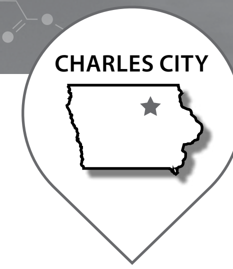
# CAMBREX

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**COMPANY PROFILE**

Founded in 1981, Cambrex is the small molecule company that provides drug substance, drug product and analytical services across the entire drug lifecycle. The company has a presence in thirteen locations globally and is one of the leading Contract Development and Manufacturing Organizations (CDMO) in the market. With an accelerated demand in the market, Cambrex continues to use their technologies and expertise to meet customers' needs for small molecule therapeutics. Cambrex's plant in Charles City, Iowa, employs approximately 375 people.

**PROJECT BACKGROUND**

Cambrex Charles City has been monitoring their usage of makeup water to the cooling tower system since 2018 to identify uncontrolled losses. Loss of cooling tower water (CTW) increases water and chemical usage, and the volume which must be treated at the on-site wastewater treatment plant (WWTP). Changes in chemical levels can also decrease heat transfer efficiency when cooling equipment. The intern was tasked with locating areas of CTW loss throughout the production loop and evaluating solutions to reduce water and chemical usage in the system. Opportunities to improve the efficiency of the plant's steam system were also analyzed.

**INCENTIVES TO CHANGE**

As a member of the Society of Chemical Manufacturers and Affiliates (SOCMA), Cambrex subscribes to an environmental management system known as ChemStewards®. As part of this program, Cambrex is dedicated to continuous improvement in environmental performance and strives to use resources efficiently and minimize waste. For the second consecutive year, Cambrex's EHS department partnered with the Iowa Department of Natural Resources' Pollution Prevention Intern program. This year's water reduction project supports the company's commitment to operational excellence and sustainability.

**RESULTS**

A mass balance was performed on the CTW system, including flow rates and estimated evaporation and blowdown rates. The CTW flow was mapped throughout the entire plant to locate drainage points for potential losses. To help identify where losses were occurring, water samples were taken at various points in the CTW system and were tested for evidence of cooling tower treatment chemicals.

**Repair Chiller Overflow:** One source of CTW loss was traced to an overflow on a chiller system. This overflow is at its highest rate during the summer months and the majority of the drainage could be conserved by repairing the equipment. Controlling this overflow will lead to a higher recirculation rate through the treated cooling tower loop and lower the required flow of makeup water. This equipment is integral to production, therefore the repair should be scheduled during the annual maintenance shutdown period.

**Switch Wet Seal to City Water:** Another source of CTW loss was identified from a mechanical wet seal which requires a continuous water flow. The seal is supplied with CTW which is not currently recycled back into the loop. This water does not need to be pre-treated. Re-piping to supply single pass city water to this equipment could reduce associated treatment costs of this continuous flow.

**Revised Procedures:** Incorrect order of operations for heating, cooling, and drain valves on equipment can lead to CTW loss. Updates were made to procedures to ensure valves are opened and closed in the correct sequence. This change will decrease the frequency of excess losses in the work center with manually operated valves.

**Return Temperature Probe:** A temperature probe installed on the return pipe to the cooling tower would allow continuous recording of the temperature drop across the towers, which varies with weather and production changes. A thermal well already exists on this pipe, where a temperature probe may be installed with a recorded output. Monitoring evaporative losses and cooling loads for the CTW system would enable personnel to see changes in tower operation and makeup water usage and make adjustments or repairs as needed, leading to reductions in the annual water usage.

**Cooling Tower Fan Automation:** All cooling tower fans are currently operated on variable frequency drives, but must be manually turned off when the cooled water reaches a certain low temperature, then turned back on when the temperature increases. The purpose is to keep water from overcooling in the winter, which prevents freezing and helps to maintain the minimum temperature required by the HVAC chillers. This operation could be automated so fans turn off when the water temperature reaches the low set point and turn back on when the temperature surpasses the low threshold. This change would require a simple adjustment of the current instrumentation, and could eliminate the necessity of manual shutoff and startup by the mechanics and could also reduce the risk of operator error.

**Pipe Insulation:** Steam and condensate piping was traced in two production work centers. Maps were created and provided to a contractor to install new pipe insulation where previous insulation was missing or damaged. Insulation is necessary on all steam and condensate pipes to protect employees in work areas, and to reduce energy losses.

**Steam Leaks and Vents:** Visible steam leaks and failed traps were identified for repair in the production work centers. Venting steam pipes were also identified, including one where losses came from inactive equipment. This steam loss can be eliminated by capping the supply to the equipment. The other vents are attached to condensate return stations, so it is recommended a full steam trap audit be completed to repair failing steam traps in these systems. Repairing leaks and maintaining the steam system reduces energy, water, and chemical demands for the boilers.

| PROJECT | ANNUAL COST SAVINGS | ENVIRONMENTAL RESULTS | STATUS |
|---|---|---|---|
| Repair Chiller Overflow | $7,571 | 788,608 gallons of water<br>458 gallons of inhibitor | Recommended |
| Switch Wet Seal to City Water | $3,618 | 303 gallons of inhibitor | Recommended |
| Revised Procedures | $1,096 | 114,192 gallons of water<br>66 gallons of inhibitor | Implemented |
| Return Temperature Probe | $1,389 | 144,704 gallons of water<br>84 gallons of inhibitor | Recommended |
| Cooling Tower Fan Automation | – | Risk Avoidance | Recommended |
| Pipe Insulation | $4,060 | 10,528 therms | Implemented |
| Steam Leaks and Vents | $40,007 | 867,761 gallons of water<br>87,449 therms<br>23,691 lbs chemical | In Progress |