

Energy Efficiency Considerations

to Optimize Cost Savings in Compressed Air Systems / Advantages of a Compressed Air Utility Service

-Jeff Amburn, MPW

In most Process and Industrial facilities, the compressed air system must always be dependable, and “running”. Why? Critical machinery needed for production requires compressed air at a specific cfm, pressure, and air quality. Interruptions in the compressed air supply often cannot be tolerated, or process and manufacturing become compromised, causing significant, costly, lost production time. A highly reliable compressed air system supply is a mandatory utility for many plant operations.

The need for a reliable compressed air supply comes at a considerable price, and the costs incurred can be attributed to several factors. **The primary, major cost is the compressed air electrical energy consumption required.** It's estimated by compressed air industry experts that the electrical energy consumed by a 500-horsepower (HP) compressor, at full load, running 24/7, at an average 8 cents per kilowatt hour (kWh), costs approximately \$260,500 annually. Many large facilities run multiples of such units, costing millions of dollars in annual electrical energy

usage, alone. Of course, there are other costs involved. Maintenance personnel must monitor the system for air quality and monitor the individual units run performance, daily. Also, the compressors and dryers require periodic maintenance service as suggested by the Original Equipment Manufacturer (OEM). Compressor and Dryer rebuild services are necessary every 5-10 years, depending on the critical maintenance provided, and based on the ambient conditions. (There are other, additional, hidden costs involved which I've discussed at some length in another article.

See: Identifying the Obvious and Hidden Costs of Compressed Air Systems: The Case for Compressed Air Utility Services.)

This article will point out some of the key areas to consider that can help to reduce the significant energy costs required by your in-house compressed air system. Some of these are easily investigated and implemented immediately, some will require the services of a compressed air specialist.



IN ANY COMPRESSED AIR SYSTEM, THE ENERGY-EFFICIENCY QUESTION BECOMES:

"How can we generate the minimum BHP needed to produce the required cfm / pressure system demand at the air purity required in the most efficient way?"

THE FOLLOWING ARE AREAS FOR IN-FACILITY INVESTIGATION.

1. Compressor Controls: Modern compressors usually feature on-board microprocessors which can be adjusted to provide for optimum unit performance and system efficiency. To reduce electrical consumption, compressors should run in the most efficient load control scheme available. (Refer to the individual Compressor operations manual for specific suggestions.) Keep in mind that a compressor at full load consumes the maximum electricity its designed to consume, and the most efficient, energy effective compressor is the one that's "off". In multi-compressor systems, it's important that the compressors are connected and communicating, if they are in close enough proximity for cabled communication. Staggering the pressure set points can often help to prevent the compressors from unnecessary short cycling as the max pressure settings are achieved. An OEM or third-party compressed air specialist can assist with suggestions for these types of settings.

2. Audits: An audit is a snapshot of compressor and system performance and compressed air-use, over a period of days or weeks. Audits can be "supply-side" (the compressors, filters, dryers), "demand side" (the piping system and equipment actually utilizing the compressed air), or both. Depending on the sophistication of a **supply side** audit, measurements are taken of compressor electrical energy consumption, as well as system cfm and pressure variations. An experienced compressed air auditor can also report on each compressed air system component for inefficiencies observed, and indicate any potential, near-term issues. **A supply side audit is invaluable to accurately determine the actual cost of energy used by the system.**



3. Leak-Detection: The Department of Energy (DOE) estimates that the average plant's air system loses up to 30% of the compressed air production to leaks. (Think of that as 30% of the available system horsepower, wasted!) While impossible to identify and stop all the leaks, a periodic leak-detection program is an important way to reduce the energy cost associated with compressed air utilization. Sophisticated leak detection equipment is available for rent or purchase from compressed air experts that can help identify and "tag" leaks. Once identified, the leaks need to be fixed. Leak detection and repair helps to significantly reduce the overall "wasted" compressed air system consumption, and results in considerable electrical energy cost reduction.

4. Compressed Air System Design Issues: The following are just a few of the "big picture" questions that impact the overall energy use and efficiency of the entire compressed air system. Questions like:

