

Improvement of a disposable diaper insert based on sphagnum

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This bachelor assignment was based on designing and creating an improved compostable diaper prototype that uses sphagnum moss as the absorbing material.

The assignment was executed at Studio Tjeerd Veenhoven. Studio Tjeerd Veenhoven is a de-sign studio based in Groningen at which Tjeerd is working with raw materials and finding new uses for these materials. Because of his expertise in working with natural raw materials Better Wetter contacted Studio Tjeerd Veenhoven to work together. Better Wetter is a program for future-proof water management in the Northeast of the Dutch province Friesland. The program consists of new ecological and economic support to develop a wetland environment. Together Tjeerd and Better Wetter are working on value creation for a variety of water-based flora, amongst which sphagnum, a wetlands moss that might be a valuable crop in the future (Figure 1). Growing this crop helps against the lowering of the ground due to agriculture, it also helps to keep CO₂ out of the air. Sphagnum has high water absorbing abilities, because of this Studio Tjeerd Veenhoven began looking into using the moss for applications where the high absorption is important, such as diapers. Sphagnum could potentially replace the commonly used super absorbing polymers in disposable diapers and make the diaper core fully compostable. A fully compostable diaper could be a great alternative for the highly used disposable diaper with their negative environmental impact.



Figure 1 Sphagnum

The focus of this assignment is to improve the already existing prototypes from previous work on leakage, liquid distribution and comfort and try to prove that it is possible to create a working prototype with a new addition of using compostable plastic. Previous work on the subject has already delivered prototypes but these did not perform good enough. This led to the following research question:

How to make a compostable diaper pouch using sphagnum as absorbing material that does not leak and has a similar comfort level as a conventional diaper?

To achieve a design result that answers the research question a test phase was constructed. This was an empirical process in which different aspects of the prototype were handled. Before starting on the design of the insert the production method of the sphagnum pad was established. This included drying and pressing the moss, once this was defined the joining of the plastic and cotton material for the outside was researched. Using heat, a strong bond could be formed that could shape the cotton and the plastic around the sphagnum pad. With this base construction of the three materials, sphagnum on the inside and plastic and cotton around the sphagnum, the designing of the prototype could take place. The key to good absorption is to contain the water inside the diaper insert since the sphagnum needs time to absorb the liquids. To achieve this, the geometry of the insert was shaped to create upstanding edges that could hold in the urine, these edges are visible in figure 2 and 3. The right layering methods of plastic and cotton assured a waterproof exterior. To ensure a decent comfort level the geometry of the diaper was based on a Pampers disposable diaper, and a cotton material that is already used in diapers was used in the prototype.



Figure 2 Usage test of the prototype



Figure 3 Final Prototype

The final usage test of the compostable diaper insert showed good absorption of the liquids and stated a sufficient level of comfort within the test conditions of this assignment. This implies a static usage test, without the unpredictable urine output and movements of a baby.

The assignments objective has been achieved. The improved prototype does not leak and is argued to have a similar comfort level to disposable diapers. Since this prototype was made in a non-professional environment using at home appliances it is recommended to investigate more professional and precise production methods in further research so that the project can be taken a step closer to production.



Figure 4 Final prototype inside diaper pants