

Improving the Method for Characterizing Structural Fabrics for Shear Resistance and Formability

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Abstract : Non-crimp fabrics (NCFs) allow for high mechanical performance of a manufacture composite component by maintaining the fibre reinforcements parallel to each other. The handling of NCFs is enabled by the stitching of the tows. Although the stitching material has negligible influence to the performance of the manufactured part, it can affect the ability of the structural fabric to shear and drape over the part's geometry. High resistance to shearing is attributed to the high tensile strain of the stitching yarn and can cause defects in the fabric. In the current study, a correlation based on the stitch tension and shear behaviour is examined. The purpose of the research is to investigate the upper and lower limits of non-crimp fabrics manufacture and how these affect the shear behaviour of the fabrics. Experimental observations show that shear behaviour of the fabrics is significantly affected by the stitch tension, and there is a linear effect to the degree of shear they experience. It was found that the lowest possible stitch tension on the manufacturing line settings produces an NCF that exhibits very low tensile strain on it's yarns and that has shear properties similar to a woven fabric. Moreover, the highest allowable stitch tension results in reduced formability of the fabric, as the stitch thread rearranges the fibre filaments where these become packed in a tight formation with constricted movement.

Keywords : carbon fibres, composite manufacture, shear testing, textiles

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