AGI ENERGY SERVICE CENTRE
Sustainable Energy for Profitability

HOW ACTING ON THE COMPRESSED AIR CAN IMPROVE YOUR ELECTRICAL ENERGY EFFICIENCY

Energy efficiency potentials can be found in many areas. In general, every energy consumer operates with an efficiency that possibly may be improved. The two main questions are therefore:

1. How big is the share of this energy consumer on total energy consumption?
2. How big is the grade by which the energy efficiency (EE) of the consumer can be improved?

In industrial companies, compressed air are often significant energy uses (SEU). It is therefore meaningful to take a closer look at these systems. Compressed air is the most expensive type of energy. This is since by generating compressed air, 90% - 95% of the energy consumed (depending on the efficiency of the system) is converted into heat and 5% - 10% into usable compressed air.
Several measures can improve the EE of a compressed air system.

01 Use of waste heat

The most important savings potential in compressed air systems is the use of the 90% - 95% waste heat. When designing an efficient compressed air system, a heat recovery will need to be also included to determine where heat is required (e.g., for hot water preparation, heating purposes, preheating for specific purposes, etc.).

02 Looking for alternatives

The most energy-efficient compressed air system is the one that is not running. Many compressed air systems have historically been integrated into companies, sometimes at times when energy was significantly cheaper.

In many companies, compressed air is today not necessary and compressed air equipment could be replaced by electrical or hydraulic equipment. This is of course a big step for a manufacturing company and requires a detailed feasibility study and profitability analysis.

03 Reduction of demand

Because of the relatively expensive operating costs of compressed air systems, the minimum quantity of compressed air should be used for the shortest possible time, constantly monitored and reweighed against alternatives.

04 Maintenance

Inadequate maintenance can lower compression efficiency, increase air leakage or pressure variability and lead to increased operating temperatures, poor moisture control and excessive contamination. Better maintenance will reduce these problems and save energy.

05 Reduction of leaks

Leaks cause an increase in compressor energy and maintenance costs. The most common areas for leaks are couplings, hoses, tubes, fittings, pressure regulators, open condensate traps and shut-off valves, pipe joints, disconnect and thread sealants. Quick connect

fittings always leak and should be avoided. In addition to increased energy consumption, leaks can make pneumatic systems and equipment less efficient and adversely affect production, shorten the life of equipment, lead to additional maintenance requirements and increased unscheduled downtime.

A typical plant that has not been well maintained could have a leak rate between 20% to 50% of total compressed air production capacity (Ingersoll Rand 2001). Leak repair and maintenance can sometimes reduce this number to less than 10%.

Overall, a 20% reduction of annual energy consumption in compressed air systems is projected for regularly fixing leaks.

Fig. 1- Ultrasonic Leak detector

06 Compressor optimization

Plant personnel have a tendency to purchase larger equipment than needed, driven by safety margins or anticipated additional future capacity. Given the fact that compressors consume more energy during part-load operation, this should be avoided. Some plants have installed modular systems with several smaller compressors to match compressed air needs in a modular way.

In some cases, the pressure required is so low that the need can be met by a blower instead of a compressor which allows considerable energy savings. Modern compressors are mostly equipped with Variable Speed Drives (VSD), which significantly reduce the idling losses. Older compressors efficiency can be improved with VSDs.

07 Check the pressure

The pressure of many compressed air systems is set too high to prevent operating problems. Here you can try to reduce the pressure step by step while constantly checking whether all consumers are still working properly.

The system pressure can often be reduced by 1 to 2 bars in this way. Every bar reduction saves 6% to 7% energy. In some systems there is only one consumer who needs a higher pressure than all others. The system pressure must then be kept at the high pressure for all consumers.

Here it often makes sense to install a pressure booster system for this one consumer and to operate the rest of the system at low throughput.

08 Optimization of the network

Compressed air networks have often been created over decades and in many places, they have been changed, expanded, rebuilt, etc. Every curve, every bend, every valve in a compressed air network represents a resistance that reduces the system pressure. Therefore, the system pressure in very branched networks must be higher than in simple networks.

For optimization, it should be checked whether all sections of the system are still required, whether all consumers are required, whether distances can be shortened, etc. If the network can be simplified, this saves energy.

For additional information on this opportunity, please contact:

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