The development of a mobile video dome

Bachelor thesis by Job Schutte

In this bachelor thesis the development of a mobile video dome is described. The video dome is created to give a new dimension to dance music. The 50 meter diameter dome is fully inflatable, which it why the video dome unlike any other video dome on the market. Its inflatability makes the dome mobile and is why the building time is much lower than other festival tents. To dome uses two inflating techniques and is divided into different modular parts.

The Bachelor assignment is carried out at O&H Concepts. O&H Concepts is an innovative company that is very internationally orientated. To appeal a new market, they want to use their knowledge and apply this to another range of products than they had been working on before. Therefore, O&H Concepts came up with the idea to build a 360 degree video dome. The idea is to give a new experience to dance music by projecting video effects all around the crowd. The goal of this assignment is to design a concept that fulfills its needs, is feasible and includes a global cost calculation.

In the assignment a classic approach was used. There is started with an analysis, then a small ideation phase. Once the concept was clear, the dome was split up into different sub systems to simplify the complex product. These sub systems are all worked out separately and later on combined to the final design.

Firstly, different analyses are done to get a clear view of the design principles. In the analysis, the atmosphere, market, stakeholder, regulations are investigated. Most important outcomes are translated into conditions and put into the List of Requirements.

In the Ideation phase, the physical appearance of the dome is determined. This is a minor, less important part for O&H Concepts than the functionality. The Appearance is mainly obtained by the air tight beam structure. Therefore, there is looked at different structures, where after the choice of the structure was made.

It has been decided to go further with a combination of two air systems. The air tight beam structure and the air supported structure. The airtight beam structure functions as frame of the tent. It has to inflate once and then it a pressure control system will make sure that the beams keep the right pressure. The airtight beam structure functions as safety net for the air supported structure. The air supported structure carries the roof. With blowers a small overpressure is created inside the dome. The roof functions as a membrane. The pressure keeps the dome into its round shape. Therefore, the dome is very suitable for video mapping.

The different structures are divided and worked out separately in the development phase. Because the structures have very large surface areas, that need to be covered. The sub systems cannot be made as one part. Therefore, there is looked to modularity. What is the best way to divide the structures into different parts and how are the parts connected to each other.

Furthermore, there is looked at the entrances and exits of the dome. It is important that no air is able to escape, because of the air supported structure. Therefore, there is chosen for revolving doors. The safety is a big aspect of the dome, and is take into account in different ways. There are several safety nets for when power is lost. Also emergency exits are brought into the design to make sure the dome is according the regulations.

The forces that are working on the dome are determined. Now it is important that those forces are calculated, so that it becomes clear what loads the dome can handle. By this the dome can also be optimalised by reducing the size of the tubes. This is an aspect where still need to be looked at.

The final design is a solution that fulfills its requirements. The dome consists out of inflatable parts and does not contain any solid parts, other than the door. The dome that is developed is much quicker to build then existing festival tents, which makes it an addition to the market. Furthermore, the design of the dome meets all the safety regulations. The fabrics are made from fire retardant material. There are several safety nets for when electric systems fail and the safety routes are according the rules.