

# INNOVATING SEALING SYSTEM

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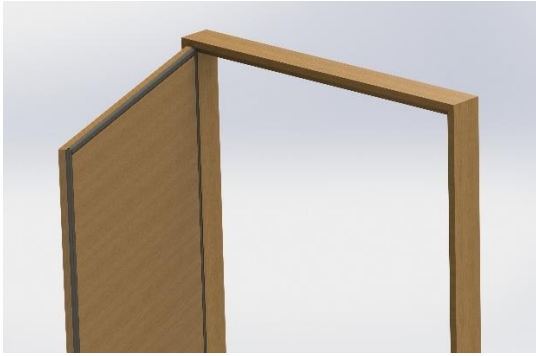
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The company where the bachelor assignment will be executed is Venster Techniek BV in Zelhem. Venster Techniek BV is a company that focusses almost fully on developing and producing sills. The assignment Venster Techniek BV came up with, was to design an innovating sealing system for wooden doors (the strip between door and window). The way this is done right now is the way it is done for a long time, and Venster Techniek was curious about new possibilities in this matter. This new sealing system however should be realistic when looking at cost prices and profitability. Venster Techniek would like to focus on the open market for sealing systems.

The aim of this assignment was to come up with innovating ideas for a sealing system for wooden doors to minimize leakage and temperature loss. The fact that houses have to be more and more energy efficient and sustainable to reduce energy consumption shows the relevance of this assignment. Wooden doors will be the focus in this assignment because this is the most difficult, concerning warping. When the sealing system works for wooden doors, it could be applied with other doors and windows as well.

At first, a general analysis about the existing solutions was done. An informal interview with the founder of Venster Techniek was held about the company itself. Also a stakeholder analysis was done to accomplish a better view of the market in which this assignment was executed. Simultaneously, sketches and a mindmap were made without too much prior knowledge, to come up with 'out of the box' ideas. A more specific analysis followed which resulted in setting up the requirements for this assignment. A list of existing possibilities for sealing systems was made, and a collage to help visualize these possibilities. A general research into materials was done as well. After all this research, the ideation phase started. This was done by expanding the 'out of the box' ideas as mentioned before, but also coming up with new ideas derived from the knowledge assembled in the analysis phase. This led towards several concepts, to be elaborated further. After the concepts were developed, the manager and an employee of Venster Techniek, the mentor from the University of Twente and the Author filled in a feedback form to derive the best concept. The cooler concept was chosen to be the final concept of this assignment. This concept was developed further in the detailing phase and evaluated by doing a test.

The design of the cooler concept is a feasible and relatively cheap way to enhance the functioning of the sealing system. The material chosen is TPE, because this is relatively cheap and easy to connect in the corners. It will also hold up in the required temperatures, and will provide the required air- and water-tightness and thermal conductivity because the magnets provide an extra attracting force to an already tested, approved and used material for sealing systems. The minimal thickness the sealing strip has will be more than before due to the magnets inside, but this can easily be countered by installing the door further away. The magnets inside the sealing strip situated on the door will attract the magnets positioned on the door frame, to ensure that the connection between door and frame will be optimal, even when warping applies. The magnet will be put inside the sealing system to reduce costs (co-extrusion), protect the magnets from corrosion and to ensure that the force created by the magnets will not be too much (magnet-magnet attraction). For the final design proposition, existing magnet strips are used to reduce production/machinery costs. The strip also is put into the door in the same manner other sealing strips, to make sure the door and frame require minimal changes which will reduce costs and make sure the product is applicable for the open market. Because this position in the door is out of sight, also the requirement to make the door look neat is fulfilled.



*Figure 1: The Cooler Sealing Strip on the Door*



*Figure 2: The Cooler Sealing Strip Close-up*

There are a view things that can be investigated in further research. A more elaborate and accurate cost price estimation can be made to investigate if the designed concept in this assignment will be fully profitable in the open market. Also, the option to co-extrude the strip and magnet can be investigated more accurate. A more in-depth analysis of the thermal conductivity can be made with calculations or tests to confirm this. Also, a test in the test box from Venster Techniek with a prototype could confirm the required air- and water-tightness. An extra strip can be added next to the magnet strip on the frame to prevent corrosion here as well.