



Best Practice	REDUCTION OF LEAKAGES	COOL-05
Application	Cooling System	
SME sector	Industrial	
SME Sub-sector	All	
Technical description	<p>Most cooling systems have some refrigerant leakage, 5-10% annual leakage is typical, with up to 15% for supermarkets.</p> <p>As most cooling systems use Hydrofluorocarbon (HFC) refrigerants with a global warming potential much higher than the GWP of CO<sub>2</sub>, reduction of leakages is essential. Unrepaired leaks not only influence the environment but also affect the system efficiency leading to increased energy costs.</p>	
Recommendation for optimisation	<p>Leakages can be reduced/prevented by:</p> <ul style="list-style-type: none"> <li>• Checking if valves are capped</li> <li>• Improving connections</li> <li>• Ensuring good condition of pipe brackets</li> <li>• Preventing vibrations</li> <li>• Continuous maintenance</li> <li>• Avoiding joint flares, if possible</li> <li>• Installing leak detection system</li> </ul> <p>If leaks are found, they need to be repaired immediately and rechecked after a month.</p>	
Relevant technical considerations	<p>There is legal obligation to detect and repair leakages for equipment containing fluorinated greenhouse gases in quantities of 5 tonnes of CO<sub>2</sub> equivalent or more. The frequency of leak checks depends on the amount of fluorinated greenhouse gases within the equipment, ranging from every 12 months for up to 50 tonnes of CO<sub>2</sub> equivalent to every three months for equipment with more than 500 tons of CO<sub>2</sub> equivalent. (European Union, 2014)</p> <p>This energy efficiency intervention is difficult to measure, normally the key parameters of the cooling system are: measured power, operating hours, COP, ambient and load temperatures. Other factors that must be considered are: production capacity, operating time, main equipment and processes provided by the cooling system.</p>	



Schemes and diagrams	<p style="text-align: center;">Heat rejection to ambient</p> <p style="text-align: center;">Sketch of a basic cooling system</p>
Economics	Several factors affect investment costs, and a case-by-case assessment is necessary.
Energy savings	<p>Unrepaired leaks not only affect the environment, but also the efficiency of the system, resulting in higher energy costs.</p> <p>An annual leakage rate of 20% results in an 11% reduction in efficiency.</p>
Economic savings	Locating and repairing a leak, including replacing the lost refrigerant, costs approx. 500 to 800 EUR
Average Payback Time	Less than 3 years (2 to 3 years for small leakages, less than 1 year for larger leakages)
Emissions	This measure does not involve further emissions.
Environmental benefits	Environmental Benefits through the reduction of CO <sub>2</sub> emissions.
Main NEBs (Multiple benefits)	<p><input checked="" type="checkbox"/> Environmental benefits</p> <p><input type="checkbox"/> Increased productivity</p> <p><input type="checkbox"/> Work environment/ Health/Safety</p> <p><input type="checkbox"/> Increased competitiveness</p> <p><input type="checkbox"/> Maintenance</p>
Replicability	High



Related measures	<ul style="list-style-type: none"><li>• <b>COOL-01:</b> Cooling load reduction and free cooling</li><li>• <b>COOL-02:</b> Compression control</li><li>• <b>COOL-03:</b> Lower condensing temperature - Raise of evaporation temperature</li><li>• <b>COOL-04:</b> Efficient fans and control</li><li>• <b>COOL-06:</b> Heat recovery</li></ul>
References	Kulterer, K., Mair, O., Horvath, C.: Leitfaden für Energieaudits in Kältesystemen, klimaaktiv energieeffiziente betriebe, Vienna 2017

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