OPTIMIZED VACUUM BAGGING FOR CFRP ROCKET BOOSTER CASES

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State of the art vacuum bagging for vacuum infusion technologies still involves a high amount of manual process steps. More efficient production technologies could increase the economic attractiveness of vacuum infusion processes for large aerospace structures.
In the context of a research project, the *German Aerospace Center (DLR)*, Augsburg and *MT Aerospace GmbH*, Augsburg have developed design methods and application concepts for vacuum bagging auxiliary materials on a full-scale CFRP rocket booster case. With a diameter of 3.4 m manual application of auxiliary materials is challenging in terms of deposition accuracy, reproducibility and reachability.
Facing these challenges, first, a design method has been developed to generate near net-shape auxiliary material packages of peel ply, perforated release film and flow media with reduced wrinkling. As joining technology continuous ultrasonic welding has been selected and validated based on the suitability for vacuum infusion and out-of-autoclave curing. Manual application tests were conducted with these packages on a full-scale booster case demonstrator. The results show, that a developable shape design of the packages for the doubly curved dome sections allows best results with regards to wrinkle minimization and the complexity of the handling procedure.
Second, a concept study on the application of the outer vacuum bag, consisting of membrane and vacuum foil, is presented. Therefore, an optimized shape design of a VAP membrane combined with a new application concept has been developed and validated.
In a final outlook, the results will be discussed focusing on intended low manufacturing rates of about 20 boosters per year.

Figure 1: a) CAD Model of booster demonstrator; b) Application of auxiliary material packages on full-scale demonstrator; c) Application of VAP membrane on model (scale: 1:6)