Gerdau

Daniel Sundberg
Mechanical Engineering
University of Minnesota Twin Cities

Company Background

Gerdau is a global steel manufacturing company that specializes in long steel production. The company began operations in Brazil back in 1901 and now operates in 14 countries worldwide. Gerdau is currently the leading producer of long steel products in the Americas and one of the main suppliers of specialty long steel in the world. The mill located in Saint Paul produces long steel products such as rebar and round stock by melting down and recycling steel from scrap material.

"This project gave me my first experience in an industrial setting, which will be invaluable in my future career. Leading my own project gave me confidence and showed me that the knowledge I gained while in school is applicable and relevant to the real world."

Project Background

Steel production is energy intensive. The goal of this project was to determine, evaluate, and quantify savings associated with making processes more efficient. The processes were analyzed to determine possible reductions in electricity, potable water, and natural gas consumption.

Incentives To Change

A major portion of production cost comes from energy used to process it. Reducing this final product cost through greater efficiency allows Gerdau to stay competitive with other steel companies and is thus a major priority for Gerdau. Gerdau has always made sustainability a priority and this is a major reason for their continued success.

Solutions

Install Variable Frequency Drives (VFDs) On The Combustion Air Fans

The reheat furnace, used to reheat the billets prior to rolling, utilizes two 125hp combustion air fans. The flow-rate from these fans is currently controlled using variable inlet guide vanes. This control method is very efficient for top-end trim control (above 90% of the design flow-rate), but inefficient for reducing the flow-rate below 90%. During typical fan operation the inlet guide vanes are set to approximately 30% open. Switching to VFD control, which is much more efficient for low flow-rates, would save approximately $46,100 annually with an implementation cost of approximately $74,200.

Replace Pneumatic Air Blower With An Electric Air Blower

Once the billets have been rolled out to their final dimensions, the bar is over 100 feet long. These bars are cut to length with a large mechanical shear. The clutch that transfers power for the shear gets very hot during use. To keep the machine from shutting down, compressed air is blown through a pneumatic blower to cool the clutch.

Compressed air is a notoriously inefficient power source and an electric blower would be much more efficient. Installing an electric blower could save $6,800 annually for a one-time implementation cost of approximately $5,200.

Duct Cooler Air From Outside To The Main Compressor

Currently the main compressor receives its air supply from inside the compressor room. Measurements indicate that this room is, on average, approximately 13°F warmer than the corresponding air outside. The installation of air ducting from outside could save 2% of the annual electric costs for the compressor. This corresponds to approximately $5,500 in annual savings which could be realized if the ducting were to be installed. The installation of ducting would cost approximately $5,000.

Replace The Compressor Cooling System's Evaporative Cooler With A Dry Cooler

The site's main air compressor is currently cooled through a closed loop evaporative cooler. This cooler consumes an estimated 3,000,000 gallons of makeup water annually due to evaporation, drift, and blow-down losses. Installing a dry cooler would reduce the potable water usage to an estimated 500,000 gallons per year (used only on very hot days for temperature trim control). The potable water savings combined with the slightly increased fan costs would save an estimated $19,700 each year. The installation of a new dry cooler would cost $74,900.

Repair Or Replace The Recuperator On The North Ladle Pre-Heater

Before molten steel can be poured in a ladle, it needs to be heated. The ladles are heated by natural gas-fired ladle pre-heaters. The site's north ladle pre-heater has been fitted with an exhaust gas recuperator that has since become inoperative. Information from when the previous recuperator was installed suggests that replacing the inoperative recuperator with a working one could save $43,500 in reduced natural gas costs annually. The installation of a new recuperator is estimated to cost $140,500.

Shutdown Shredder Electric Motors When Idle

The "shredder" area of the plant is where scrap material is reduced in size through the processing of material through the hammer mill. During typical daily operation, events occur that stop the processing of material. These delay periods can last over an hour, during which the motors are typically left running. Analysis of average delay time and motor running costs suggest $18,400 could be saved annually by shutting the motors down during idle periods greater than 15 minutes. These results could be attained with no implementation cost.

Repair Identified Natural Gas, Compressed Air, And Oxygen Leaks

During a small leak test survey, seven leaks were found and documented. The repair of these leaks is currently in progress and is estimated to save $9,800 annually. Additionally, many of these leaks were noted to take place at torch stations. It has been recommended that the site install a leak testing solution at each of the torch stations to detect these leaks early.

Recommendation	Reduction	Annual Savings	Status
Install VFDs on the combustion air fans	640,000 kWh	$46,100	Under Review
Install electric air blower	103,000 kWh	$6,800	Under Review
Duct cooler air to main compressor	76,000 kWh	$5,500	Under Review
Install dry cooler to cool compressor	3,100,000 gallons water	$19,700	Under Review
Repair/replace recuperator on ladle pre-heater	82,100 therms	$43,500	Under Review
Shut down shredder electric motors when idle	263,000 kWh	$18,400	Under Review
Repair gas, compressed air, and oxygen leaks	6,400,000 ft^3 of gases 9,000 kWh	$9,800	Complete