AJINOMOTO HEALTH & NUTRITION NORTH AMERICA, INC.

EDDYVILLE

2025 28-WEEK CO-OP PROJECT

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COMPANY PROFILE:

Ajinomoto Health & Nutrition North America, Inc. (Ajinomoto), founded in 1909, is a Japanese-based food and amino acid producer with more than 34,000 employees worldwide and annual sales exceeding ten billion dollars. Dedicated to its mission to improve the health of humankind, Ajinomoto produces high quality products to resolve food and health issues globally. Ajinomoto is the world's largest producer of monosodium glutamate (MSG), a flavor enhancer that is naturally present in many foods. The location in Eddyville, Iowa, focuses on the production of MSG as well as amino acids for farm animal consumption, including lysine, threonine, and tryptophan.

PROJECT BACKGROUND

One of Ajinomoto's business commitments is to reduce impacts on the environment through energy and greenhouse gas (GHG) reduction sustainability projects. The objective of this 28-week co-op is to evaluate specific manufacturing unit operations to determine if improvements in energy efficiency and water usage can be realized. Several specific unit operations are under investigation, primarily focusing on process heat exchangers, flash steam vent condensers, and forced circulation evaporators. The intern began by assessing current operating parameters and then devised strategies to create or restore sustainable energy and water usage.

INCENTIVES TO CHANGE

Energy prices continue to rise. Water scarcity is a real risk to both business and the environment. Additionally, Ajinomoto has a commitment to reduce GHG emissions by 50 percent by 2030. All these serve as strong incentives to fully explore energy and water recovery opportunities. Additionally, stable, and safe operation are the top priority for Ajinomoto. Effective and efficient unit operations are inherently more dependable. These projects can directly reduce GHG emissions, cut water and energy use, and facilitate long-term cost-savings and improve reliability.

RESULTS

An in-depth energy assessment was conducted on specific unit operations by reviewing current performance against design basis. A detailed investigation of historical and current operational data was conducted using several methods, such as the plant data historian system, as well as manual field readings, reviewing process and instrumentation diagrams (P&ID), original equipment drawings and specifications, and communication with the specific equipment vendor representatives. This investigation often would result in identifying lost efficiency due to bypassed energy or water recovery equipment due to fouling. It also led to realizing underutilized equipment either by mis-operation or mis-design against current operation conditions. It was based on these findings that the following recommendations have been identified as part of the intern's work:

Recover Energy Using Wastewater Heat Exchanger
In the past, the facility idled a heat recovery heat exchanger due to operational challenges, primarily heat exchanger (HX) fouling. A thorough analysis was made of current data and site operation, and an investigation of why the unit was taken offline in the past. It was determined that consistent plugging of the heat exchanger was the primary reason the equipment was bypassed, along with lack of site awareness of the unit operations contribution to overall energy savings.

By putting the idle heat exchanger back into service, there is projected to be a significant reduction in the usage of steam as the unit will be recovering up to 30,000 Btu of heat per hour that is currently being lost and sent to wastewater. To address the operational challenges, new plate packs with wider gaps for passing solids are being considered. The anticipated savings of this change is more than $90,000 per year, and a simple payback is estimated to be 3-4 months. The next step will be to submit a testing plan to the manufacturing plant production team to perform a commercial plant test for this redesign. Additionally, the intern will determine how to maintain the tracking of energy performance to make the value contribution to the business visible for all stakeholders.

Maximize the Flash Steam Condenser Performance
The manufacturing plant's steam condensate recovery system was realized to be wasting a significant amount of energy due to flash steam generation and venting to the atmosphere. An investigation of the system revealed the HX used to capture this excess flash steam energy was not performing as designed. Several candidates for root cause have been identified, including steam trap failure, heat exchanger fouling, and excess flash steam loading as the primary candidates. Optimizing this steam heat recovery system will recover more of the available latent heat and condensate water, which can be utilized in preheating the incoming boiler makeup water and reducing the

natural gas usage, and overall utility expenses. The next step is to perform root-cause investigations into why these steam system conditions exist during the annual plant outage, and then take corrective actions, which could include things like cleaning, trap repairs, or adjustment of the process controls.

Improve Vapor-to-Steam Ratio Monitoring and Control
Ajinomoto uses several steam and water energy intensive unit operations in their evaporation processes. One of the efficiency performance metrics is vapor-to-steam ratio, which is an indicator of the efficiency of the evaporator's utilization of steam heat energy. The target of this project is to promote higher awareness and utilization of this asset's health metric. Higher vapor-to-steam ratio indicates more efficient water removal and lower energy usage and cost. The project began with reviewing the original equipment design data & evaluating past calculation methods. The intern identified any missing data or updated calculations necessary for accurate real-time monitoring.

The next step of this project will be creation of live dashboards that will enable stakeholders to monitor the vapor-to-steam ratio, as well as the energy and GHG impacts of this equipment. This will allow stakeholders to understand performance in real-time and adjust for maximum efficiency. It also will make this data more visible in the decision-making process to maximize efficiency, aligning with Ajinomoto's sustainability objectives.