

Design for Recycling of E-Textiles – A Circular Approach

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Keywords: e-textiles, eco-design, circular economy

E-textiles experience an increasing popularity in both the textile and the electronics industry as well as the research community. The global market volume of e-textiles is expected to more than double by 2026 [1]. In all areas of application, wearing comfort, robustness, reliability and washability of the products are crucial to promote user acceptance [2]. One way to improve these properties is to miniaturize the electrical circuitry and fuse it to or combine it with the textile substrate [3]. However, this trend towards a high degree of integration of the electrical components leads to challenges in terms of reparability and recycling of e-textiles and their components [4].

Against the background of the growing market for e-textiles, the quantity of waste products will increase. Due to their hybrid nature, recycling and recovery of reusable re-sources from e-textiles are much more challenging than for pure textile or electronic products. Without taking into account the reparability, recyclability and circularity already during the product development phase, end-of-life solutions for e-textiles will be severely limited.

As a step towards circular e-textiles, the current market and research developments of e-textiles, the legal framework and guidelines on EU level, eco-design strategies, as well as best practices in the field of waste management of used textiles and e-waste were examined. Through a survey conducted among sorting and recycling companies in the textile and electronics sector, we investigated the current state of recycling and waste management for e-textiles within the EU. A supplementary expert interview provided insights into a business model for circular textile products.

Based on this combined research, a hypothetical product life cycle for a circular e-textile was developed. This spans the range from product development to end-of-life of e-textiles, making it possible to develop an approach with the holistic claim of the circular economy.

References

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