Gear@SME
Saving energy together

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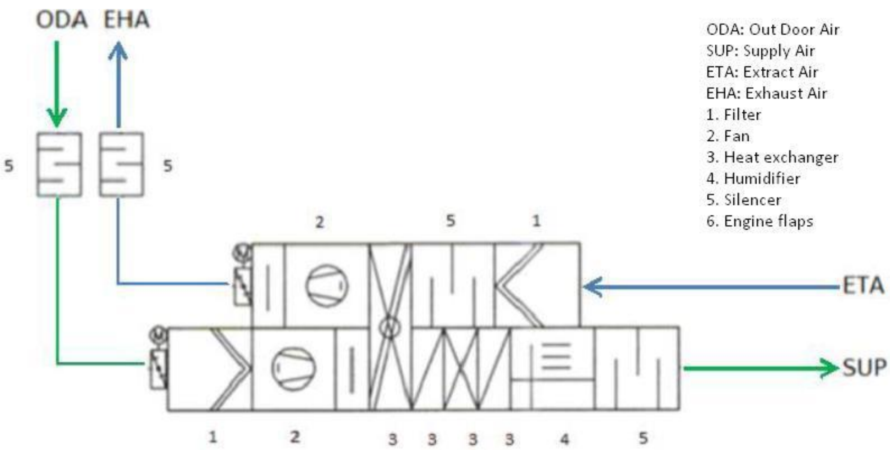
Best Practice	HEAT AND MOISTURE RECOVERY	HVAC-06
Application	Optimisation of HVAC systems	
SME sector	All	
SME Sub-sector	All	
Technical description	Maintenance and servicing of filters, air ducts and fittings has a significant impact on the efficiency of a ventilation system. Maintenance and servicing of these components is all too often neglected when considering the ventilation system, although they can represent a high proportion of the required energy input. The effects of poorly maintained or leaking equipment are manifested in increased flow or pressure drop.	
Recommendation for optimisation	Air filters must be replaced on a regular basis. Filters have the task of binding and fixing the impurities in the air. According to ISO 16890 filters are divided into filter groups. The performance of a filter is evaluated according to its degree of separation against particle sizes of 0.3-10 microns. The group PM 1 detects particle sizes up to ≤1 micron. Likewise, the fractions capture PM 2.5 particles up to ≤2.5 or PM10 to ≤10 microns. Filters should always be subjected to electronic pressure sensors. The final pressure-difference [Pa] should not be higher than 450 Pa. The sensors show the degree of contamination of the filter and are therefore an indication of when to replace the filter.	

Filter groups according to ISO 16890

Filter groups	Particle distribution (micron)	criteria *ePM=efficiency Particulate Matter
ISO ePM$_1$	$0.3 \leq x \leq 1$	minimum efficiency ≥ 50 %
ISO ePM$_{2.5}$	$0.3 \leq x \leq 2.5$	minimum efficiency ≥ 50 %
ISO ePM$_{10}$	$0.3 \leq x \leq 10$	minimum efficiency ≥ 50 %
ISO Coarse	$0.3 \leq x \leq 10$	minimum efficiency < 50 %

Relevant technical considerations	Energy efficiency optimisation: the power requirement of the fan, and the energy requirements of the air conditioning depend on the delivered air flow and the pressure loss to be overcome. For this reason, when the system is optimized for energy efficiency, the tightness and pressure loss of the system must also be

	considered. In fact, the electric power decreases when either the volume flow or the pressure loss is reduced. This means that a low-pressure loss of the components can significantly reduce the electrical power of the motor. Replacing filters: filters should always be subjected to electronic pressure sensors. The final pressure-difference [Pa] should not be higher than 450 Pa. The sensors show the degree of contamination of the filter and are therefore an indication of when to replace the filter.
Schemes and diagram	 Sketch of a basic ventilation system
Economics	Cost of energy exceeds the cost of the filter itself. In fact, energy costs can be 4 to 10 times the initial filter cost of high-efficiency final filters. The cost of air filters ranges from 100 to 300 EUR.
Energy savings	Filters with a greater filtering surface and lower initial pressure drops (defined as premium) allow about 30% lower energy consumption than traditional filters.
Economic savings	The lower pressure loss allows a 10% reduction in energy consumption
Average Payback Time	Less than 3 years
Emissions	This measure does not involve further emissions.
Environmental benefits	Reduction of CO_2 emissions due to lower energy needs.
Main NEBs	☒ Environmental benefits ☐ Increased productivity This measure is primarily intended to protect the health of people in the room

(Multiple benefits)	☒ Work environment/ Health/Safety ☐ Increased competitiveness ☒ Maintenance	and secondarily, to protect the system parts from contamination or damage.
Replicability	High	
Related measures	• HVAC-01: Reduction of fan running time • HVAC-02: Flow rate reduction through variable speed variation (VSD) • HVAC-03: Replacement of fan • HVAC-04: Replacement of transmission system • HVAC-06: Reduction of pressure loss • HVAC-07: Leakage reduction of pipes • HVAC-08: Replacement of motor	
References	Gerstbauer, Ch., Kulterer, K., Gorbach, Ch., Brunner, W.,.: Leitfaden für Energieaudits von Lüftungsanlagen, klimaaktiv energieeffiziente betriebe, Wien 2013 Chimack M.J., Sellers D., "Using extended surface air filters in heating ventilation and air conditioning systems: reducing utility and maintenance costs while benefiting the environment", in Proceedings from the 2000 summer study on energy efficiency in buildings, 2000 Michael D. Walters Risk of Sick Leave Associated with Outdoor Air Supply Rate, Humidification, and Occupant Complaints – Indoor Air 2000 10: 212-22	

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