4 Compressed Air

Compressed air systems [1] are installed in almost 70% of all factories and it is not uncommon that these systems account for more than 20-30% of the company's total electricity consumption. A review of the system and its operational conditions will often result in one or more compressors being closed down or replaced by more operationally economic types, which will definitely improve the efficiency of the whole system.

When trying to optimise the compressed air system it is important to investigate both the entire system as well as the individual components. This means that apart from checking the individual parts of the system, it is necessary also to analyse the system's inlet and discharge side and their interaction. In the optimisation procedures is therefore advisable to consider the following:

- Investigation and documentation of the existing operation conditions including identification of operation parameters
- Clarification of existing and future demands on the performance of the compressed air system based on the company's production plans
- Analysis of operational data including demands to system performance over 24 hours
- Reuse of the energy from the compressors
- Analysis of alternative system installations including improvements
- Outline the technical and economical solutions at component as well as system level
- Implementation of solutions
- Collection of technical data for validation of energy and economical savings. Check payback times and so on
- Continued thorough and systematic supervision and optimisation of the compressed air system means better utilisation, technically as well as economically

- Ensure continued optimal operational conditions and preventive maintenance of the system

4.1 Compressed Air Requirements

4.1.1 Capacity

The capacity of the compressed air system is typically determined by analysing the requirements of the individual components and work procedures which use compressed air. When calculating the compressed air demand it is important to consider the load cycles of the individual processes, so that the measurements are not based on 24 hours' full load. Thus, the total capacity requirement of the plant is determined by adding up the average demand figures of the individual tools and processes. In cases where a high load is required for a limited time it is possible to use stored air from an air receiver. In some system setups it may be optimal to connect more air receivers which are placed close to the sources which require the high capacity. Mostly, a thorough review of the actual capacity demands of the system will show that the overall capacity of the system can be reduced.

A system with oversized compressors will run ineffectively, as the compressors normally use more energy per produced air volume, when running outside their peak load area. It is often more economical to use several smaller compressors, which are sequentially controlled at loads below the peak loads of the plants.

If there are still capacity problems after the optimisation of the system(with additional compressors), there are still alternatives to the use of compressed air, for example, electric tools, which may often be a more efficient and less energy-consuming solution.

4.1.2 Load Profile

It is extremely important to clarify the company's requirements for compressed air – typically defined over one working day, and an accurate load profile of the system is important to be able to design and implement an energy-efficient compressed air system in the company. Companies with a very varying load profile should invest in a system consisting of several sequentially controlled compressors which are running effectively under partial load. Correspondingly, companies with a simpler load profile can do with a system controlled according to simpler principles.