

Designing a cleaning solution for FC Twente

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Ultimately, the experience from the visitor of the stadium 'de Grolsch Veste', which is the home of the football club FC Twente, needs to be improved. In order to accomplish this, the goal of this bachelor's assignment was to design a cleaning solution for the football club FC Twente. Currently the client of this thesis, which is the facility department of the club, is struggling with properly cleaning the seats of the stadium and needs a better solution for that specific problem. During this project, research has been conducted which was formulated into concepts. One of the concepts was developed into more detail in order to present a CAD (computer aided design) model at the end of the project.

Even though a special cleaning device was recently purchased to clean the inside of the stadium, which includes the seats but also the stairs and floor of the stadium, the results were not satisfying. A mixture of water and detergent is sprayed onto the desired surfaces. After that, the water and dirt are removed with the help of a wet vacuum. This is required due to the internal structure of the stadium. Because the brittle concrete allows water to drip into the structure of the stadium, water cannot stay on the ground of the stadium for too long. Additionally to this, only little pressure can be used in order to protect the concrete. These factors plus the lack of a brush or another mechanical energy led to unsatisfactory cleaning results. Also, two workers are required to use the machine, with one using the water gun and the other person using the wet vacuum. This results in an expensive and time-consuming cleaning process.

After this has been found out, the wishes of the main stakeholders needed to be considered. The visitors of the stadium wish for pleasant experience when watching a football game. For this, the object they are in contact with the most, which is the seat, needs to be clean. The workers of the cleaning company would like the new cleaning device to be as easy to use as possible and at the same time as comfortable to use as possible. For the head of the facility department, it is important to be as fast as possible with as little money spent as possible. Out of these requirements, and more, a new cleaning device needed to be developed.

Three similar concepts showed a vacuum like shape, which includes nozzles, brushes and a wet vacuum. This way, the surface that needs to be cleaned can be wetted, brushed off and the dirt and excess water can be taken off the surface with the wet vacuum leaving a clean and dry seat. The concepts differ in the way those three main features worked and are implemented in the design.

However, all of them can be operated by one person, saving a lot of time during the cleaning process. Furthermore, in all three concepts, a brush is used in order to properly clean the seats.

The final concept, called the CleanSeat, is a handheld cleaning device using two round brushes, water nozzles and a wet vacuum to clean the seats of the stadium (Figure 1). The nozzles are placed inside of the brushes in order to spray directly onto the surface from a close range. The mixture of water and detergent, which is sprayed onto the surface is spread with the help of the brushes. Lastly, the drum brush in the back of the device elevates the water and dirt into the wet vacuum (Figure 2). This allows the device to also clean, uneven surfaces such as the bulge of the stadium seats. The fact that only one person is required to use the cleaning device, the whole process can be done a lot cheaper and faster, because the process of cleaning and vacuuming has been combined. With the help of an adjustable handle, it is easy to switch between cleaning the surface of the seats or the floor of the stadium. This allows to work ergonomically the whole time, even when cleaning the bottom of the seats or other surfaces that are difficult to reach.

With this detailed concept, all requirements that were set earlier have been fulfilled, leaving a happy supervisor behind. Only extra wishes such as automation were not able to realize with the CleanSeat.



Figure 1- CleanSeat model



Figure 2- CleanSeat from underneath to see how it operates



Figure 3- Complex mechanism inside the CleanSeat

Unfortunately, it was not possible to create a prototype and test the concepts functionality. That is why the next step should be to test if the mechanism and ideas that were designed would work. Critical points in the design are

potentially the weight of the overall product and its internal complexity (Figure 3). Currently, many gears are required to drive the three brushes, resulting in a higher chance of fatigue of the system. This would need to be checked in a working prototype. However, if the product works as developed in the 3D modeling software, it solves the objective that was given in the beginning and will be an added value to FC Twente.