



## Compressed Air System Increases Efficiency and Saves Energy

**Sara Lee now has a better compressed air system** at its industrial bakery in Sacramento, California, because of an energy efficiency project completed in December 2004. Before the project, the compressed air system's pressure flow controller (P/FC) had failed, causing the system's performance to substantially decline. Plant personnel commissioned Draw Professional Services of Cave Creek, Arizona, a DOE Allied Partner, to evaluate the system. One of Draw's employees, Frank Moskowitz, is a Qualified AIRMaster+ Specialist and instructor. His evaluation provided a system-level strategy for improving the compressed air system that involved repairing the P/FC, fixing the compressor controls, repairing leaks, and replacing a 150-horsepower (hp) compressor with a 100-hp unit fitted with a variable-speed drive (VSD). This project greatly increased the compressed air system's efficiency and performance and has reduced the bakery's annual energy and maintenance costs for compressed air.





*A system-level assessment that included an **AIRMaster+** analysis resulted in a comprehensive project to achieve greater efficiency and improve the system's performance.*



**Sara Lee Bakery Group**, a division of Sara Lee Corporation, prepares and markets a full line of branded, packaged baked goods in the United States, Europe, and Australia. The Sacramento facility is a 300,000-square-foot industrial bakery built in 1929. With 450 full-time employees, it produces more than 6 million hot dog and hamburger buns and almost 2 million loaves of bread per week. Compressed air is important to production because it directly supports the stacking, blowing, and cleaning operations required by the breadmaking machines.

Before the project, the bakery's compressed air system was served by one 100-hp and two 150-hp rotary screw compressors. After the P/FC failed, the plant's air demand patterns began fluctuating severely, and all three compressors had to operate simultaneously so the plant could meet its production targets. The situation was made worse by the fact that the compressor controls were out of adjustment. This caused them to react to different control pressures, and more

than one compressor would activate when only one unit was actually needed. Furthermore, compressed air leaks accounted for 15% to 20% of the system's demand, and some uncontrolled open blowing applications were found. Those two conditions exacerbated the pressure fluctuations and wasted even more compressed air.

After the project, the compressed air system's performance improved considerably. In addition to having a consistent air supply and stable pressure, the plant can now meet its air demand with fewer compressors.

The 100-hp fixed-speed compressor is now the base unit, and the 100-hp VSD unit is the trim compressor. Plant staff were able to dispose of one of the two 150-hp compressors; the remaining one serves as a backup.

#### **PROJECT RESULTS**

The compressed air system project at the Sara Lee Bakery is yielding impressive energy savings while making production more reliable.

Measurements taken since the project's completion indicate energy savings of 471,000 kWh annually, for a cost savings of \$40,000 per year. These figures are consistent with AIRMaster+ estimates. Also, because two compressors are effectively offline, maintenance costs have declined, saving another \$10,000 per year. An \$11,000 rebate from the Sacramento Municipal Utility District reduced total project costs to \$27,000. With annual savings of \$50,000, the project's simple payback was 6.5 months.

#### **LESSON LEARNED**

Inoperative and improperly functioning components can reduce compressed air system performance, leading to higher energy and maintenance costs. Using a system level approach to repairing or replacing malfunctioning components is the best way to optimize system efficiency, reduce energy consumption, and ensure reliable production.

#### **Other Project Details**

Sara Lee invested \$38,000 to purchase and install the Atlas Copco GA 75 VSD compressor. The Sacramento Municipal Utility District provided an \$11,000 rebate, dropping equipment costs to \$27,000. All other changes to the air system were done by in-house staff.

Demand side leaks are constantly being repaired. A flow controller that was not functioning was reestablished and now holds plant pressure at 82 psig.

Supply side pressure is now held at 92 psig, which is 10 psig lower than previously. This equates to an additional 5% energy reduction.

Open blowing was not replaced as expected. However blowers will be purchased to replace open nozzles in the depanning areas.





At Sara Lee's Sacramento bakery, a misadjusted compressor controls package and a failed P/FC caused the compressed air system's performance to be erratic and increased energy and maintenance costs. A system-level assessment that included an AIRMaster+ analysis resulted in a comprehensive project to achieve greater efficiency and improve the system's performance. This approach can be replicated in many industrial manufacturing plants requiring compressed air.

**PARTNER PROFILE**

Frank Moskowicz is a mechanical engineer with more than 30 years of experience in industrial plant engineering. He has worked with Draw Professional Services, a DOE Allied Partner, for 16 years and has audited hundreds of compressed air systems throughout North America in a variety of manufacturing plants. He has published articles in Plant Engineering magazine, MRO Today, and Energy Matters, and has presented hundreds of seminars throughout the industry. In addition, he is a qualified instructor for both Fundamentals and Advanced Compressed Air Challenge ([www.compressedairchallenge.org](http://www.compressedairchallenge.org)) training and a DOE Senior AIRMaster+ instructor.

**QUALIFIED SPECIALISTS**

Qualified Specialists are industry professionals who identify cost-cutting and efficiency opportunities in industrial

plants. They are experienced professionals who complete a qualification training workshop and exam for specific DOE-developed software tools to receive special designations, and they can use these tools to help plants reduce costs, decrease maintenance and downtime, and improve productivity. The training recognizes and enhances a professional's expertise in the use of the DOE's AIRMaster+ software tool, Pumping System Assessment Tool, Process Heating Assessment and Survey Tool, or Steam System Tools.

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**BENEFITS**

- Saves \$50,000 annually
- Reduces annual energy consumption by 471,000 kWh
- Reduces annual maintenance costs
- Achieves a 6.5 month simple payback

**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.

**BEST PRACTICES**

BestPractices is part of the Industrial Technologies Program, and it supports the Industries of the Future strategy. This strategy helps the country's most energy-intensive industries improve their competitiveness. BestPractices brings together emerging technologies and energy-management best 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.

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Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.