Analysis of the multilayer woven fabric behaviour during the forming process. Focus on the loss of cohesion within the woven fibre network.

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Abstract

The first step in the composite manufacturing process consists of forming a flat textile reinforcing structure into a 3D shape. The quality of the final composite part is affected by the presence of defects induced during the forming process. Loss of cohesion in the woven fibre network (intra-ply yarn sliding) is a frequent defect in the forming process. It is expected when the cohesion between the yarns is weak or when the blank holder pressure is high. However, the mechanism of formation of this defect is not fully understood. In the present study, forming experiments with friction-based holder have been conducted for a monolayer twill woven carbon fabric in two orientations and for two plies of this fabric with different relative orientations.
The occurrence of the intra-ply yarns sliding has been observed as a function of the blank holder pressure. A correlation between the occurrence of this defect and the fabric orientation has been noticed. Furthermore, the effect of the fabric orientation, number of plies, relative plies orientation and blank holder pressure on the recorded forming force and on the fabric in-plane shear is also reported and analysed.

Keywords: