CARGILL, INC.

CEDAR RAPIDS

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COMPANY PROFILE

Cargill is a privately-owned business that began in 1865 as a grain storage facility. It has grown to be a global producer and marketer of food, agricultural, financial and industrial products and services. Cargill is committed to environmental stewardship and strives to be a good corporate citizen in the communities that it serves. The Cedar Rapids Corn Milling Plant works with customers and farmers to process raw corn into a diverse collection of marketable materials, foods, and ingredients. The Cedar Rapids, Iowa, plant operates three shifts per day and employs about 200 workers.

PROJECT BACKGROUND

The facility uses water from wells as a coolant for most of the machinery. As the coolant flows through the equipment, the coolant absorbs the heat and eventually discharges into the river. While the effluent is free of contaminants, the temperature can also impact the natural environment. The purpose of this 24-week project is to evaluate methods to lower the temperature of the effluent in order to alleviate the impact of the warmer water on the environment. The first part of the project is to gather water flow and temperature data throughout the process. This data will then be used to evaluate methods and make recommendations for improvements to the current process or the potential addition of a post-cooling system.

INCENTIVES TO CHANGE

In the future, there will be new, required calculations for determining allowable temperature parameters for water discharged into designated waterways. These new calculations are expected to require a substantial reduction in the temperature of the cooling water discharged into the river. Due to these upcoming calculations, Cargill would like to evaluate the current well water and cooling systems, research methodologies to improve the efficiency of the system, and determine areas of opportunity to modify the discharge temperatures.

RESULTS

Effluent Analysis: The intern catalogued all equipment that utilizes well water as a coolant. Documentation included the proper identifications, location, and pictures of the equipment for ease of distinction. Using this resource, the intern also identified the original manufacturer information of the equipment and contacted the manufacturers to collect the original drawings and specifications to be included in the equipment files. This catalogue of data will also be useful in the maintenance of equipment to ensure that the machinery is operating within its designed parameters. The intern created a flow diagram using software that allows for the visualization of the system and the monitoring of flows and temperatures of the well water at different locations in the plant. The intern also developed piping and instrumentation diagrams (P&IDs) to provide a detailed drawing of the equipment, valves, sensors, pipe sizes, and flows of the well water. The P&IDs will be an essential resource in the analysis of the current system and for the planning of process changes.

In addition to the equipment, the intern identified key areas for monitoring and recommended purchasing and installing flow and temperature sensors. The intern took daily measurements to establish trending during the hottest months, which helped to understand how much cooling capacity is required and where modifications in the system will be most effective.

Next Steps: During the second 12 weeks of the project, the intern will focus on completing the temperature and flow model and finish gathering any essential data. Once the intern has finished collecting this information and organized it into a usable model, the model will be used to analyze the heated water, providing valuable insight and guidance towards possible solutions. The intern will then research and evaluate strategies that could reduce the temperature of the discharge water. The intern will also research the implementation of various cooling systems and the possible elimination of single pass cooling in areas where recirculation is feasible.

The most feasible strategies for the reduction of discharge temperature will be further researched in areas such as capital investment and environmental impact. These will become recommendations, and the intern will write proposals describing each potential project.