Dal-Tile:

Optimized Compressed Air System Improves Performance and Saves Energy at a Tile Manufacturing Plant

Project Summary

To save energy and reduce costs, Dal-Tile Corporation optimized the compressed air system at its glazed tile manufacturing plant in Dallas, Texas, in 2002. Before the project, the system experienced erratic air quality and wide fluctuations in pressure that led to inconsistent product quality and excessive energy costs. As part of a corporate initiative to reduce operating costs and save energy, Yvonne Rieger, project manager at Dal-Tile Corporation, commissioned Air Science Engineering, a U.S. Department of Energy Allied Partner, to assess the compressed air system. The assessment generated a system-level improvement project to increase the system's efficiency and support the plant's production parameters. This project reduced the plant's energy use by 5.7 million kWh annually, saving $288,000 per year in compressed air energy and maintenance costs. With total project costs of $278,000, the simple payback was just under one year. The energy and maintenance cost reductions from this project encouraged Dal-Tile to implement similar projects in five additional facilities that use compressed air.

Benefits

- Saves $274,000 in annual energy costs
- Reduces energy consumption by 5.7 million kWh per year
- Saves $14,000 in annual maintenance costs
- Achieves a one-year simple payback
- Resulted in improvements at five more plants

Applications

Compressed air systems are found throughout industry, and they can consume a significant portion of the electricity used by manufacturing plants. Using a system-level strategy to improve a compressed air system is the best way to enhance system performance, increase efficiency, and save energy.

Plant/Project Background

Established in 1947, Dal-Tile Corporation is the largest manufacturer, distributor, and marketer of ceramic tile and natural stone in the United States. Headquartered in Dallas, Texas, the company has 10 production facilities in the United States and Mexico and sells its products through a network of more than 200 company-owned sales service centers, independent distributors, and leading home center retailers nationwide. The Dallas plant is the site of the company's first glazed wall tile manufacturing operation. Compressed air is important for dense phase transfer systems, dust collectors, air cylinders, and other equipment.

Before the project, 11 rotary screw compressors totaling 1,475 horsepower (hp) served the plant's compressed air system. Each compressor was individually controlled, and some units were added over time to support changing production parameters. The system's flow rate, normally 2,600 standard cubic feet per minute (scfm), rose to 3,200 scfm during peak demand when dense phase transfer systems were operating. Because the peak demand intervals were irregular, plant personnel operated nine compressors continuously to meet it and to prevent pressure losses. Nevertheless, the system pressure fluctuated between 90 and 110 pounds per square inch gauge (psig), and air quality was unreliable.

The recommended system-level project included installing a 10,000-gallon storage receiver and a pressure/flow controller to stabilize system pressure. Plant personnel also installed a programmable logic control (PLC)-based multiple compressor controls package, two mist eliminators, a larger dryer, and 15 zero-loss condensate drains. They also reconfigured part of the system's piping and repaired leaks. These measures have improved the compressed air system's performance substantially. The air quality is better and the pressure level is stable at 92 psig +/- 1 psig. In addition, only three or four compressors, representing a maximum of 600 hp, are needed to meet all demand conditions.

Project Results

The compressed air system project at Dal-Tile's Dallas plant is saving $211,000 in compressed air energy costs and 5,716,000 kWh per year, which is consistent with AIRMaster+ estimates. Demand charges are $63,000 lower per year, and taking four compressors off-line has further reduced annual compressed air maintenance costs by $14,000, saving $288,000 all together. With total project costs of $278,000, the project's simple payback is less than one year.

Lesson Learned

Compressed air systems should be evaluated periodically to determine whether they are performing optimally. In any compressed air system, efficiency losses can accumulate, resulting in higher energy costs and poor system performance. At Dal-Tile's Dallas plant, incremental compressor installations resulted in an inefficient arrangement of compressors, piping, and undersized air treatment components. This arrangement required excess compressor run time to maintain the required flow rate and pressure level. Once plant personnel optimized the compressed air system, it could adequately support the plant's production parameters with less than half the previous compressor capacity. Energy and maintenance cost reductions from this project encouraged Dal-Tile to implement similar projects in five additional production facilities that use compressed air.

Dean Smith

Partner Profile

Dean Smith, Director of Marketing for Quincy Compressors and Manager of Air Science Engineering, has more than 15 years of experience as a consultant in compressed air and gas system analysis. He has audited more than 500 compressed air systems in a variety of industries, published many articles on compressed air topics, and developed patents on compressed air system components and evaluation methodologies. He is a Qualified Instructor for the Compressed Air Challenge (CAC) Fundamentals and Advanced Management training and was a member of the core group that developed this training.

CAC Instructors

The CAC qualifies instructors who are trained, certified experts in the use of compressed air systems. They are dedicated to providing industrial end-users with strategies they can implement immediately to improve the efficiency and reduce the costs associated with compressed air systems in their plants.

Project Partners

Air Science Engineering, Inc.
Powder Springs, GA

Dal-Tile Corporation
Dallas, TX

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