Carley Foundry

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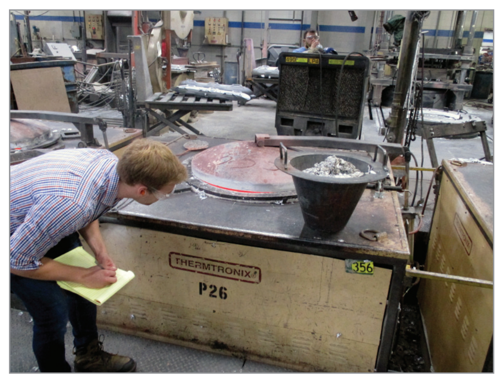
Organization Background

Founded in 1955 by Frank and Lois Carley, Carley Foundry has grown quickly from its beginnings as a family owned commercial casting supplier to local machine shops in Minneapolis, to now supplying castings throughout the world. Carley Foundry has always strived to deliver premium quality castings for a diverse and demanding customer base. Now located in Blaine, Minnesota, Carley Foundry produces castings for customers in the markets of aerospace, medical, recreational vehicles, defense, and more. Carley Foundry employs 400 employees and is in its third generation of Carley ownership. Carley Foundry strives to be innovative leaders in tooling development, casting production, engineering design assistance, and testing methods.

"MnTAP has been an incredible experience that has provided me with the tools and experience to tackle future problems in my professional career. I thoroughly enjoyed my summer internship with MnTAP and the work that I accomplished was incredibly rewarding." ~ AC

Project Background

Carley foundry wanted to reduce energy consumption, power demand, and production costs in the aluminum foundry. While foundry staff had ideas for saving energy, they didn't have time during the busy production schedule to really dig into the opportunities and solutions. Carley and MnTAP kicked off the project by outlining opportunities; including staggering heat-treat oven use, considering furnace set-back temperatures and insulation, and repairing compressed air leaks. The summer was spent analyzing the feasibility of these and other opportunities that would save the foundry energy.



Incentives To Change

With increasing costs of energy and aluminum, Carley Foundry is attempting to reduce energy costs to stay ahead of competition. By reducing energy waste in a variety of production steps, Carley aims to reduce their energy costs by 5-10%. Furthermore, Carley wants to reduce their own carbon footprint and waste streams to produce more environmentally responsible castings. The project will improve current practices concerning both furnace and air compressor usage, while also providing operating cost information to both the accounting departments as well as floor managers who had little knowledge of operational energy costs prior to the project.

"As a foundry, we are a large user of energy. I suspect like many companies, we tend to gravitate to our core competencies when looking for cost savings or a better process, as opposed to utilities. Our MnTAP intern however, has provided us with the technical horsepower and investigative effort to look into energy savings ideas we just never seem to have the time to do. The payback was tremendous! We will now save a significant sum of money, have a much better understanding of how energy is consumed throughout the facility, and potentially increase worker comfort as we reduce heat load and plan a future ventilation system."

~ Randy Oehrlein
VP Engineering, Carley Foundry Inc.

Solutions

Use Overnight Setback Temperatures for Furnaces

The typical pour temperature of aluminum within an aluminum foundry is 1,400 F. The melt temperature of aluminum is 1,221 F. Before this project, it was standard practice to hold metal at the pour temperature. This is reasonable when metals are being melted and immediately poured, but at a large foundry like Carley, metals are commonly melted and then held for extended periods of time. Through experimentation with one furnace, MnTAP and Carley found the differences in energy consumption associated with holding aluminum at 1,400 F compared to 1,300 F and 1,225 F. The result was potential savings of over 2 million kWh per year by using overnight setback temperatures. The foundry chose to use 1,280 F as a starting overnight setback point. The foundry was also pleasantly surprised to find that their relatively new furnaces had setback timers built-in. MnTAP and Carley learned how to program the setback, and started saving energy immediately. With current setbacks, Carley is on pace to save $80,000 in energy in the first year.

Reduce Furnace Temperatures During Production when Not Pouring

This is the natural extension to the first project. Temperatures were first turned down overnight; the next step was to turn them down when furnaces are not pouring. This was implemented by programming two different setpoints into the furnaces, holding and pouring. These setpoints can be changed using a simple switch. To implement this change, furnaces are by default held at the holding point. Shift leads are responsible for flipping the switch on furnaces that will be poured during their production shift. By the end of the intern project, this strategy had been implemented with predicted energy savings results of $30,000 per year.

Replace Pneumatic Cabinet Coolers with Electric Cabinet Coolers

In looking for additional energy savings opportunities, MnTAP and Carley noticed 12 electrical cabinet cooling units that were cooling using compressed air. Compressed air is a notoriously expensive utility – the conversion of energy into compressed air typically result in 10% of the useful work that would be attainable through an equivalent electric piece of equipment. In the case of these vortex cabinet coolers, there is an estimated total savings of 350,000 kWh and $26,000 per year in savings by switching to a non-pneumatic equivalent. Carley is currently testing one new cooler and is planning to replace the remaining coolers after testing is successful.

Recommendation	Annual Reduction	Annual Savings	Status
Use overnight setback temperatures for furnaces	2,112,000 kWh	$104,000	80% Implemented
Reduce furnace temperatures during production when not pouring	220,000 kW demand 100 kW demand	$30,000	Implemented
Fix compressed air leaks	460,000 kWh	$35,000	75% Implemented
Replace pneumatic cabinet coolers with electric cabinet coolers	350,000 kWh	$26,000	10% Implemented
Turn off quench tanks overnight when not in use	400,000 kWh	$20,000	Planned
Repair furnace insulation and lids	174,000 kWh	$18,000	10% Implemented
Stagger heat treat oven power draw	60 kW demand	$10,000	Planned
Replace pneumatic rod cooler with electric	126,000 kWh	$10,000	Planned
Optimize lid controls & keep lids closed	70,000 kWh	$6,000	Planned

MnTAP Advisor: Jon Vanyo, Engineer