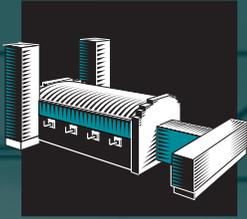


GLASS



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OFFICE OF INDUSTRIAL TECHNOLOGIES

ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

BENEFITS

- Saves \$711,000 annually
- Reduces annual energy consumption by 7.9 million kWh
- Reduces maintenance needs
- Improves system performance
- Avoided \$800,000 asbestos abatement costs
- Yields a simple payback of just over 1 year

APPLICATIONS

Compressed air systems are found throughout industry and consume a significant portion of the electricity used by manufacturing plants. Upgrading aging and inefficient compressed air systems within the context of a system-level strategy can improve system performance and save energy.

A system-level strategy focuses on an entire motor system, not just a motor system's individual components. By using this method, companies can best determine how to optimize an industrial motor system.

Compressed Air System Upgrade Improves Production at an Automotive Glass Plant

Summary

In 2000, Visteon Corporation implemented a project that improved the compressed air system at its automotive glass plant in Nashville, Tennessee. The project involved replacing worn, unreliable compressors with smaller, more efficient units and reconfiguring the system to allow it to operate more effectively. The completed project yielded significant savings in energy and maintenance costs. In addition, the project allowed Visteon to avoid paying \$800,000 for asbestos abatement. The total cost of the project's implementation was \$724,000 and the total annual savings were \$711,000, leading to a simple payback of just over 1 year.

Plant Background

Visteon is an automotive parts manufacturer that was spun off from Ford Motor Corporation in 2000. With 81,000 employees and more than 130 technical, manufacturing, sales, and service facilities in 23 countries, Visteon produces a wide range of automotive components for automotive manufacturers all over the world. The company's three main business segments are Dynamics and Energy Conversion; Comfort, Communication and Safety; and Automotive Glass.

VISTEON AUTOMOTIVE GLASS PLANT IN NASHVILLE, TENNESSEE



Visteon's Nashville glass plant started operating in 1956 and has since undergone 10 expansions. These expansions have doubled floor space to more than 2 million square feet and doubled production output, making it the world's largest complete automotive glass production plant. The Nashville plant produces windshields, backlights, and door glass. Compressed air is important for the plant's production because it serves the molding machines that are essential for glass production, as well as a large number of air cylinders, grinders, drills and drying applications. Prior to the project, the plant's compressed air system was served by four aging 600-horsepower (hp) centrifugal water-cooled compressors and one 250-hp rotary screw unit that were located in the powerhouse. These compressors broke down frequently and imposed high maintenance costs on the plant.

Project Overview

In 1999 a facility management review by Mr. Joe Ghislain, an instructor for the Compressed Air Challenge, which is a DOE Allied Partner, produced a system-level strategy for the Nashville plant to optimize its compressed air system. The review pointed to some issues that contributed to the system's inefficiency and made recommendations to solve them. The first problem identified was numerous air leaks that were wasting compressed air. Next, the review indicated that the plant had a series of blow-off applications that could be satisfied more effectively and at lower cost with low-pressure fans. The review also questioned the need for maintaining a system pressure above 100 pounds per square inch gauge (psig) when many applications were rated for 90 psig. Finally, the review stated that because the powerhouse was quite distant from the rest of the plant, the air had to travel a long distance before getting to the end-use applications, thus making system operating costs excessively high.

In addition, the existing compressors were in poor condition and becoming increasingly costly to repair. Normally, the plant's air demand could be satisfied by two of the centrifugal units and the rotary-screw compressor at peak needs. However, the compressors, which had been in service since the 1960s, operated so poorly that they frequently had to be taken out of service for repairs. At times, the plant had to rent compressors at a cost of \$1,000 per day while its compressors were being repaired.

Project Implementation

After reviewing the situation, engineers and management decided to overhaul the compressed air system to increase its efficiency. They decided to dispose of the existing compressors and replace them with two 450-hp and one 275-hp lubricant free, rotary screw compressors. In addition to being smaller and more energy efficient, the new units are cooled with a closed-loop cooling system, which eliminates the need to pump water from the river for compressor cooling. Instead of installing the new units in the powerhouse, plant personnel placed them in a central plant location that required minimal engineering and equipment to connect them.

