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Best Practice	OPTIMISATION OF THE PRESSURE IN THE SYSTEM	CAIR-02
Application	Compressed Air Systems	
SME sector	Industrial	
SME Sub-sector	All	
Technical description	In many systems the operating pressure is much higher than actually needed. Studies have shown that the pressure level can be reduced by up to 1 bar without influencing productivity. In many cases the pressure is reduced by regulators before reaching the users. This excess of unneeded pressure has to be provided and causes additional cost due to increased leakages Indicators • System pressure above 7 bar (most industrial appliances only need 7 bar)	
Recommendation for optimisation	A constant system pressure at the needed level can be provided by an intelligent high-level control of the compressors. The minimal required pressure has to be tested at every user individually. It is important to notice that in systems, which already have energy efficiency measures done on them, a reduction of the pressure can cause operational problems. Basically, an intelligent control unit, combined with efficient users, is preferred over a reduction of the system. To test the possibility of a pressure reduction in the system several pressure values have to be evaluated and compared: • Difference between the pressure at the compressor and the pressure in the system: should not be higher than 1 bar. Otherwise measures for reducing the pressure drop should be done • Difference between the current pressure at the compressor and the needed one: If too high, the compressor pressure can be lowered. • Difference between the pressure in the system and the needed pressure at the users: Fit pressure to needed level by either a valve or a separate branch in the distribution system. A very simple method to test if the pressure can be lowered can be done if all the applications in the system are either not sensible to pressure below the required value (don't get damaged), or equipped with an alarm, that goes off if the pressure drops too far. The pressure can be lowered incrementally, until one application sets the alarm off or shows a change in the operational behaviour. To avoid fluctuations in the system pressure from disturbing the operation of the applications, the system pressure has to be raised a bit. It is a very rudimental technique and the plant manager has to be sure that there will be no damage, but it is easy to apply. Additional measures can be done to enable the reduction of the system pressure: • Frequent maintenance of filters and dryers • Replacement of unnecessary filters, valves or T-joints in pipes	

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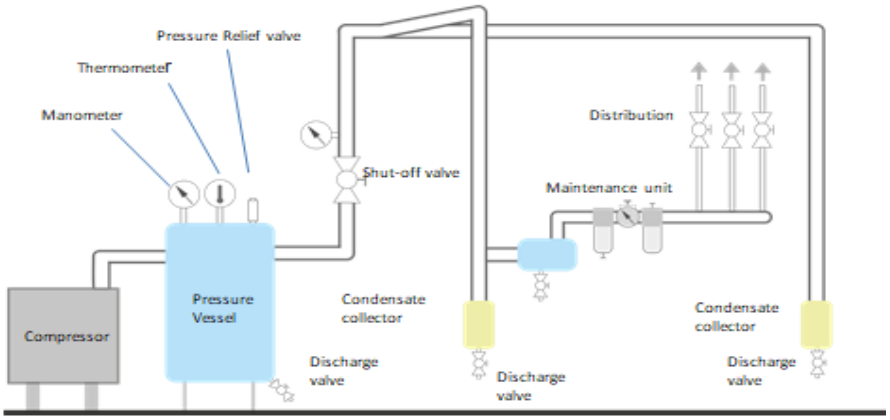
	• Reduction/Avoidance of dead volume • Separate networks, each with their own pressure level • Tools and users which work with lower pressure values • Avoiding compressed air for cooling, atomisation or cleaning purposes • The reduction of the pressure level in the system of 1 bar saves 7% of the total energy needed. A reduction of 0,3 bar already reduces leakages by 4%.
Technical considerations	In most cases, if different pressure levels are used, it is recommended to separate the existing network into 2 with their own pressure level each. Single users with exceptional high-pressure needs can be provided with boosters, which raise the pressure locally to the needed level.
Schemes and diagrams	 Scheme of an industrial compressed air system
Economics	Unit cost of industrial pressure regulators from 100 EUR
Energy savings	Up to 10% on energy bills
Economic savings	• Maintenance losses about 1mm: 150 EUR/year • Replacement of filter cartridges: 1,000 EUR/year • Open tubes for blowing applications: over 10,000 EUR/year • Single-acting compressed air cylinders: 1,000 EUR/year • Controlled vacuum ejectors: 1.000 EUR/year
Average Payback Time	Less than 3 years
Emissions	0.702 $kgCO_2/kWh_{el}$ (CO_2 emitted by production for one hour of 1 Nl/min of compressed air)

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Environmental benefits	Reduction of CO_2 emissions due to lower energy requirements
Main NEBs (Multiple benefits)	☐ Environmental benefits ☒ Increased productivity ☒ Work environment/ Health/Safety ☐ Increased competitiveness ☒ Maintenance
Replicability	Medium
Related measures	• CAIR-01: Optimisation of compressed air users/appliances • CAIR-03: Switch-off of appliances in non-operational times • CAIR-04: High Level Control • CAIR-05: Sizing and type of compressor • CAIR-06: Network Optimization • CAIR-07: Reduction of leakages • CAIR-08: Heat recovery
Case study	Reduction of pressure (Austria, 2016) • Initial Situation: it was shown that the pressure level was too high and therefore a reduction has a great potential for energy savings. • Description of the optimisation: the pressure in the system has been reduced from 8 bar to 7 bar by installing a vessel in the system. The vessel was already available, so no investment costs were necessary. The amount of electricity saved is 51,000 kWh/year. • Implementation costs: not available • Payback Time: not available
References	Kulterer, K., Huber J., Ruthner H., Oetiker H., Pucher C., Steinbrugger, C.: Leitfaden für Energieaudits zur Optimierung von Druckluftsystemen, klimaaktiv energieeffiziente betriebe, Wien 2015 Larrabee C.: Managing Multiple-Compressor Systems: Utilizing Controls to Improve Performance 3E Strategy, Department of Mechanical engineering, University of cape town: How to save energy and money in compressed air systems

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