



R&D Systems



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Company Background

R&D Systems, Inc. is a Bio-Techne company that is based in Minneapolis, Minnesota. They specialize in producing biological reagents such as antibodies, cytokines, and recombinant proteins for use in research and development. R&D Systems also produces enzyme assay kits and clinical controls. They launched their first product, a platelet-rich-plasma control, in 1977. R&D Systems' products are driving research in laboratories and universities world-wide. Their Minneapolis facility employs 700 people, and counting.



"My MnTAP internship gave me a glimpse into the 'real world' of engineering. I learned how to better assemble and pitch ideas and how to complete big projects one step at a time." ~OH

Project Background

R&D Systems uses about 11 million gallons of city water per year to run various lab equipment and supply reagent grade water to the labs. The main focus of the project was reducing the water usage of the lab water systems. The other objective was to find ways to conserve energy in the facility.

Incentives To Change

R&D staff saw an opportunity to reduce resource consumption in the laboratories and requested MnTAP's assistance to help facilitate the process. Besides financial incentives such as lower utility bills, R&D was motivated by a vision of a greener, more sustainable laboratory environment.

SOLUTIONS

Reduce Point-of-Use Polisher (PUP) Purge Flow Rate

The PUPs are the final water purification step. The 16 PUPs purge water continuously, at an average flow rate of about 6 gallons per hour. The flow rate on one PUP was reduced to 0.16 gph using a smaller orifice flow restrictor on the purge stream. The unit was monitored for several weeks, and no issues with water quality arose from the lower purge rate. By reducing the flow rate with a smaller orifice on all PUPs, R&D will save 1.6 million gallons of water annually. Since the reverse osmosis systems will run less often, this solution also saves 8,000 kWh per year.

Increase Reverse Osmosis Recovery

Reverse osmosis (RO) is one step in the process of generating reagent grade lab water. Two RO systems are operating below their optimal recovery. The concentrate stream flow rate is set by the venturi injector, a type of differential pressure injector that creates a vacuum for the degassing membrane. If the size of the venturi injector is decreased, the concentrate flow rate is reduced and recovery is increased. Swapping out the venturi injectors on two RO units for smaller models will save 520,000 gallons per year.

Optimize Poultry Cooker Cooling Water

One RO unit has two RO membrane elements, whereas the others have four. Due to the lower number of



membranes, this RO unit ran at much lower recovery (<30%) and the permeate flow rate was half the other units. If two additional membrane elements are installed, the productivity (in terms of permeate flow rate) and recovery will increase. The pump will run less often, saving about 400 kWh per year. After installing a smaller venture injector, a total 230,000 gallons of water will be saved annually.

Retrofit Autoclave with a Temperature-Controlled Solenoid Valve

R&D has several autoclaves, or steam sterilizers, for cleaning glassware. One unit was using a constant stream of single pass cooling water. A simple water conservation retrofit kit consisting of a temperature-controlled solenoid valve will stop the constant flow of cooling water to the sterilizer. The water will flow only when the discharge is above 140°F, reducing water usage by roughly 62% according to the manufacturer. With the retrofit kit installed, the autoclave will use 324,000 fewer gallons of water each year.

Increase Temperature of Ultra-Low Temperature Freezers

R&D has over 100 ultra-low temperature freezers for biological sample storage. All units run at -80°C. Research from Stanford and Harvard has shown that -70°C is generally a better set-point for this type of freezer. Raising the temperature set-point will save approximately 1,000 kWh per unit, with no cost. This solution is recommended for 70 long-term storage freezers that are rarely opened for an overall savings of 70,000 kWh per year.



Reduce PUP Flushing Time

It was observed that some researchers flush the PUPs, or let water run to clear out tubing, for 15-20 minutes each morning. The standard operating procedure (SOP) calls for just two minutes of flushing before use, and flushing for longer has no benefit. Reducing this purge time will save 78,000 gallons per year.

Install a VFD on a Water System Pump

While most of the pumps in the lab water systems already have variable frequency drives (VFDs), one did not. Installing one will save approximately 9,000 kWh per year.

Recommendation	Annual Reduction	Annual Savings	Status
Reduce PUP purge rate using smaller orifices	1.60 million gallons 8,000 kWh	\$15,300	In Progress
Increase recovery of RO unit by switching venture injector	520,000 gallons	\$4,700	In Progress
Increase recovery of RO unit by adding 2 membranes and a smaller venturi injector	230,000 gallons 400 kWh	\$2,100	In Progress
Install retrofit kit on steam sterilizer	324,000 gallons	\$2,964	Recommended
Increase temperature of 70 ULT freezers to -70 °C	70,000 kWh	\$5,600	Recommended
Reduce PUP flushing time by following SOP	78,000 gallons	\$720	Implemented
Install VFD on pump	9000 kWh	\$710	In Progress