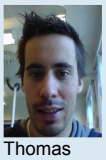

Thomas Murer

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Examiner	Prof. Carsten Wemhöner
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Subject Area	Environmental Engineering
Project Partner	Laurent Georges, NTNU, Trondheim

Analysis of change in design procedures for heat pump systems in nZEB

Development of an early decision tool for the heat pump integration in nZEB buildings

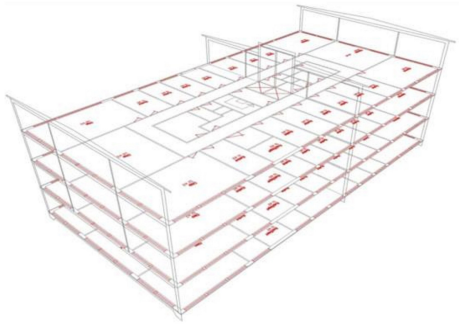

Figure 1: Office building

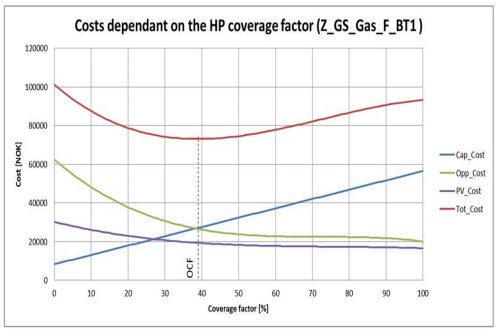

Figure 2: Cost comparison

Task: The work accomplished during an Erasmus exchange at the Norwegian University of Science and Technology (NTNU) is a continuation of a thesis on a decision tool for the heat pump integration in office buildings. The simulation tool (SimTool) developed in this thesis enables the user to take decisions about the best energy supply for an office building based on costs, energy performance and CO_2 emissions in an early design stage.The office building investigated during the thesis is shown in figure 1. It is located in Oslo and has a total heated area of 2400 m^2.

Approach/Technologies: The SimTool was first proven by analysing the performance of the different components like buffer tank, heat pump and ground source model and comparing it with the results of the previous thesis. Afterwards, the simulation tool was used to investigate the influence of different parameters on the system performance. Figure 2 shows the annual costs over the coverage factor for a zero emission building. By using this curves the cost optimal coverage factor can be seen in the figure.

Result: Since the whole hydraulic system is implemented in the SimTool, it is possible to investigate the performance of each component. One example of such an analysis is described in this section. The duration curve of the power supply shown in figure 3 illustrates the difference between two buffer tank layouts. With the layout 1 the heat pump is able to deliver more power to the system, while the layout 2 needs more power from the backup heater. The influence of this difference can be seen in the total costs and the CO_2 emissions, as well. Furthermore, the results of the analysis can be used to design the optimal building heating system based on cost, emission and energy performance aspects of the components.

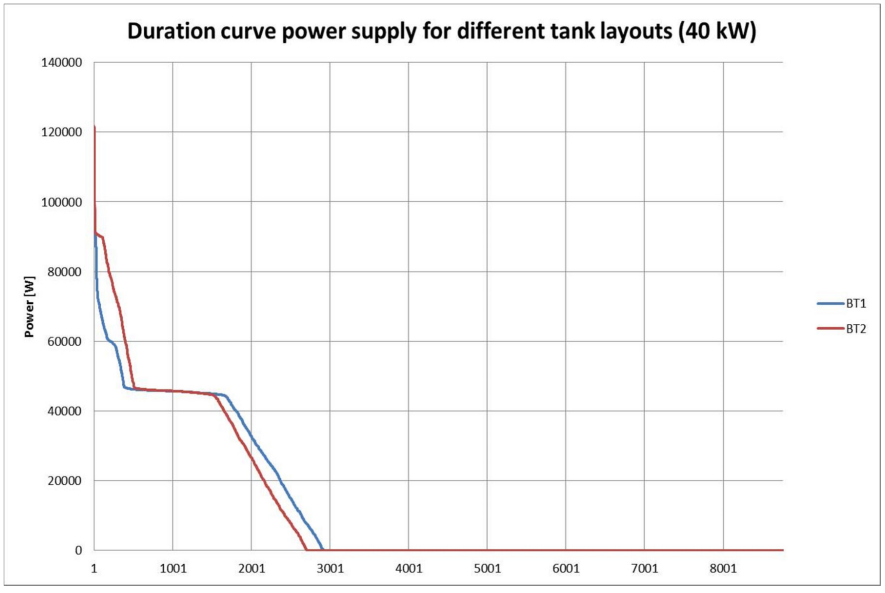

Figure 3: Duration curves for different tank layouts