Compressed air technical briefing

Why compressed air?

Compressed air is often used in industrial applications including pneumatic actuators, material blow-off, air tools and air-operated diaphragm (AOD) pumps. A compressed air system is often viewed as an additional utility because it is vital for the operation of the facility.

An air compressor is a machine that increases the pressure of ambient air. The process is energy intensive with 85% of the electrical energy being converted into waste heat. This leaves only 15% of electrical energy being converted into compressed air that can deliver useful work.

Many steps between compressed air generation and end use are susceptible to losses and inefficiencies. These losses mean more compressed air must be generated up front so that the proper amount reaches the final end use.

This increases the amount of energy used to deliver the final compressed air product. Because of the high energy intensity required to produce compressed air, it is vital to have a compressed air system working as efficiently and effectively as possible.

What is a compressed air technical audit?

A compressed air technical audit analyzes and identifies opportunities to improve a compressed air system's efficiency and operation. The audit is conducted by a compressed air contracting service. The resulting report includes a schematic for the current compressed air system, including all compressed air generation, treatment, distribution and storage. All components are inventoried and analyzed. The supply side and demand side of the system are evaluated for energy efficiency and operational opportunities. Proposed system changes are presented, and energy-saving opportunities are quantified. Typically a leak survey is conducted as part of the demand-side evaluation. While the customer pays for the survey and repairs, incentives from Focus on Energy are available.

Recommended savings measures

Based on our expertise and experience working with customers, the following savings measures are consistent among different types of facilities. Consider implementing these measures prior to proceeding with a compressed air technical audit.

1. **Compressed air leak survey and repair**

   Industrial facilities often lose 10 to 30% of produced compressed air through leaks. These leaks waste energy by requiring the compressor to increase air pressure to compensate for pressure losses.

   A leak survey conducted in conjunction with the technical audit discovered that every customer had multiple leaks in their system. In fact, an average of 46 leaks were identified from the audits. These 46 leaks added up to 169 scfm of compressed air and an average cost of $18,494 per year. At an estimated repair cost of $7,800, the average payback for leak repairs is five months.

2. Replace timed drains

Many compressed air condensate systems have a timed drain to flush out water that is removed from the compressed air. When using a timed drain, there is a set amount of time when the valve is closed and when it is open. When the valve opens, compressed air pushes out the removed water. After the water is pushed out of the line, compressed air follows until the timer closes the drain. This turns a timed compressed air drain into a controlled compressed air leak since compressed air is being released for the majority of the time the valve is open.

Instead of timed condensate drains, a level activated no-air-loss condensate drain can be used. This type of drain allows only water to be drained out, not compressed air. It works similarly to the float in a toilet bowl.

All of the technical audits identified timed drain replacement. The average savings was $281 per drain per year. Typical paybacks with Focus on Energy incentives are 2.5 years.

3. Replace open-blow nozzles with engineered nozzles

In industrial facilities, compressed air sometimes is used to clean surfaces, remove chips or dry parts. Typically, nozzles are just straight open tubing letting out controlled compressed air leaks. When no other option for blow-off is available and compressed air is necessary, engineered nozzles are great solutions. Engineered nozzles, also known as air entraining nozzles, use the Venturi effect to supply the desired airflow (cfm) while reducing the amount of compressed air that is consumed. It works by drawing in ambient air along with the compressed air to provide the necessary airflow. A standard nozzle replaced with an engineered nozzle saves around $480 annually (based on 2,000 hours of annual use and an electric cost of $0.10/kWh).

4. Reduce system air pressure

Compressed air systems often are over-pressurized to ensure equipment does not fail to operate due to insufficient air pressure. It is not uncommon for systems to be over-pressurized by 20 psi. A good rule of thumb is that compressor energy is reduced by 1% for every 2 psi that system pressure can be reduced.

5. Reduce compressed air use

It is common for compressed air systems to operate around the clock even though a facility only operates on one or two shifts. This becomes costly because compressed air systems are not perfectly sealed. Even when no one is around, air leaks still occur and triggers the compressor to operate to keep the desired set point. Leaving compressors on when the facility is not in operation can be an expensive decision.

Even if some areas operate 24 hours a day and others do not, strategies exist to help reduce compressed air consumption due to air leaks during shutdown periods. A solution can be sectioning off these areas or installing valves to prevent the flow of compressed air when those areas are not in use.

When to pursue a technical audit

These savings measures should be evaluated before conducting a compressed air system technical audit. Many times, these initial steps are sufficient for increasing system efficiency and are more cost effective to do independently than performing a full-scale technical audit.

When these measures have been pursued and there is still room for improvement, or there is more complexity to implementing them that requires a deeper look, then a technical may be the best next step.

Potential technical audit outcomes:

- Distribution piping changes to minimize friction losses
- Identification of compressed air end uses that can be replaced with an electrical equivalent
- Control sequencing for compressor staging
- Installation of proper-sized storage

Contact us

Please contact us whenever we can help you with your energy service.

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