

Heat pump efficiency - impact of auxiliary equipment and matching to the heat load

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The objective of this study is to investigate how auxiliary equipment (pumps and/or fans) and matching of a heat pump to the heat load influences the performance. For heat pumps, both with conventional on/off and variable-speed control of the compressor, the auxiliary equipment will have an increased impact on the total COP when the heat pump is operating at part-load. For variable-speed compressors the auxiliary equipment will constitute a larger part of the total drive power when operating at part-load and the total COP will not increase as much as the motor coefficient of performance. For on/off controlled heat pumps working at part-load, the total COP will decrease since some of the auxiliary equipment operates when the compressor is turned off. The impact of the auxiliary equipment on COP will also be dependent on how the heat pump is sized relative to the heat load. It is therefore interesting to investigate both how the efficiency of the auxiliary equipment affects the total COP and how the use of variable-speed compressors affects the sizing of the heat pump to the heat load.

A straightforward computer model is used in order to analyse the issues mentioned. Input data to the model come from laboratory tests. Results from discrete test points show that when the compressor is brought down from 50 to 30 Hz, the degradation in COP due to the circulation pumps increases from 8 % to 14 %.