Next, plant personnel performed a leak detection and repair campaign that eliminated the largest leaks in the system. At the same time, they switched many of the blow-off applications from using plant air to blowers. Once the compressors were installed and the leak repair was complete, the plant began operating the new compressors at a discharge pressure of 97 psig. The plant engineers monitored the end-use applications and gradually lowered the system pressure to 90 psig +/- 2 psig.

Results

This project greatly improved the performance of the compressed air system and yielded substantial energy and maintenance savings. Prior to the project, the plant needed to operate at least two of its four 600-hp centrifugal compressors at full load to meet the system's air demand, which averaged

VISTEON COMPRESSORS IN NEW CENTRAL PLANT LOCATION



4,600 standard cubic feet per minute (scfm). Currently, the plant only baseloads one 450-hp unit and the 275-hp unit for its normal production needs, which now average approximately 2,800 scfm. This reduction in required compressor capacity and output is attributed to the success of the leak repair campaign, the lower system pressure, and the elimination of the use of compressed air from blow off applications. These measures have led to annual compressed air energy savings of 7.9 million kilowatt-hours (kWh) and \$238,000.

Additional annual energy savings of \$33,000 and \$40,000 have come from placing the new units in the plant and from reducing the compressed air system's dependence on the plant's millwater pumping system. When the compressors were located in the powerhouse, the powerhouse had to be heated to provide the appropriate ambient air temperature for the air treatment equipment. Once the compressors were housed in the plant, the powerhouse did not require heating. The new closed loop cooling system reduced the load on the plant's millwater pumping system by 1.5 million gallons per year.

In addition to energy savings, the plant realized annual savings of \$400,000 from reduced maintenance and maintenance labor on the existing compressors. Total project savings are thus \$711,000 per year, and because the total project cost was \$724,000, the simple payback was just over 1 year. Finally, the plant avoided a large expense by relocating the compressors to the plant. The powerhouse contained asbestos, and if the plant had kept the compressors located there, it would have had to spend \$800,000 on asbestos abatement.

Lessons Learned

Worn and improperly configured industrial compressed air systems can lead to energy waste, low product quality, and excessively high operating costs. A system-level strategy that specifies

the optimal compressed air system configuration along with the appropriate size and type of compressor improves performance, saves energy, and improves productivity. In the case of the Nashville Glass Plant, replacing compressors that had reached the end of their useful lives was done in conjunction with measures that improved the system's efficiency and allowed the plant to operate effectively with less compressor capacity. By using a systems approach towards equipment replacement, eliminating leaks and blow off applications, and adjusting the system pressure to the lowest level that served the plant's requirements, the Nashville plant was able to increase the efficiency of its compressed air system, yielding substantial energy and maintenance savings.



BestPractices is part of the Office of Industrial Technologies Industries of the Future strategy, which helps the country's most energy-intensive industries improve their competitiveness. BestPractices brings together emerging technologies and best energy-management practices to help companies begin improving energy efficiency, environmental performance, and productivity right now.

BestPractices emphasizes plant systems, where significant efficiency improvements and savings can be achieved. Industry gains easy access to near-term and long-term solutions for improving the performance of motor, steam, compressed air, and process heating systems. In addition, the Industrial Assessment Centers provide comprehensive industrial energy evaluations to small- and medium-size manufacturers.

PROJECT PARTNERS

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INDUSTRY OF THE FUTURE—GLASS

*In April 1996, several organizations representing the glass industry signed a compact with the Department of Energy (DOE) in an effort to encourage technological innovations that will reduce energy consumption, pollution, and production costs in the industry. The glass industry published a report entitled **Glass: A Clear Vision for a Bright Future**, which articulated the industry's vision of its future. This compact set the foundation for collaborative efforts between the industry and the Federal government. Signed by both key industry players and Department of Energy officials, it was a formal commitment to align DOE's limited resources to meet the challenges identified in the vision.*

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