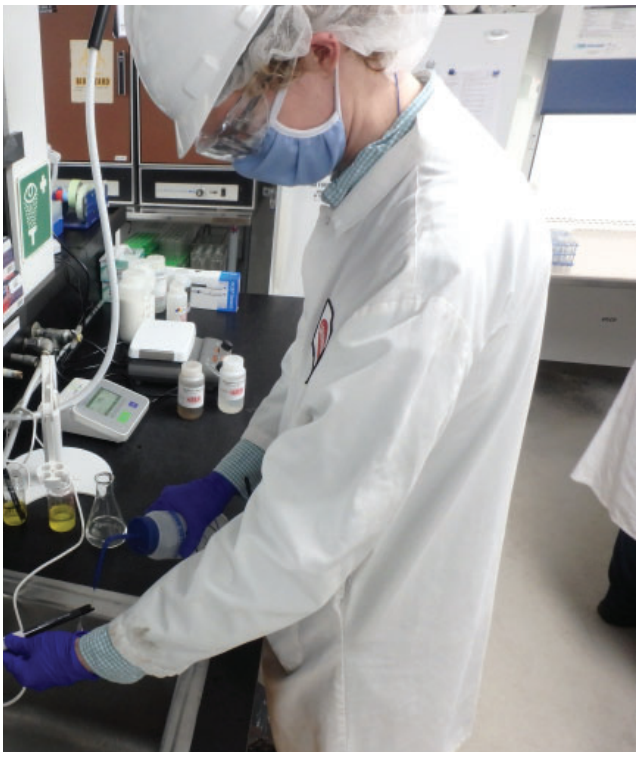
Part of the microbial treatment of the yeast cultures is to decrease the pH to conditions in which the yeast is resilient but other microbes are not. The intern found a consistent increase in phosphorus output to the sewer associated with this procedure. By conducting bench scale laboratory experiments to simulate the process, a new target pH and corresponding flow rate of sulfuric acid were determined. These new process conditions would allow pH in the fermenters to be driven by sulfuric acid rather than phosphoric acid. By updating their pH operating procedures, MSY would be able to reduce their phosphoric acid usage and prevent over half a ton of phosphorus per year from going to the sanitary sewer, netting them over $6,000 in savings from reduced chemical and sewer charges.

Use Cooling Tower to Cool Air Compressors

MSY cools their air compressors using a closed loop, which is in turn cooled by single-pass well water. The intern determined that a cooling tower could replace the single-pass well water stream with a recirculating loop, reducing the well water demand for this process by over 95%. This equates to over 100 million gallons of well water saved annually.

Use Spent Cooling Water for Boiler Make-up

The intern found an opportunity to reduce water consumption and reclaim process heat by proposing the reuse of softened well water from cooling processes for boiler make-up water. This well water, having been warmed from cooling the fermenters, could replace the colder city water currently used for the boiler feed and would require less energy to be heated to steam. This switch in water source could amount to 3,900 therms of energy and 1.3 million gallons of water saved. Overall cost savings from this recommendation is $7,500.



Recommendation	Annual Reduction	Annual Savings	Status
Optimize pH Procedure by Prioritizing Sulfuric Acid Usage	1,040 lbs Phosphorus	$6,400	Testing Planned
Use Cooling Tower to Cool Air Compressors	100 million gallons	$4,700	Further Investigation Needed
Use Spent Cooling Water for Boiler Make-up	3,900 therms 1.3 million gallons	$7,500	Recommended
Reduce Centrifuge Rinse Times	480,000 gallons	$4,300	Planned

MnTAP Advisor: Daniel Chang, Associate Engineer