



Osama Samaha
Chemical Engineering
University of Minnesota Duluth

Organization Background

AaCron Anodizing is in Plymouth, Minnesota and began their operations in 1968 as a single process line specializing in aluminum window casings and sheets. By 1975, a second process line was established, and the facility expanded to 70,000 square feet. They currently have a team of 78 employees and take pride in their portfolio of unique finishes, colors, and large projects.



"My time at AaCron Anodizing gave me a once in a lifetime experience in industry and exposed me to the art of anodizing. I enjoyed being a part of a team that was supportive and committed to my work. I appreciate MnTAP for giving me the opportunity to develop my skills as a young engineer and will look back at my time at AaCron proudly." ~Osama Samaha

Project Background

Anodizing is a metal finishing process that uses a combination of water, electricity, and chemistry to produce an array of finishes and colors. Prior to the project, the facility recognized there were opportunities to reduce their water and energy use. Therefore, this project focused on optimizing the schedule for well operation, exploring how to reduce the flow rates for 15 rinse tanks, and improving efficiency of the natural gas fired dryer.

Incentives to Change

AaCron's water is supplied by three onsite wells. Process water is discharged to a sanitary sewer, while non-contact cooling water is permitted for discharge to an onsite pond. Although there are low costs associated with their water use and discharge, they were interested in exploring new

water conservation and resource efficiency opportunities at their facility to demonstrate their commitment to environmental stewardship.

SOLUTIONS

Install Continuous Flow Pipe Restrictors

Prior to the project, AaCron used 8.5 million gallons of water in their 15 rinse tanks with each operating at a flow rate of 2 gallons per minute (gpm). To reduce rinse tanks' water use, the site installed pipe restrictors. These reduced the flow by nearly 70% without impacting the rinse process. Overall, this suggestion will save AaCron over 6.6 million gallons and \$33,000 per year. It already has a shorter than expected payback period, which was initially projected to be two weeks.

Enforce Restricted Well Usage

At the beginning of the project, AaCron's wells were manually activated at 4:00 AM even though the process line did not begin until 5:00 AM. This presented an opportunity to save water that was not being used for its operations. After coordinating with the operators, a later activation time of 5:15 AM was established. This change was enforced through a new procedure and log sheet to ensure the change would be followed. This change will save 9.8 million gallons and \$3,200 per year.

"It is clear that MnTAP takes time and care to match each intern with their respective company. Osama's work ethic and enthusiasm was apparent from day one. He fit in and operated not just as an intern, but as a member of the team. While his innovative ideas will be missed, his work this summer is integral to meeting our environmental sustainability goals."

*~Casey Selle Charging,
Technical Manager, AaCron Anodizing*

Solutions

Fix Compressed Air Leaks

Compressed air is used throughout AaCron but mainly on the process lines and in the tooling shop. The air hoses are often used and tugged on, which can lead to imperceptible air leaks around the fittings. An ultrasonic leak detector was used to check for leaks and helped find 12 leaks around the facility. Once the compressed air leaks are fixed, it will save 24,700 kilowatt-hours (kWh) and \$3,400 per year. These fixes will cost a total of \$130 to correct and will result in a payback period of 2 weeks.

Install Kill Switch Timer for Dryer

AaCron has one natural gas-powered dryer, which is used to dry off parts at the end of the process line. This dryer uses an on-off switch and commonly runs even after the parts have been removed. To reduce excess use of the dryer, it was recommended to install a kill switch timer, which would enable operators to set a specific duration for the dryer operation. This switch is estimated to save AaCron 3,000 therms and \$1,400 dollars per year. The switch has an estimated cost of \$900, which results in a payback period of 8 months.

Install Air Cooled Chiller for South Well Single Pass Cooling

AaCron uses nearly 150 million gallons of well water per year for non-contact, single-pass cooling. This includes 78 million gallons from the North well and 70 million

gallons from the South well. By installing an air-cooled chiller along the South well water-cooling line to remove excess heat, AaCron would no longer need to use the North well and could save 78 million gallons per year. Due to the low costs associated with well water, this would only result in savings of \$16,000 per year. With an implementation cost of \$600,000, the payback period would be approximately 36 years. Due to this long payback period, this recommendation requires further investigation. However, AaCron is committed to researching avenues for water reduction with non-contact water and will seriously consider this recommendation.

Install Lid for Dryer

AaCron's dryer does not have a lid. Therefore, as heat is generated by the natural gas flame, it rises and escapes from the dryer's walls. This results in heat loss and decreases drying efficiency. The installation of a lid is estimated to save 10,500 therms and \$5,000 per year. Other benefits include shortened production times for each load and an increased lifespan of the burner due to reduced usage. A lid is calculated to cost \$9,000 with a payback period of 2 years. With limited space around the dryer for lid placement, this implementation requires further investigation.

Recommendation	Annual Reduction	Annual Savings	Status
Install continuous flow pipe restrictors	6,600,000 gal water	\$33,000	Implemented 7/03
Enforce restricted well usage	9,800,000 gal water	\$3,200	Implemented 7/22
Fix Compressed Air Leaks	24,700 kWh	\$3,400	Planned
Install kill switch timer for dryer	3,000 therms	\$1,400	Recommended
Install air cooled chillers for South well single pass cooling	78,000,000 gal water	\$16,000	Further Investigation Needed
Install lid for dryer	10,500 therms	\$5,000	Further Investigation Needed

MnTAP Advisor: Kelsey Klucas, Director