The California Energy Commission and the U.S. Department of Energy, Office of Industrial Technologies BestPractices present:

ENERGY SOLUTIONS FOR CALIFORNIA INDUSTRY:

WAYS TO IMPROVE OPERATIONS AND PROFITABILITY

MAY 2002

CASE STUDY

BENEFITS

- Saves 289,000 kWh and $26,000 annually
- Improves system performance
- Reduces production downtime
- Improves production

APPLICATIONS

Compressed air systems are found extensively in industrial production processes and can be the greatest source of electricity consumption in a plant. Proper configuration of a compressed air system is important in ensuring that it operates efficiently.

ABOUT THIS EVENT

The purpose of the Energy Solutions for California events is to provide a *professional, solutions-oriented* environment for industrial electricity users who face serious challenges to remaining operational and profitable during the current energy crisis. Industrial electricity users have the opportunity to receive unbiased information and analytical tools that can increase reliability and manage short and long-term production costs.

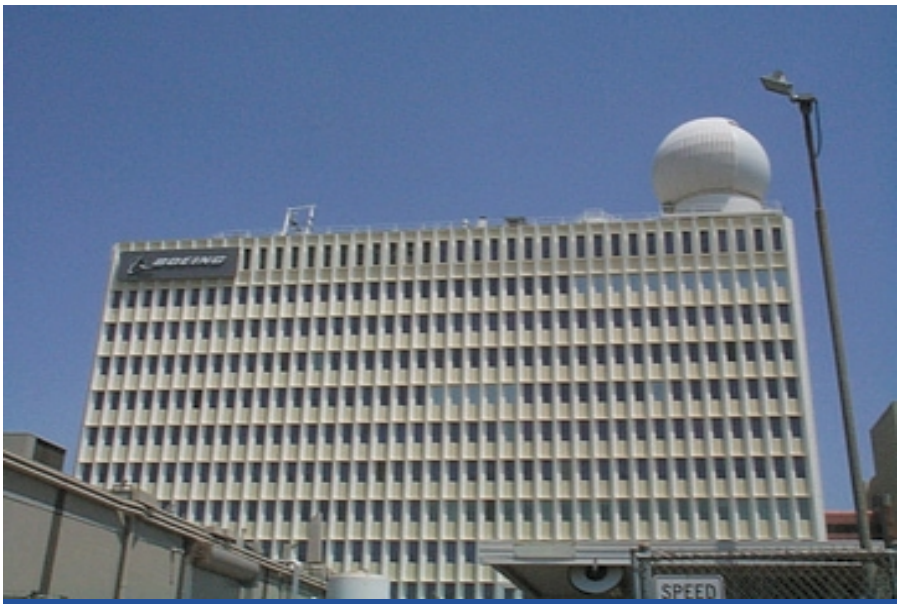
Compressed Air System Optimization Improves Production and Saves Energy at a Satellite Manufacturer

Summary

In 2001, a compressed air improvement project was implemented following an audit on the compressed air system at Boeing Satellite Systems (formerly Hughes Space & Communications Company) in Los Angeles, California. Thanks to the project's implementation, the plant was able to stabilize and lower its system pressure, which led to expected annual energy savings of 289,000 kWh and $26,000. With a project cost of $47,000, the simple payback is 1.8 years. The project's implementation also improved the reliability of the compressed air system.

Company/Plant Background

Boeing Satellite Systems is a subsidiary of The Boeing Company and is located in El Segundo, California. At the El Segundo facility satellites



Boeing Satellite System's El Segundo Facility

and space communication systems for military, commercial, and scientific uses have been developed and produced since 1961. These satellites and space communications systems perform communications and meteorological functions for a variety of international and US customers.

Compressed air is important for the El Segundo plant's production process because it is needed for the precision automated component manufacturing machines as well as pneumatic air movers. The air movers are special lifting devices that use balloons to provide vibrationless movement and accurate positioning of satellites and their components. The air movers and automated manufacturing machines require consistent, stable pressure to function reliably. The plant's compressed air system is served by two 200-hp, rotary screw compressors. Prior to the project, the system pressure fluctuated between 95 and 125 psig.

Project Overview

The unstable pressure levels led the El Segundo plant to conduct an evaluation of their compressed air system. The plant personnel teamed up with an OIT Allied Partner, Draw Professional Services, to examine the system and determine how to optimize its performance and eliminate the pressure fluctuations.

The first problem the evaluation found was that the operating pressures for the compressed air applications were excessive. Based on the mistaken belief that the lowest end-use pressure requirements were 110 psig, low-pressure alarms had been installed just upstream of those applications' inlets. When the system pressure fell below 105 psig, machine shutdowns and minor production interruptions were possible. One main reason why the pressure level fluctuated so much was intermittent air use by some of the applications. The sudden increase in air demand by some end uses was so great that it caused the system pressure to decay to unacceptably low levels before the compressors could react.

