

EAGLE WINDOW AND DOOR



JOHN DONAHOE
MECHANICAL ENGINEERING, IOWA STATE UNIVERSITY

DUBUQUE



COMPANY BACKGROUND

Eagle Window and Door is an Andersen Corporation company that has two locations in Dubuque, Iowa. Eagle specializes in manufacturing aluminum clad wood windows and doors for high-end residential and commercial applications. It offers a wide variety of customization options that includes 50 exterior colors, nine different wood species, and 11 interior finishes. The products manufactured at Eagle are part of the Andersen Architectural Collection, which is focused on creating the style of home the customer desires.

PROJECT BACKGROUND

The electrical costs associated with the compressed air system at both of the Eagle locations contribute significantly to the total bill. In addition, oil present in the air lines results in considerable scrap and lost labor costs. The intern examined ways to improve the efficiency and performance of the compressed air systems, in order to reduce the company's total energy usage, cost and environmental impacts.

INCENTIVES TO CHANGE

Eagle Window and Door has always been committed to environmental responsibility through its involvement with the Window and Door Manufacturers Association, the U.S. Green Building Council, the National Fenestration Ratings Council, and the U.S Environmental Protection Agency's Energy Star program. The company emphasizes preserving nature, reducing waste, using recycled materials, and conserving energy. These principles and priorities are being applied to both of the manufacturing locations.

RESULTS

Mist Eliminator Installation: The automated paint line, located at the smaller Eagle facility, produces approximately \$453,770 in scrap material and product annually. Oil in the air lines contributes to 24 percent of the scrap generated. Ideally, 0.01 PPM of oil should be present in the lines; currently, the oil exceeds 1.37 PPM. The installation of a mist eliminating filter will help to filter out this oil and could save Eagle \$64,511 annually in scrap reduction and lost labor.

Air Dryer Replacement: The air dryer is an important component in providing high quality end-use air. The current dryer specifications indicate it is a 50° F dew point dryer, while the ideal temperature for the painting application



is approximately 37° F. In addition, new technology dryer units have significantly less pressure drop across their inlets and outlets compared to the current model. A two pound per square inch drop of exit pressure could improve the compressor's efficiency by one percent. Replacement would result in approximately \$600 in savings annually.

Air Compressor Replacement: The current air compressor is approaching the end of its service life and is the main source of oil in the system's air lines. If the facility upgraded to a newer variable speed drive technology, considerable electrical savings could be realized. In addition, the amount of scrap and lost labor would be reduced, which would provide a total savings of \$99,663 annually.

Air Leak Repair: A system air leak analysis was performed at each Eagle location. Leaks in the air lines have a direct impact on electrical costs and wasted energy. Over \$5,209 worth of annual leaks were located in the facilities. Implementing a compressed air system maintenance program and repairing leaks would reduce electrical costs as well as decrease the environmental impact.

Demand Side Storage: Portions of the main facility experience a highly variable demand for compressed air depending on the time of day and production schedule. This range in demand can cause the compressor to fall behind on supplying air. Installing air receiver tanks for storing air near the high demand areas of the facility would help eliminate large demand spikes and allow the compressor to run smoother and at a lower operating pressure, ultimately reducing energy costs by approximately \$2,810 per year.



CONVENTIONAL AIR POLLUTANTS AND GREENHOUSE GASES DIVERTED IN STANDARD TONS

Total for all sectors					
CO ₂	SO ₂	CH ₄	N ₂ O	CFC	PM ₁₀
371.50	1.93	12.11	0.02	4.34	0.05

PROJECT	ANNUAL COST SAVINGS	ENVIRONMENTAL RESULTS	STATUS
MIST ELIMINATOR INSTALLATION	\$64,511	133 TONS 47,048 KWH	IN PROGRESS
AIR DRYER REPLACEMENT	\$600	7,143 KWH	RECOMMENDED
AIR COMPRESSOR REPLACEMENT	\$99,663	320 TONS 190,836 KWH	RECOMMENDED
AIR LEAK REPAIR	\$5,209	62,012 KWH	RECOMMENDED
DEMAND SIDE STORAGE	\$2,810	33,440 KWH	RECOMMENDED