

Summary

Modern textiles and fashion goods are often designed without regard to subsequent recycling processes. With increasing global awareness of the industry's harmful environmental impact and resource exploitation, the demand for scaling and investment in textile collection, sorting and recycling is rising. However, contemporary textile production demands perfection and flawlessness, a standard which complex waste textiles inevitably fails to meet when used as input in the production of new products. Poor fiber quality and multiple blends of qualities and colors complicate efforts to create a circular textile economy, resulting in most recycled textiles being downcycled.

This PhD thesis addresses two ways of integrating mechanically recycled textiles into design products and suggests alternative circular routes for complex waste textiles. First, it investigates color imperfections and ways in which mixed-color textile waste, characterized by a lack of uniformity, can be sorted and designed for commercial and visible air-laid, thermally bonded, nonwoven interior design applications. Second, it explores the use of Fiber Injection Molding (FIM) technology in the production of three-dimensional interior designs.

The research employs a practice-based design methodology grounded in Constructive Design Research. Experimental practice is central to reflection, understanding and knowledge formation related to design inquiries. Contextual and theoretical understandings provide insights into contemporary challenges and historical textile recycling methods and the impact of these methods on emotional perceptions. This comprehensive approach illuminates the complexities of textile recycling from multiple perspectives, addressing tangible obstacles related to recycling technologies, sorting and colors, as well as intangible challenges related to sensory and emotional responses.

The thesis critically investigates current textile recycling practices and advocates for the acceptance of imperfections in recycled design, challenging the perception of imperfections as insurmountable obstacles in mass production. The research suggests that the areas of application for existing recycling technologies can be significantly expanded when viewed through a design-centered perspective. Additionally, it presents models for color sorting and designing with imperfections, as well as a framework for developing product designs based on mechanically recycled textiles and FIM technology.

Arguing that designers must take the entire value chain into consideration, including sensory and emotional values when designing with recycled textiles or other recycled materials, the thesis emphasizes the importance of having an in-depth understanding of all processes and considerations both before and after a production step. Furthermore, the thesis contends that comprehensive design development can push the boundaries of the application of recycling technologies and the perception of design qualities of mass-produced products based on recycling.