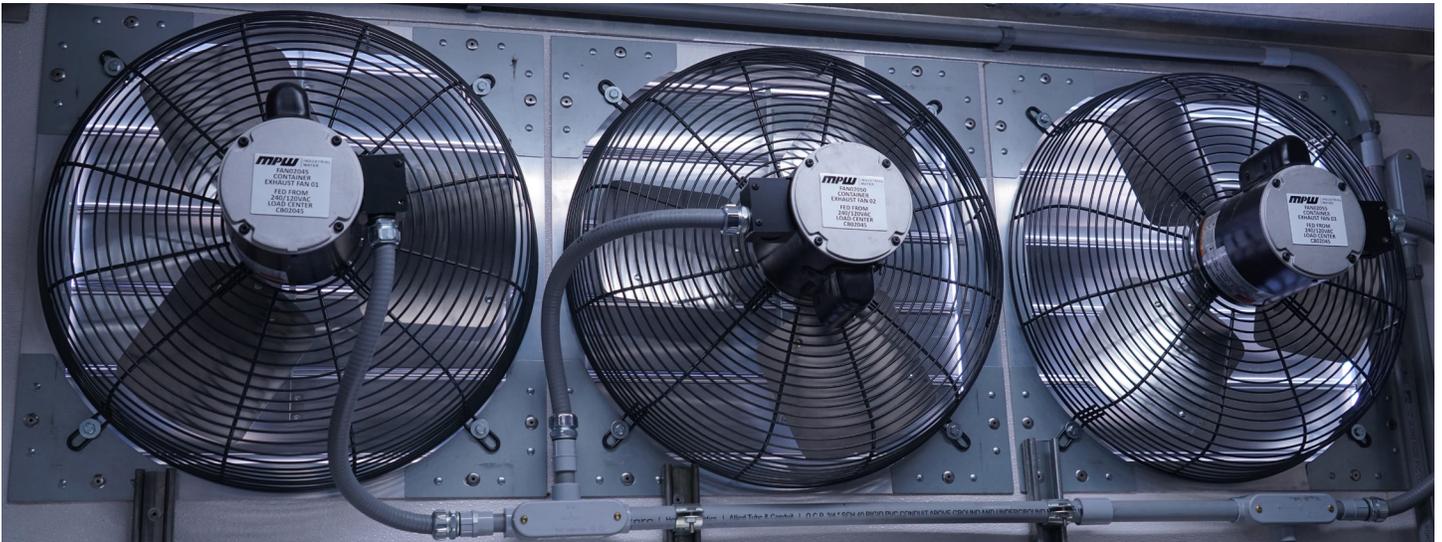
- Are the primary compressed air system com-

ponents utilized in the most energy efficient way?

- Are the system filters receiving the proper recommended maintenance?
- Is there adequate compressed air storage for the cfm and pressure variations indicated by the audit, to minimize compressed air disruptions to demand side uses?
- Is the compressed air system piping adequate? Are pressure drops minimized throughout the piping system?
- Do the air dryers work the way they should? Can the air dryers be upgraded to reduce compressed air consumption?
- Are there potential service issues?

These questions are just examples and not all-inclusive. These types of big picture issues are best reviewed by a compressed air system specialist with experience in auditing, and in air system layout and design. Specific, detailed information and ideas related to all these types of questions can be obtained from several sources on the internet that target "compressed air system energy efficiency."





5. Diesel drive Rentals: Is it the most energy inefficient way to utilize compressed air? Probably. Of course, maybe you've got to have compressed air and can't get it, when you absolutely need it, any other way. But at what cost? If you are running a diesel drive compressor 24/7, you may need a diesel fuel truck parked next to it, to provide it with "juice"! At this writing, the national price for diesel fuel in the USA is approximately \$3.70 per gallon. A diesel drive, 1500 cfm compressor running 24/7, at full load, will consume nearly 400 gallons of fuel per day, at a cost of about \$1500 to operate, plus the daily rental fee of more than \$300/day, on average. Comparatively, a 350HP (1500 cfm) electric drive compressor at .08 cents per kWh will cost about \$500 /day, total. So, a diesel drive compressor may be using 3 times the energy cost of a comparable electric unit. Of course, as I mentioned, sometimes it's the only way . . . or is it?



A UNIQUE SOLUTION TO OBTAINING NEW EQUIPMENT, WITH AN EMPHASIS ON ENERGY SAVINGS, IS TO CONSIDER A COMPRESSED AIR UTILITY SERVICE.

ADVANTAGES OF A COMPRESSED AIR UTILITY SERVICE

What's a Compressed Air Utility Service? Compressed Air Utility Services are compressed air systems that are specifically ordered and supplied as all-inclusive utilities, like gas or water, for your process or manufacturing facility. Each customer can specify cfm, pressure, and air quality requirements. The energy savings gets built-in! Air Utility services provide the most energy efficient equipment available. Centrifugal compressors, or rotary screw compressors, are built into modules that are pre-piped and wired. These systems include the most energy efficient drives, controls, and dryer equipment. There are additional reasons to consider a compressed air utility service:

- A Return on Investment (ROI) report is generated to cost-justify the project. This report compares the costs of the current, in-house system vs. the expected utility service costs.
- There are no upfront capital costs: Plug -and-play equipment is obtained for a monthly service charge, like a utility.
- Maintenance and service fees are included.
- 24/7 monitoring services ensure reliability and are included.
- Back-up? Included.
- Performance guarantees? Included.

Compressed air utility services provide custom systems for any portion of a process or manufacturing facility's' compressed air system requirements. Audit services and annual leak inspection can be included and provided by the utility services. Inclusive of all energy and maintenance savings with utility services, these systems often prove 25-40% savings over many currently "owned" facility systems.

(For answers to questions regarding any of the information contained here, please contact MPW Industrial Air Services.)

