



Lou-Rich, Inc. Saves Over \$42,100 by Reducing Water and Chemical Use

Minnesota Technical Assistance Program ■ INTERN SUMMARY

Design Improvements and Monitoring Reduce Water Use

Company	Lou-Rich, Inc. Albert Lea, Minnesota
Project	Reduce water used in cleaning and cooling operations
Results	Reduced water use by 8.9 million gallons per year, saving \$42,100 annually. Implementation costs were approximately \$3,000.

Lou-Rich is a contract metal manufacturer and supplier of engineering services including design, prototyping, manufacturing and packaging. The company's metal fabricating processes include cutting, stamping, welding and various machining operations.

When the city of Albert Lea increased water and sewer rates by 20 percent in 2003, Lou-Rich requested a MnTAP intern to assist in evaluating options to reduce water use. The company had the intern focus on its four areas of highest water use.

Phosphatizing Operation

Lou-Rich's five-stage washer is a metal pretreatment system that washes and prepares part surfaces with an iron phosphate coating prior to painting. The washer used 41 percent of the plant's water. The company had modified its wash system to cascade the phosphatizing rinse (stage 4) into the cleaning rinse (stage 2) to reduce water use.

Design Improvements

Cascade Rinse. The cascade's design did not provide enough pressure to return the rinse through the pipe to the earlier tank. The intern modified the tank, raising the phosphatizing bath level to create sufficient pressure. Improving the cascade allowed the company to shut off the 15 gallon per minute

(gpm) fresh water feed to stage 2. This change reduced water use by 2.7 million gallons per year (gpy), saving \$7,100 annually.

Halo Rinse. While the intern was at Lou-Rich, the company changed stage 5 to a chemically-active seal rinse and added a halo (fine mist) rinse using reverse osmosis water to ensure product quality. The existing drain board directed the rinse into stage 5, diluting the tank and washing chemical down the drain.

Because the intern evaluated this new water use shortly after installation, he was able to suggest design improvements to redirect the halo rinse effluent to stage 4 for reuse. Because of the excess volume of seal rinse chemicals being used, the design flaw would have been flagged within three months. Eliminating the dilution problem in stage 5 sooner saved 4,225 gallons of chemical, costing \$16,800.

Flow Control

The intern measured rinse flow in stage 4 and found that the tank's flow rate varied. The stage did not have a mechanism to indicate flow. Operators were gauging the flow rate by the ball valve. Ball valves are on/off valves; the position of their handles do not indicate flow rate. The intern installed a rotameter which gives visual feedback so operators know how much water is being used. This float-style meter had a needle valve to precisely control water flow.

The chemical supplier gave the intern guidance on turning over the rinse tank (the time required to theoretically replace the full volume of the tank) and rinse conductivity levels relative to city water feed. The intern reduced flow in stage 4 from 15 gpm to 4 gpm. The rinse remained relatively clean and caused no part-quality problems—the intern lowered the rinse flow further to 2.5 gpm. Conductivity rose but remained well within the conductivity guidelines.

Better control of stage 4 rinse flow reduced water use by 2.25 million gpy, saving \$5,900.

Molybdenum

The city of Albert Lea was concerned about the concentration of molybdenum in its wastewater treatment sludge and asked its industrial contributors to reduce molybdenum effluent. Lou Rich's chemical vendor helped the company eliminate molybdenum in its effluent by changing the chemistries used in the seal rinse and phosphatizing. The switch did not affect products or cause other problems. One of the alternate chemicals costs more and the other less, overall saving \$2,000 annually.

Hydraulic Presses

The cooling system for the hydraulic presses accounted for 24 percent of the company's water use. Oil manufacturers recommend operating temperatures to prevent their product from degrading under excess heat. But, the intern observed that the temperature of the cooling water exiting the heat exchangers was not perceptibly higher than when it entered, indicating that excess cooling water was being used.

Lou-Rich replaced a solenoid and ball valve with a rotameter to provide feedback to operators in order to control flow. By throttling flow to the hydraulic presses from 24 gpm to 3 gpm, the company cut water use by 2.57 million gpy, saving \$6,800 a year.

If equipment use had been more variable with lower throughput then the company would have installed a temperature controller on the water-cooled hydraulic presses to enhance flow control.

Spot Welders

The cooling system for the spot welders accounted for 10 percent of the company's water use. Previously the spot welders had a constant flow of water for cooling the welding tips and power supply. Flow was throttled from 10 gpm to 1 gpm and timers and solenoids were installed to synchronize water flow with use. These changes reduced water use by 1.1 million gpy, saving \$2,800. This also reduced the risk of damage from corrosion resulting from condensation forming in the power supply box when it is cooled below the dew point.

Timers and solenoids interlocked with spot welders are an option when purchasing new equipment.

Plating Pretreatment Line

The operations used in the manufacture of copper evaporator coils accounted for about 10 percent of the company's water use.

Parts Basket Design

The intern observed that the parts basket design resulted in excess carryover of process chemistries, unnecessarily contaminating subsequent process tanks. Based on the intern's suggestion, Lou-Rich fabricated new basket bottoms. The sheet metal bottom with a punched hole pattern was replaced by more-widely spaced bars. Decreasing the surface area of the bottom and moving the supports further apart allowed the basket to drain more quickly and reduce dragout. No measurements were taken to estimate impact.

Rinse Efficiency

When the intern measured conductivity in the rinse tank of the tinning line, the conductivity in the top half of the tank was significantly lower than the bottom half. Conductivity was stratified because the inlet and outlet were both at the surface. Rinse water flowed almost directly from one pipe to the other which prevented proper mixing, making the rinse inefficient. To increase mixing within the tank, the inlet was placed at the bottom of the tank, creating a diagonal flow which evened out the tank's conductivity.

The three rinse tanks each had a fresh water feed. Lou-Rich removed the fresh water feeds from the first two tanks and cascaded the rinses back from the final stage. These changes reduced water use by 276,000 gpy, saving \$700 annually.

Quick Cooling Water Test

A simple test to see if you are using too much cooling water is to feel the inflow pipe and feel the outflow pipe. Do you feel a noticeable change in temperature? If no, you are probably using too much water and you should investigate further.

For More Information

MnTAP has a variety of technical assistance services available to help Minnesota businesses implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources, and reduce energy use and cost. Our information resources are available online at <mntap.umn.edu>. Or, call MnTAP at 612/624-1300 or 800/247-0015 from greater Minnesota for personal assistance.

This intern project was conducted in 2003 by MnTAP intern Kyle Page, a chemical engineering senior at the University of Minnesota.