6. Reflection

This chapter elaborates the interconnection between the research and the final design (the Carbon Fibre Canopy), in which the quality of city squares and other outdoor public spaces is enhanced. Next to that the technological innovation and the design process will be discussed.

6.1 Research and Design

The research concluded four possible structural designs where Carbon Fibre Reinforced Composite could be further implemented in large scale structures, respectively; cable-net, shell, frame or gridshell. From the first three structures there are already several reference projects build with other fibre reinforced composites such as glass fibres and therefore the choice was made to design a gridshell structure, with the prospect of exploring the use of large tubular elements.

The continuous production processes of CFRC could not be integrated in the contemporary building process, which uses prefabricated components and on-side assembly. The Carbon Fibre Canopy presents a solution for large scale use of CFRC. The in-depth research on manufacturing processes, material properties and large scale structures resulted in an innovative building process; continuous pultrusion winding. With this process new forms and structural elements needed to be designed.

6.2 Technological innovation

The continuous pultrusion winding process combines two common manufacturing processes; pultrusion and filament winding. This combination results in a tubular filament which is wound around a support structure. This technique enables the use of CFRC as a building material on a large scale. Whereas the normal filament, which is only the thickness of a tread, would take too long to build such a structure.

This new method would also be the first continuous building process and closes the gap between digital design and the final structure. The on-side production changes the way of contemporary assembly and component fabrication, but also reduces the use of transportation.

A second innovation with this design is the absence of any connections. The tubular filaments are held together by a helical form connection and resin. This method creates a whole new bare structure, which has an almost natural appearance.

6.3 Design Process

The design approach which was used for this project was the ‘Design by Doing’ starting with Carbon Fibre Composite as a solution for unsuitable building areas and lost spaces in cities. During the design process the findings from the research formed the program requirements for the final structure. An example of this is the absence of connections, which preserves the fibre length and therefore the strength of the structural components.

This approach also coincides with ‘Learning by Failure’ and creates a steady learning curve along the whole design process. The constant trial and error of different ideas provides a strong foundation for the final design.

6.4 Social context

The Carbon Fibre Canopy project forms a solution for improving the quality of city squares. In the Netherlands it works as a roof against the rainy climate, but in other countries it could provide sufficient shade for large open areas. But the new building method could also be used to design new buildings and houses.

It therefore stretches not only the limits of city squares, but it could change the urban environment as we now know it.