John Deere

CASE SUMMARY 8

JOHN DEERE FOUNDRY

Waterloo, Iowa
Black Hawk County

Intern: Nick Decker
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The Company

Deere and Company does business in more than 160 countries and employs approximately 43,000 people worldwide. John Deere consists of three equipment operations (agricultural, commercial and consumer, and construction and forestry), credit operations and four support operations (parts, power systems, technology services and health care). The John Deere Foundry, located in Waterloo, Iowa, produces gray cast iron and ductile iron castings for transmission cases, rear axle hubs, wheels and other agricultural components. The John Deere Foundry employs approximately 400 workers and is one of several operations in the Waterloo-Cedar Falls area.

Project Background

Environmental projects and goals are driven by management through an Environmental Steering Committee, which sets annual goals to reduce waste generation and energy consumption, and diverts waste streams going to the landfill. A goal was set to reduce compressed air usage, and its energy usage, by a minimum of 10 percent.

Incentives to Change

John Deere Foundry desired to improve the operation of its compressed air system by reducing energy consumption, improving compressed air quality and minimizing downtime. These goals were intended to conform to both economic and environmental drivers within the company. A reduction in energy consumption would result in reduced greenhouse gas emissions, demand from the local power company and foundry spending.

Results

Recommended opportunities for savings include:

1. **Mold pattern blow off**

Currently, John Deere Foundry utilizes three open-ended pipes located on one of its mold machines to blow debris off patterns used to create casting molds. This setup results in sand being blown off the discharged and incoming template. Replacing the open-ended pipes with a series of nozzles that use less compressed air can complete this type of blow off more effectively. The reduced compressor load will save approximately $31,651 annually in electrical costs.

2. **Transport ladle cooling**

Transport ladles carry molten metal from holding furnaces to the molds, where they are poured. After each shift, the ladles are cooled so that they can be worked on, such as cleaning out hardened metal. The ladles are currently cooled utilizing a compressed air line at 92 psi. Using two HP blowers instead of compressed air can complete this cooling process more effectively. Converting from compressed air to blowers will save approximately $14,407 annually in electrical costs.

3. **Centrifugal compressor throttling**

The centrifugal compressors at the foundry currently operate with an average throttling range around the top eight percent of the power band. They cannot operate outside this band and therefore spend a significant amount of time in an unloaded condition, not producing air for the plant while still operating. The compressors should be able to throttle within the top 20 percent of the power band. By reducing the time that the compressors spend in an unloaded condition, expanding the throttling range from 8 to 20 percent represents a saving of $9,789 per year in electricity.

4. **Rapid compressor loading/unloading**

Occasionally, the centrifugal compressors will rapidly cycle between loaded and unloaded conditions, either as a result of fluctuating demand or a demand outside the operational range of the compressors. Using a pressure drop from 94 psi to 90 psi, 14,752 gallons of storage would be necessary. Alternatively, an increased throttling range may produce the same outcome. Savings from the reduced cycling results from less time at full amps, transitioning between loaded and unloaded conditions while valves are operated, producing annual electrical savings of $5,360.

5. **Compressed air leaks**

Compressed air leaks can occur at any location a connection is made to the compressed air system. Although leaks may seem insignificant, they add up. It is estimated that eliminating even 75 percent of these leaks will save $98,676 per year in electricity, which is a significant portion of the overall compressed air system operating cost.

The total opportunities for the John Deere Foundry represent annual energy savings of $159,883 per year, and would also reduce compressor energy consumption by 10 percent.