



Best Practice	MINIMISE/USE OF VENTED STEAM	STEAM-08
Application	Steam systems	
SME sector	Processing and manufacturing industries	
SME Sub-sector	Food processing, paper, and cardboard manufacturing sectors, pharmaceutical, chemicals, distilleries, etc.	
Technical description	<p>Low-pressure steam from industrial processes is often vented to the ambient or condensed in a cooling tower. This leads to significant losses due to wasting energy, water, and water-treatment chemicals.</p> <p>Steam venting also happens when safety valves or other pressure controlling devices open due to an unbalance on the steam headers.</p> <p>Low-pressure steams' potential uses include driving evaporation and distillation processes, producing hot water, space heating, producing vacuum or chilling water.</p>	
Recommendation for optimisation	<ul style="list-style-type: none"> • Minimise vented steam: when more steam is produced than needed by the end-use processes, pressure relief valves open and vent steam to the ambient. This happens mostly with combined heat and power industrial plants where backpressure steam turbines drive process loads. Minimising the amount of vented steam with a good production/load management can lead to substantial energy savings. • Use vapour recompression to recover low-pressure waste steam: if the plant uses steam at different pressure levels, there is a significant savings potential by recovering low-pressure waste steam that otherwise would be vented to the ambient. Intermediate-pressure steam is typically produced by expansion of high-pressure steam. To save energy, low-pressure waste steam can be mechanically compressed or boosted to a higher pressure instead. This is done by vapour recompression that relies upon a mechanical compressor to increase the temperature and pressure of the steam. Recompression typically requires only 5% to 10% of the energy required to raise an equivalent amount of steam in a boiler. • Use thermal compressor: apart from the method mentioned above, there is also another way to recover low-pressure waste steam: thermal compressors. These devices use the energy contained in high-pressure motive steam and transfer it to low-pressure waste steam to produce a mixed discharge of intermediate pressure. When high-pressure steam is available, thermal compressors can be economically used for compression ratios up to 6:1. The benefits of such compressors are: <ul style="list-style-type: none"> - Simple construction - Insensitivity to fouling - Easy installation - Low capital and installation costs 	



	<ul style="list-style-type: none"> - Easy maintenance with no moving parts - Long useful operating lives • Use low-grade waste steam to power absorption chillers: absorption chillers use thermal energy, instead of mechanical energy, to compress the refrigerant. These devices can be powered by low-pressure waste steam with a temperature of about 120°C and a pressure of 2 bar absolute. In a plant where low-pressure steam is vented to the atmosphere and a refrigeration need is supplied by mechanical compression, using the waste steam in an absorption chiller could lead to significant energy savings. However, a rather high amount of low-pressure steam is needed to power an absorption chiller and the implementation is challenging. 	
Economics	<p>Absorption unit: cost of small adsorption/absorption systems: 3,500-4,000 EUR/kW</p> <p>Pre-air heaters: starting at around 1,400 EUR</p>	
Energy savings	<p>From 5 to 10% in energy savings</p> <p>Pre-air heater: 3%</p>	
Economic savings	<p>Up to 20% savings on energy bills</p>	
Average Payback Time	<p>Less than 3 years</p> <p>Payback time for minimising vented steam is below 2 years</p>	
Emissions	<p>70mg NO_x/Nm³</p> <p>Exhaust-related emissions from steam generation systems</p>	
Environmental benefits	<p>The use of recovered waste steam allows to obtain environmental benefits such as the reduction of CO₂ release</p>	
Main NEBs (Multiple benefits)	<input checked="" type="checkbox"/> Environmental benefits <input type="checkbox"/> Increased productivity <input checked="" type="checkbox"/> Work environment/Health/Safety <input type="checkbox"/> Increased competitiveness <input type="checkbox"/> Maintenance	<p>The use of recovered waste steam improves the working environment by limiting the formation of vapour clouds.</p>
Replicability	<p>Low-Medium</p>	
Related measures	<ul style="list-style-type: none"> • STEA-01: Reduction of energy demand 	



References	<p>https://www.systema.it/assets/uploads/Brochure/Catalogo%20Cooling%20IT%2004-2017%20Rev.04.pdf</p> <p>Blessl and Kessler, 2017, Energieeffizienz in der Industrie, Springer Vieweg, DOI: 10.1007/978-3-662-55999-4</p> <p>US Department of Energy. Energy Efficiency and Renewable Energy. Advanced Manufacturing Office: Energy Tips: Steam. Steam-tip sheet #11 "Use vapor recompression to recover low pressure steam"</p> <p>Steam Up: WP 3: The Steam Audit Methodology, 2016</p> <p>Steam Up: D 7.5 Factsheet Steam Up Measures. https://steam-up.eu/sites/steam-up.eu/files/documents/d_7.5_factsheet_steam_up_measures_0.pdf</p> <p>Statistik Austria, 2019, Nutzenergieanalyse für 2017</p> <p>Kulterer, K.: klimaaktiv Messleitfaden I, Österreichische Energieagentur im Rahmen des Programms des Lebensministeriums, Wien 2015</p>
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