Reflection Paper

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TU Delft
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Master Thesis
Heat recovery with hybrid ventilation in office buildings

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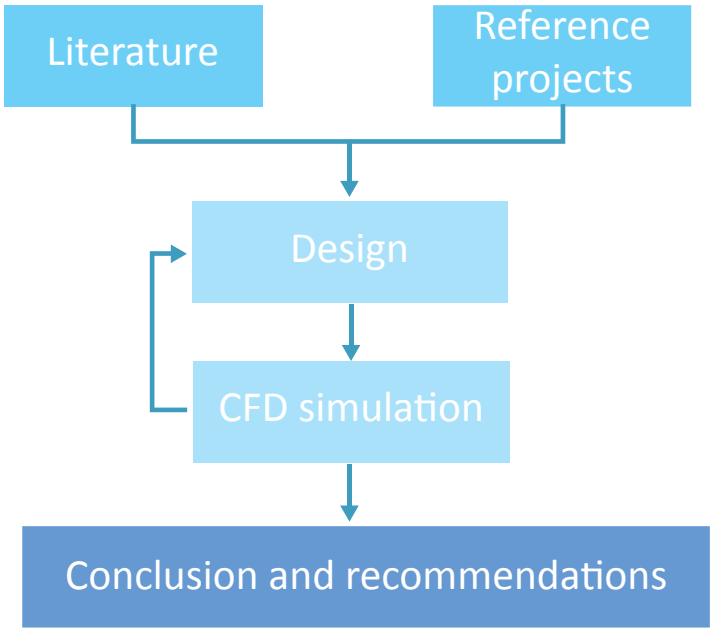
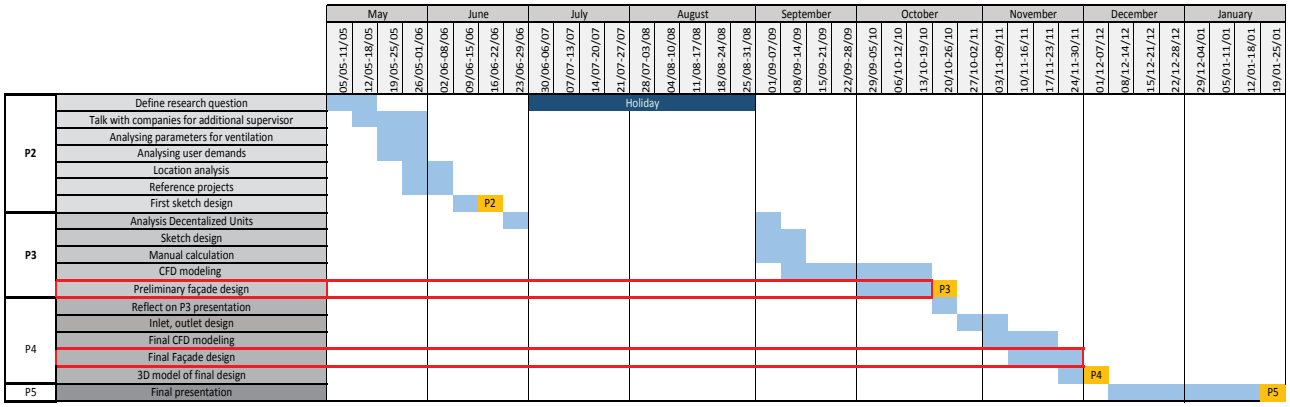
For my graduation topic I was looking at the possibilities of adapting decentralized mechanical ventilation system to hybrid ventilation system. During the research I looked at the current literature and reference projects and created a design based on those. This design was simulated and tested using computation fluid dynamic (CFD).



Research process showing the iterativ process between the CFD simulation and the design

My goal with this research was to investigate/ research the possibilities for reducing the energy used for ventilation in a building. As this is currently an increasing demand for new buildings it can easy be integrated in the new system. But what would happen with the older buildings that need to be renovated? As a result of this, the proposed decentralized ventilation system should able to suit the old building. During the research process it became clear that the system could be located on both types of buildings. This allowed me to let go of the small offices used in the old buildings and made me look at other types of office floors layouts like open-plan offices. The open-plan offices demanded some additional research about the effectiveness of the system and gave completely different boundary conditions for the ventilation system. In the end this did allow to design a decentralized hybrid ventilation system which could be located in different types of building layouts and saving 5% of the total energy consumption of the building.

The design of the hybrid ventilation system was mainly based on the data collected by simulations and literature. By combining these data the sketch design was not a result of an architectural demand. The hybrid ventilation system can be integrated in many possible ways, so I gave some boundary conditions which have



Planning of the research process. The upper red border (during P3) shows where the desing should have been placed into a architectural context. This only happend in the during the P4

to be met in the design. With these boundary conditions, the architect will be able to integrate the ventilation system in his architectural context. This creates a ventilation system with a lot of possibilities regarding the design. The architectural context should have been integrated a bit earlier in the process as the main design is only generated by using literature and simulations. According to the planning this should have happened but due to the complexity of the fluid dynamics and the CFD-program it didn't work out.

The planning and research methods were the main guidelines during the research. As stated above, only the architectural integration was moved towards the end of the research process. The planning helped to organize the research process. It was a very useful guideline and didn't allow a lot of wandering around side topics which were not directly related to the research. Also the combination of the literature with the simulations helped to explain the results of those simulations.

My graduation thesis only allowed me to really focus on the topic of natural ventilation. It taught me a lot about subjects I hardly knew anything about like the pressures inside a ventilation system and the fluid dynamics of a ventilation system. Also the knowledge of my tutors helped me to solve the problems regarding the fluid dynamics or the architectural implementation if I wasn't able to find it myself. So when looking back at the entire process, I would not make any large changes to the research process as the set targets and goals are all met with the current process.