DEFECT ASSESSMENT METHOD FOR AUTOMATED FIBRE PLACEMENT INDUCED DEVIATIONS

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The Automated Fiber Placement (AFP) process provides remarkable benefits with respect to productivity and part quality as well as manufacturable part complexity (e.g. fiber steering). Although, using this technology evokes some new aspects to be considered in part design. Aforementioned part complexity and process limitations determine the occurrence of deviations from the designed "ideal" part to the manufactured "real" part. The effect of these manufacturing induced deviations (on the final part behaviour) is currently not fully understood. Hence, there is a substantial need for the development of concepts and methods, respectively, in order to assess the actual structural behaviour. According to experimental investigations [1] a significant influence of defects on the structural performance of composite parts was experienced (cf. Figure 1).

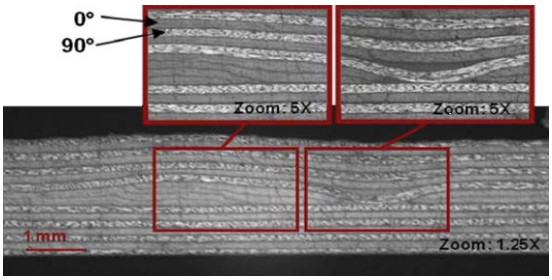

Figure 1: Specimen with Gap and Overlap. (Source: [1])

However, a reliable and calculable quantification is still missing. For that purpose the Feedback Method [2], which was developed by the DLR within the EU-Projects MAAXIMUS, is being extended within ECOMISE and is presented here. This enhancement leads to the Defect Quantification Method, which in turn is an approach to numerically enable quantification capabilities for occurring manufacturing deviations. Within this context, the presentation will address the issues of taking into account manufacturing defects within an FE simulation, quantifying the impact of manufacturing deviations on the global structural behaviour as well as efficiently analysing large structures.

[1] K. Croft, L. Lessard, D. Pasini, M. Hojjati, J. Chen, and A. Yousefpour, "Experimental study of the effect of automated fiber placement induced defects on performance of composite laminates," Compos. Part A Appl. Sci. Manuf., vol. 42, no. 5, pp. 484–491, May 2011.

[2] L. Kärger, "TFP Feedback Method", MAAXIMUS-FP7-213371 Deliverable D3.15.1, 2011.