

Functionalizing of technical textiles by means of additive manufacturing processes

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Digital manufacturing methods are enabling textile producers to consider individual needs of the customer. State of the art inkjet printing is already showing us how digital technologies are changing value chains and sequences: from the conventional push model where textiles are mass produced and pushed into the sales to a more sustainable on-demand model. On-demand services were triggered by a specific order and allows individual requests, designs and constructions. Recently different digital manufacturing methods for functionalizing textiles are under research and development. This digital tool set comprises both subtractive and additive manufacturing methods. In wider sense all digital additive printing and dispensing methods are beneficial to functionalize textiles. Their feature is depositing materials additively in a defined spatial resolution in all coordinates in the space (X, Y, Z) onto textile substrates.

The printing information is given by computer aided designs which were developed by special educated staff like engineers or designers. Recently a barrier for real customized products (batch size: 1) are the creations of these individual designs and constructions, because new functional constructions from scratch are resource intensive and expensive. An approach to overcome this barrier is to apply so called algorithm aided designs. With this method, individually parameterized functional constructions are generated based on mathematical methods. This allows users to reconstruct designs in certain limits in a very fast way. A case study is shown how to construct stiffening and reinforcement structures by applying the method of Voronoi tessellation.

Textile structures are flexible, stretchable and are available in flat two-dimensional structures from roll or sheets or in three-dimensional constructions like near-net shaped knits from flat or circular knitting machines. By applying contactless material deposition methods, it is possible to process these complex three dimensional textile structures.