This excessive system pressure coupled with a leakage rate of approximately 25% of the system's output caused a high degree of artificial demand. One source of air leakage was a regenerative dryer that was continually in the purge mode. The artificial demand led the compressors to work harder than necessary because they had to support the system's leaks in addition to the end uses. Other problems

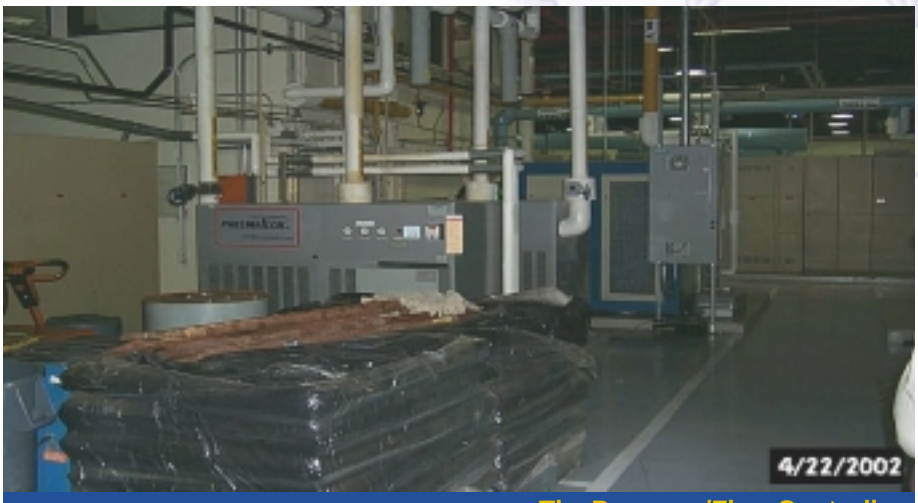
that affected the compressed air system's performance included moisture build up and additional air loss through open blowing applications, electrical condensate drains, and airflow from equipment that was not in use.

Project Implementation

The El Segundo plant engineers implemented a system-level optimization project whose focus was to stabilize and lower the system pressure. In the first phase of the project, the plant installed a pressure/flow controller (P/FL) with additional storage and performed a leak detection/repair campaign. The additional storage was a 1,020-gallon tank that was installed just upstream of the P/FL. Compressed air was to flow into the tank at 110 psig and be released by the P/FL at 105 psig. The leak repair effort, which included turning the dryer off its purge mode, reduced the leakage rate from 25% to 10% of output. The next steps in the project included measures to further reduce the artificial demand. The plant replaced many of its electrical condensate drains with zero loss drains and placed solenoid valves on the end use applications that released air while not in use.

Project Results

Following the project's implementation, the plant witnessed a substantial improvement in its compressed air system's performance. The compressor discharge pressure was reduced from 125 to 110 psig and the P/FL now maintains the pressure in the main header at 105 -+ 1 psig. Prior to the project, both compressors had to be operated. With



The Pressure/Flow Controller

the new configuration, the increased storage provides enough air for the end uses to continue operating through demand spikes. As a result, only one compressor is needed to adequately supply the plant's compressed air demand. The plant's average total flow has decreased from 400 scfm before the project to 325 scfm currently. This decrease has been made possible by the leak repair campaign and application of zero loss air drains and solenoid valves that have sharply reduced artificial demand.

Due to the stabilization and lowering of the system pressure level, and the reduced demand, the plant has experienced annual energy savings of 289,000 kWh and $26,000. More importantly, the stable pressure has eliminated the possibility for minor production interruptions caused by the previously unstable air supply. With a total project cost of $47,000, the simple payback is 1.8 years.

Lessons Learned

Improperly configured compressed air systems can lead to high energy costs, excessive maintenance, and lost production. In the case of Boeing Satellite Systems, severe fluctuations in air demand patterns and substantial leaks led the plant to operate more compressors than necessary, resulting in compressed air waste. Furthermore, incorrect assumptions about the minimum needed operating pressure of certain end use applications and low pressure alarms might result in shutting those applications down, causing production downtime. Once the plant modified its system by stabilizing and lowering the pressure, eliminating the moisture carryover, and reducing its demand by repairing leaks and misapplied end uses, the compressed air system functioned more effectively. The system's more efficient operation resulted in compressed air energy savings and improved production for the plant.

United States Department of Energy's Office of Industrial Technologies BestPractices

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

California Energy Commission

The California Energy Commission is the state's primary energy policy and planning agency. It is the California Energy Commission's mission to assess, advocate, and act through public/private partnerships to improve energy systems that promote a strong economy and a healthy environment.

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PROJECT PARTNERS

- **Boeing Satellite Systems El Segundo, CA**
- **Draw Professional Services Macungie, PA**

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