Green Foundry Project 2105-02

Title: **Multi-Master Air Compressor Controls**

☒ Full Scale Implementation OR ☐ Pilot Scale/Study

1. Description of the project: What is the issue and how did you fix it?

Scope

Compressed air can be one of the most expensive forms of energy available in a foundry because of poor efficiency. Excess pressure wastes energy and adds extra wear on compressors; while pressure drops reduce equipment efficiency. The plant completed standard foundry compressed air practices to upgrade compressors, eliminate air leaks and track regular PM to improve performance. The next step was to install an automatic system to monitor pressure of 8 compressors; shutting down compressors or reducing output as demand is reduced and increasing to maximum efficiency at peak demand.

In early 2020 all businesses were challenged with business fluctuations due to COVID; which also re-prioritized capital. The plant decided it had the expertise to carry out this project using in-house resources by installing the transformers, transducers, and program PLC's. That make this project unique.

Implementation

Current transformers on the 8 compressors were tied back into point I/O units in order to monitor the amperage drawn in real time. Additional pressure transducers were installed in air receivers at three corners of the facility to monitor real time facility pressure. PLC's were tied in and programmed finding the correct algorithm to regulate the system; shut off unneeded compressors and to delay bringing on additional compressors until needed. If plant air pressure goes above 98 psi for 2 minutes, one compressor is shut down. If pressure drops below 85 psi for 2 minutes, compressor(s) are reloaded. Network controls are linked together to form a chain of communication that makes decisions to stop/start, load/unload, modulate, vary displacement, and vary speed. Additionally, to prevent continuously loading and unloading one compressor, power-on is rotated between compressors via the control system. This strategy allows each compressor to function at a level that produces the most efficient overall operation.

2. Environmental Benefits: Conservation of raw materials or energy, reduction or elimination of emissions, wastes, toxics, water discharges, etc.

This project resulted in annual reduction of 432,000 kWh in energy consumption. Additionally, electric energy savings results in reduced co2 greenhouse gas emissions of 306 metric tons; which is equivalent to 36 homes' energy use for one year.

3. Other Benefits: Productivity, health and safety, employee morale, etc.

Uptime

Energy savings are an easily quantifiably savings, however being able to improve uptime has a major impact as well. Downtime due to compressor failure or air pressure drops is very costly in regard to excess labor, and potentially not getting product producedtimely. Reliable uptime leads to better labor utilization and operating profile.

Data

Trending data is used to enhance maintenance functions and minimize costs of operation. The control dashboard created allows maintenance and management to monitor and control all components in the system without having to be near the compressors, or even in the plant. System alerts are sent via text or email immediately.

4. Cost Savings: Capital cost, operating cost, ROI or other pertinent cost information.

Cost

Low investment is a huge win on this project, total cost was $5,100 for supplies and programming labor. A computerized control system installed and programmed by an outside software company is estimated at $325K; after potential rebates (when available again), final cost is estimated at $175K.

Savings

Tangible savings are in energy costs. Amp hours saver per day at 3,600. kWh savings per day is 1728 x $0.0338/kWh = $58.41 per day savings. Based on 250 operating days, annual savings are $14,602, approximately 9% annual savings. ROI on the energy savings alone is 4 months. The additional aspects of this project including enhanced PM schedule and regular checking of air leaks will further increase savings.

5. Applicability to other foundries and additional Comments

The uniqueness of this project, that it was programmed in-house at a much lower cost makes this project attractive to other manufactures utilizing multiple compressors. Employees who have programming skills are much more prevalent today. This project requires a basic knowledge of PLC programming and can be achieved by many.

The two attached files are system display screens. One showing the status and psi of each compressor and the other showing historical psi performance.

6. Applicable Environmental Categories and Foundry Processes. Select all that apply.

Environmental Categories

☒ Carbon (GHG) Emissions Measurement and Reduction

☐ Air Quality ☐ Water Use and Discharge ☐ Waste Management

☐ Beneficial Use ☐ Stormwater ☒ Material and Resource Conservation

☐ Community Engagement

Foundry Process(es) Impacted

☐ Melt ☐ Pour ☐ Mold ☐ Core ☐ sand system/reclaim

☐ Shakeout ☐ Heat Treat ☐ Quench ☐ Finishing ☐Shipping

☐ Maintenance ☐ Pattern Shop ☐ Casting Design

☒ Management Systems and Metrics

☐ Other, explain: Click or tap here to enter text.

7. Add photos to enhance your application, if applicable.

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