

NUMERICAL SIMULATION OF IMPACT BEHAVIOUR OF CARBON COMPOSITE LAMINATE IN DEPENDANCE OF PLY THICKNESS

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Summary: The impact behavior of carbon fibre reinforced plastic laminates is investigated by numerical simulation in dependence of ply thickness.

The influence of ply thickness on the damage behavior of composite laminates has been subject of increased interest in recent years. Positive influence has been reported with decreasing ply thickness on different mechanical properties [1]. Studies are however dispersed and mostly small so that clear conclusions are largely missing until date.

Impact behavior in dependence of ply thickness has essentially only been studied experimentally so far. The indications were favorable for decreasing ply thickness, but systematic evidence is missing. In this study numerical models of a laminate are built up, keeping a constant laminate thickness, with variation in ply thickness. As reference a 1,65 mm thick laminate consisting of 13 plies is chosen. The modelling is carried out in ABAQUS [2], using continuum shells for each ply, with cohesive elements between all plies, to enable simulation of delamination. In-ply damage is accounted for by the Hashin damage model.

Variations from the reference laminate are modelled, with 17 and 21 plies. Simulation of impact, taken as part of a Compression after Impact test procedure, is carried out using explicit integration. Delamination location and size is compared for all variations, as well as in-ply damage. It is concluded that the ply thickness, but also stacking play a role in the distribution and size of damage.

Summary and conclusions and recommendations for future research are given.

References

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