Consolidated Precision Products

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Company Background

Consolidated Precision Products (CPP) is an aerospace sand casting company. It produces high-precision aluminum and magnesium castings for NASA rockets, military and commercial aircrafts and helicopters, to name a few. CPP has 19 facilities across the United States, Mexico, and Europe. From product concept to sub-assembly and kitting, CPP is the largest aerospace-qualified manufacturer capable of producing both investment and sand castings. Founded in 1991, CPP's Bloomington operation employs approximately 550 employees working two shifts.

"The internship allowed me to use the engineering knowledge I have gained from school and put it to use in a real-world manufacturing setting."

Project Background

The project involved gathering performance data on CPP's heat treat ovens, quench tanks, and fluidized bed systems. This data included parameters like energy and waste throughput and efficiency analysis. Based on this analysis, new opportunities for energy use reduction were identified and efficiency improvements were suggested. Finally, the recommended changes were prioritized using simple payback calculations.

Incentives to Change

Reduction of energy costs, resources used, operation costs, and improvement in the environmental conditions for employees were among the many incentives for change. CPP utilizes a variety of ovens, both electric and gas, for heat treating and aging products after they are cast. Exhausts from these ovens, especially the sealed-tube gas ovens, are high temperature and high flow rate, with the ovens running at low efficiency. Increasing efficiency has the potential for substantial energy and monetary savings. In addition, CPP has been looking at ways to increase quench tank efficiency over the past few years. The fluidized bed used by CPP has 800 degree F exhausts running 24/7 year-round, and there is enormous potential for energy harvesting to reduce energy costs. A majority of parameters for the processes can be monitored on a computer which is connected to a server that retrieves real-time information from the equipment. This data could be used to quantify savings.

Solutions

Install Plug-in Recuperator in Oven 4

Oven 4 is a sealed-tube gas oven that runs about 6,000 hours annually. I suggested using a plug-in recuperator to preheat combustion air to over 600 degrees F to utilize the 1,400 degree F exhaust temperatures. This would increase efficiency from 60% to 71% and save $5,711 annually, with a one-time implementation cost of $15,600. This project qualifies for rebates from CenterPoint Energy.

Install Lower-Powered Burner in Quench Tank 19

The quench tank for Oven 19 suffers from an over-powered burner, which results in very high temperature flue gases that are damaging the custom exhaust stack. I recommend installing a lower powered burner setup, downsizing from 20 therms/hour to 8.3 therms/hour. Apart from the replacement cost of a new exhaust stack, this would save $1,247 annually, with a one-time implementation cost of $3,870.

Install Heat Exchanger to Fluidized Bed

The fluidized bed is used for taking sand off of castings and exhausts 805 degree F flue gases continuously. To harness this massive source of wasted energy, I recommend installing a heat exchanger. This will direct the flue heat to the aluminum-pour region, replacing the makeup air unit currently used for heating in the winter. It would save $20,465 annually with a onetime implementation cost of $40,000. This project qualifies for rebates from both Xcel Energy and CenterPoint Energy.

Insulate Magnesium Pour Ladles

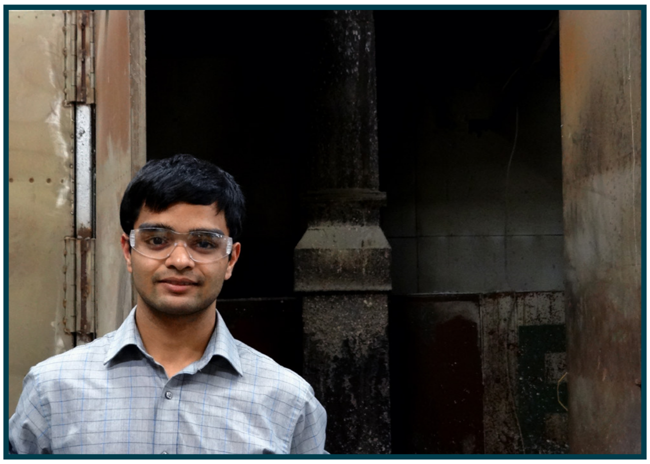
It is recommended that the tipper ladles used to pour molten magnesium into molds be insulated with 2-inch ceramic blankets. This would allow for an increase of 15-20 minutes of pouring time for the magnesium. An additional advantage is gas savings from not having to heat up smaller magnesium pots, instead replacing them with one larger pot. This would also save labor costs and eliminate the need for electric heaters on tipper ladles to maintain temperature.

Manage Magnesium Pour Time

I noted that magnesium melting burners are switched on early (at 3:00 a.m.), while most pots are not poured for 2-3 hours after they reach optimum temperature. This leads to wasted use of natural gas. Better managing magnesium pour time to reduce this delay is recommended, as it would save $19,408 annually with zero implementation costs.

Repair Compressed Air Leaks

There are many compressed air leaks at the facility. Flow rate meters have been installed on the compressors and programmed to display the flow rate and power consumption on a personal computer to allow for remote monitoring. By measuring activity at a time when the facility is not operating, leaks can be quantified. Initial readings suggest waste of approximately $30,000 annually, though more data is needed for assured numbers. A compressed air audit is scheduled for later this year and I recommend repairing any leaks that are identified.



Recommendation	Reduction	Annual Savings	Status
Install plug-in recuperator in Oven 4	12,690 therms	$5,700	Under review
Install lower-powered burner in Quench tank 19	2,771 therms	$1,250	In progress
Install heat exchanger to fluidized bed	38,980 therms	$20,470	Under review
Insulate magnesium pour ladles	170,040 kWh	$13,600	Under review
Manage magnesium pour time	43,130 therms	$19,400	Under review
Repair compressed air leaks	--	--	Under review