

JOHN DEERE OTTUMWA WORKS



JOSH PLUMMER
MECHANICAL ENGINEERING
UNIVERSITY OF WISCONSIN - PLATTEVILLE

COMPANY PROFILE

Deere & Company began in 1837 as a one-man blacksmith shop. It has since become a Fortune Global 500 company, employing more than 67,000 people globally. In 2012, Deere & Company celebrated its 175th anniversary with record net sales of \$36.2 billion, and record net revenues of \$3.1 billion. The company produces a variety of heavy machinery used around the world in agriculture, turf management, construction and forestry. At the company's Ottumwa, Iowa plant, the focus is on agricultural equipment, including windrowers, mower conditioners, round balers, and square balers.

PROJECT BACKGROUND

As part of the Deere & Company family, the John Deere Ottumwa Works facility implements sustainable environmental practices, including energy reduction projects. The focus of the 24-week intern project was to conduct a plant wide motor survey to pinpoint utility use, evaluate possible energy saving updates, and develop recommendations for resource reduction on the paint lines and throughout the plant.

INCENTIVES TO CHANGE

In 2013, John Deere announced four company-wide eco-efficiency goals to reduce their environmental impact. One of these goals is to reduce greenhouse gas emissions and energy consumption per ton of production by 15 percent by 2018. As a result, Deere & Company is pushing facilities to find ways to trim energy usage. Due to energy consumption and inefficiency, the paint line motors and personal fans used at John Deere Ottumwa Works provide an opportunity to help achieve the 15 percent energy reduction goal.

RESULTS

Motor Drive Belts: The paint lines have many high-horsepower fan motors that run approximately 2500 hours per year, using roughly 20 percent of the plant's total electricity. The motors themselves are fairly efficient but operate with an older style belt-drive system. Upgrading the drive systems to a synchronous belt-drive design would increase operating efficiency of the motors by 3-5 percent. In the main paint line, there are 21 motors in need of drive system replacement. Upgrading these 21 motors with synchronous belt-drives could reduce annual electricity costs by approximately \$8,783.



Installing Ceiling Fans in Dept. 250 and 254: Many individual fans are used around the facility to cool factory workers. It is more efficient to have a few large electric motors than a lot of small electric motors. Installing twelve 16' ceiling fans could provide more even air flow and reduce electricity consumption while maintaining worker comfort. Ceiling mounted fans also have the added benefit of destratification, or equalization, of the air temperature in the building which can reduce heating costs by up to 35 percent in the winter months.

Hot Water Pipe: Hot water is required in the manufacturing process at John Deere Ottumwa Works for pretreatment in the paint system. Insulating the water storage tank could ensure a steady water temperature and reduce the amount of energy used. Furthermore, temperature sensors installed on the tank's exhaust stack could regulate the burners that heat the water, resulting in a steady water temperature with less energy required.



Light Emitting Diode (LED) Flood Lights: The exterior flood lights around the facility generally consist of 250-watt and 400-watt metal halide lights. New 105-watt and 150-watt LED flood lights have emerged on the market as direct replacements for the current lights. Along with consuming almost a third of the power of the current lights, LEDs also provide a much whiter light that resembles natural light. Replacing six metal halide lights on the south main street lot with five staged LED lights could save up to 7,345 kilowatt hours per year. Replacing the seven metal halide lights, located outside of Department 74, with seven strategically placed LED lights could save up to 8,142 kilowatt hours per year while providing better light coverage of the area.

CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN METRIC TONS

From Recommendations in Recommended Status

TOTAL FOR ALL SECTORS							
CO ₂	SO ₂	CH ₄	N ₂ O	CFC	NO _x	VOC	PM ₁₀
224.80	1.19	26.00	0.17	2.77	0.58	0.09	0.03

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
MOTOR DRIVE BELTS	\$8,783	106,143 kWh	RECOMMENDED
INSTALLING CEILING FANS IN DEPT. 250 AND 254	\$18,416	41,830 kWh 21,390 therms	RECOMMENDED
HOT WATER PIPE	\$108	2,650 therms	RECOMMENDED
LED FLOOD LIGHTS (SOUTH MAIN STREET)	\$562	7,345 kWh	IN PROGRESS
LED FLOOD LIGHTS (OUTSIDE DEPT. 74)	\$623	8,142 kWh	IN PROGRESS

