

STANLEY ENGINEERED FASTENING

DECORAH



BRIANI CAREY
MECHANICAL ENGINEERING
THE UNIVERSITY OF IOWA

COMPANY BACKGROUND

Founded in 1969, Stanley Engineered Fastening, formerly Infastech, is one of the world's largest manufacturers of engineered mechanical fasteners and cold-formed components. The company provides fasteners for use in a diverse range of applications including automotive and commercial technologies, electronics, construction and industrial use. Primary plant processes include heading, pointing, threading, plating, cold-forming, sorting, packaging, and heat treating. The Decorah, Iowa, facility has 500 employees and serves customers around the world in more than 150 different countries.

PROJECT BACKGROUND

This project first involved an audit of the compressed air system, including leak detection and analysis of the compressor control system. The intern developed and recommended a plan to reduce energy costs and emissions through repairs and efficiency optimization. A preventative maintenance plan was also recommended for the compressed air system. A comparison and cost analysis was also provided to evaluate a lighting retrofit at the plant.

INCENTIVES TO CHANGE

Stanley is committed to sustainable business policies, reducing environmental impact and improving community quality. The company's green goals include reducing water consumption, energy use, and waste generation.

Compressed air and lighting are large energy consumers at the plant. Leaks can account for up to 35 percent of the air used, increasing the demand on the compressors. Since it is expensive to produce, repairing leaks and optimizing the operating efficiency of the compressed air system could provide significant cost savings to the company.

The original lighting system uses high wattage lamps that consume large quantities of energy. By switching to a more efficient, longer-lasting bulb, costs associated with maintenance and energy use could be reduced.

RESULTS

Compressed air accounts for an estimated 25 percent of the company's electricity usage. The plant has one variable speed drive and four rotary-screw type compressors that provide 90 to 100 psi to more than 400 machines. The compressed air is used to run conveyor belts, as a blow off on rails, and for moving, cooling, cleaning and drying parts.

Repair Air Leaks: Ultrasonic leak detection was conducted in two of the four departments. This resulted in more than 700 leaks being tagged and recorded, which accounted for a loss of more than 1000 cubic feet per minute. Leaks decrease the amount of air supplied to the machines, which in turn necessitates running compressors at higher pressure. Repairing the leaks will result in a significant reduction of energy usage and associated costs, and a 200hp compressor could be eliminated from the system.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN METRIC TONS

TOTAL FOR ALL SECTORS							
CO ₂	SO ₂	CH ₄	N ₂ O	CFC	NO _x	VOC	PM ₁₀
1,671.16	9.01	62.64	0.83	20.49	4.28	0.13	0.22

Maintenance Plan: An ongoing leak detection plan was formulated and presented to the company. The proposed plan would involve purchasing an ultrasonic leak detector and conducting detection on one of the four departments each year.

Update Flo-Trol: Four of the five compressors are regulated by a flow-based control system. This eliminates the need to designate a lead compressor, increases system efficiency and reduces air waste. The screw compressors run at full load nearly all the time and the variable speed kicks in as needed to supplement pressure. The system also tracks data useful for calculations including energy, pressure and temperature. Reprogramming the control system to include a fifth compressor that is currently manually controlled would reduce run-time and help to optimize the operating efficiency of the overall system.

Light-Emitting Diode (LED) Lighting Retrofit: The original lighting system used 400-watt metal halide bulbs that are resilient to heat and impact. They provide a high lumen output, but require a lot of energy. To be more efficient, the company started replacing these with fixtures that house six four-foot T8 fluorescent tubes. Fluorescents give off high quality light, use less energy, and have a longer lifetime, but are not as resistant to heat, and due to their mercury content require special disposal. LED retrofit tubes were recommended for increased savings on maintenance, waste disposal, and energy. LED lamps have a much longer life than the fluorescents and will save more than one million kilowatt hours annually.



PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
REPAIR AIR LEAKS	\$55,671	856,477 KWH	IN PROGRESS
MAINTENANCE PLAN	\$38,970	599,534 KWH	RECOMMENDED
UPDATE FLO-TROL	\$4,786	68,375 KWH	IN PROGRESS
LED LIGHTING RETROFIT	\$67,189	1,033,680 KWH	RECOMMENDED