GOOD PRACTICES IN SME

Optimizing air pressure in compressed air installations

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Optimizing air pressure

The lower the air pressure produced by the compressed air installation, the more cost-effective its production. Naturally, a minimal pressure is required for a given process or a given recipient, however it is essential to decrease the peak air pressure in compressed air installations. There are several methods to decreasing the "range" of the installation's pressure:

- Direct control through mechanical switches on the compressors. The systems are outfitted with electromechanical pressure switches (presostats), which detect pressure differences. The sensor is equipped with a transmitter which controls the compressor.
- Variable speed control (using a frequency converter) of the compressors is the most energy efficient method.
- Using multiple compressors of different power ratings and a control circuit, which activates the appropriate compressor depending on the demand of the compressed air system.

It has been shown that decreasing the pressure by 1 bar creates energy savings of between 6-8%. Lowering the systems pressure also decreases air leakage from the installation.

Source: KAPE based on: „Dokument referencyjny na temat Najlepszych Dostępnych Technik w zakresie Efektywności Energetycznej" Komisja Europejska,2009

Pic. 1 air-com: threaded air filter

Pic. 2 ebmia: high pressure filter

Pic. 1 pneumat: Inline filter

How to maintain filters in a compressed air installation?

Undesired pressure decreases in a compressed air installation can also be caused by unmaintained (insufficient cleaning) or rarely replaced (in the case of single use filters) filters. It is often falsely assumed that a filer, once installed, will always clean particulates and oil. Filters are working correctly if their filtration materials maintain the appropriate parameters. If the material is dirty (glued together) or frayed, the filter element can rupture. Manometer readings of a raptured filter will be wrongly interpreted like a new filter (due to a lack of resistance – just as in a new filter). A filter which has been pushed apart will also have a similar effect.

Filter depletion consists of a slow pressure decrease (usually to about 0,3-0,5 bar) followed by an exponential decrease. A pressure decrease of 1 bar is equivalent to a 7% energy loss in compressed air production. Proper maintenance consists of replacing the filters at least once a year or when the pressure drops by about 0,4 bar.

Source: „Jak oszczędzać energię w systemach sprężonego powietrza?", Wojciech Halkiewicz, FEWE,2009

Relationship between pressure drops in compressed air installations and pipe diameter

Pressure drops in the installation and the equipment down the installation (wet equalizing tank, filter, dryer, u-bends, valves) are strongly dependant on the air flow rate, that is the compressors output. The relation is approximately quadratic.

Decreasing the pipe diameter increases the flow rate – and with it the pressure decreases. Segments of the installation where the diameter of the pipes is too small can create large pressure drops, and therefore decrease the energy efficiency of the entire installation. For this reason, it is essential to consider the effect of the pipe's diameter on flow resistance.

Source: „Podręcznik do samooceny zużycia energii dla MŚP", Jacek Szymczyk, 2020