Fatigue Analysis of Continuously Carbon Fiber Reinforced Polymer Composites

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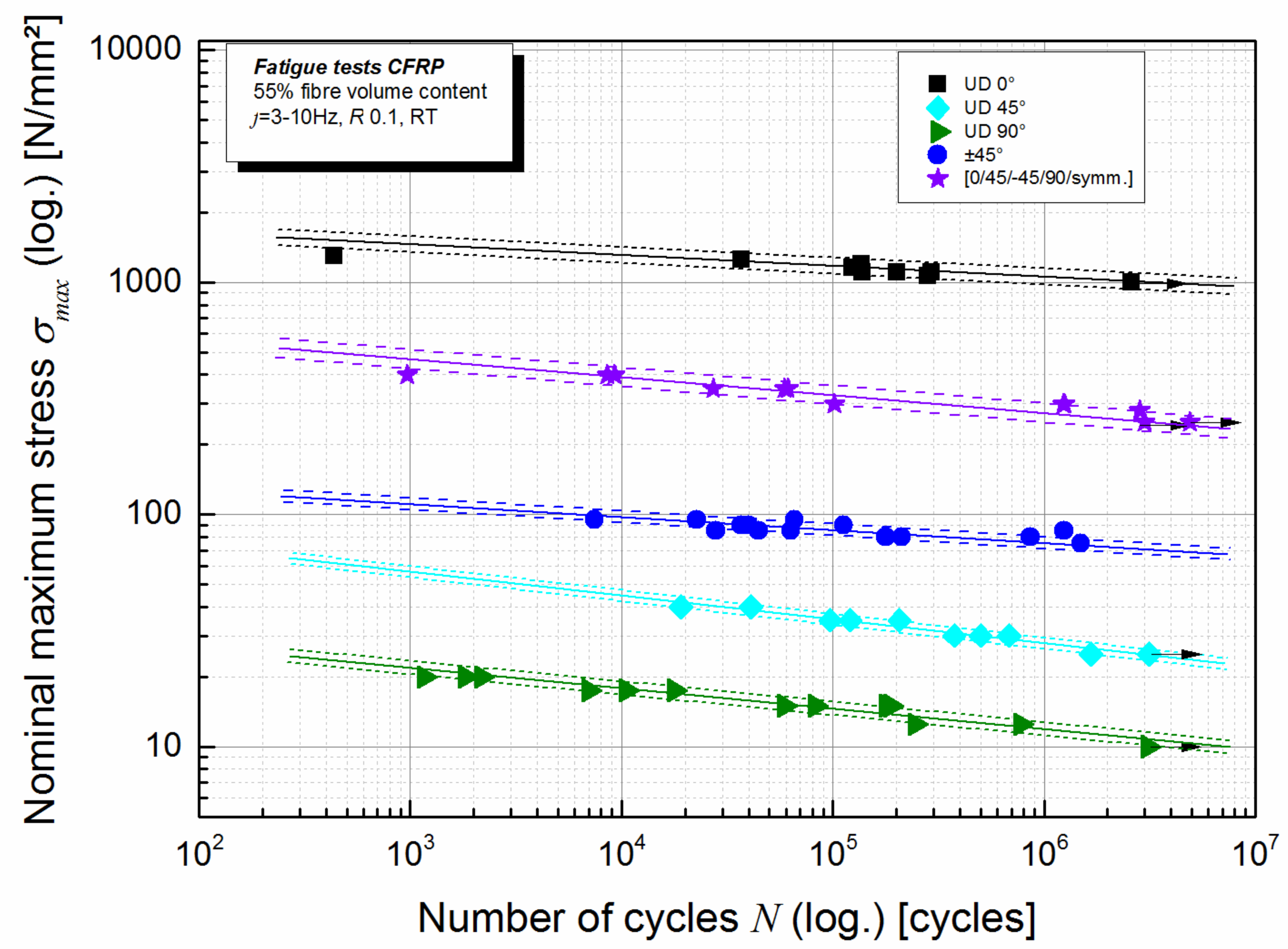
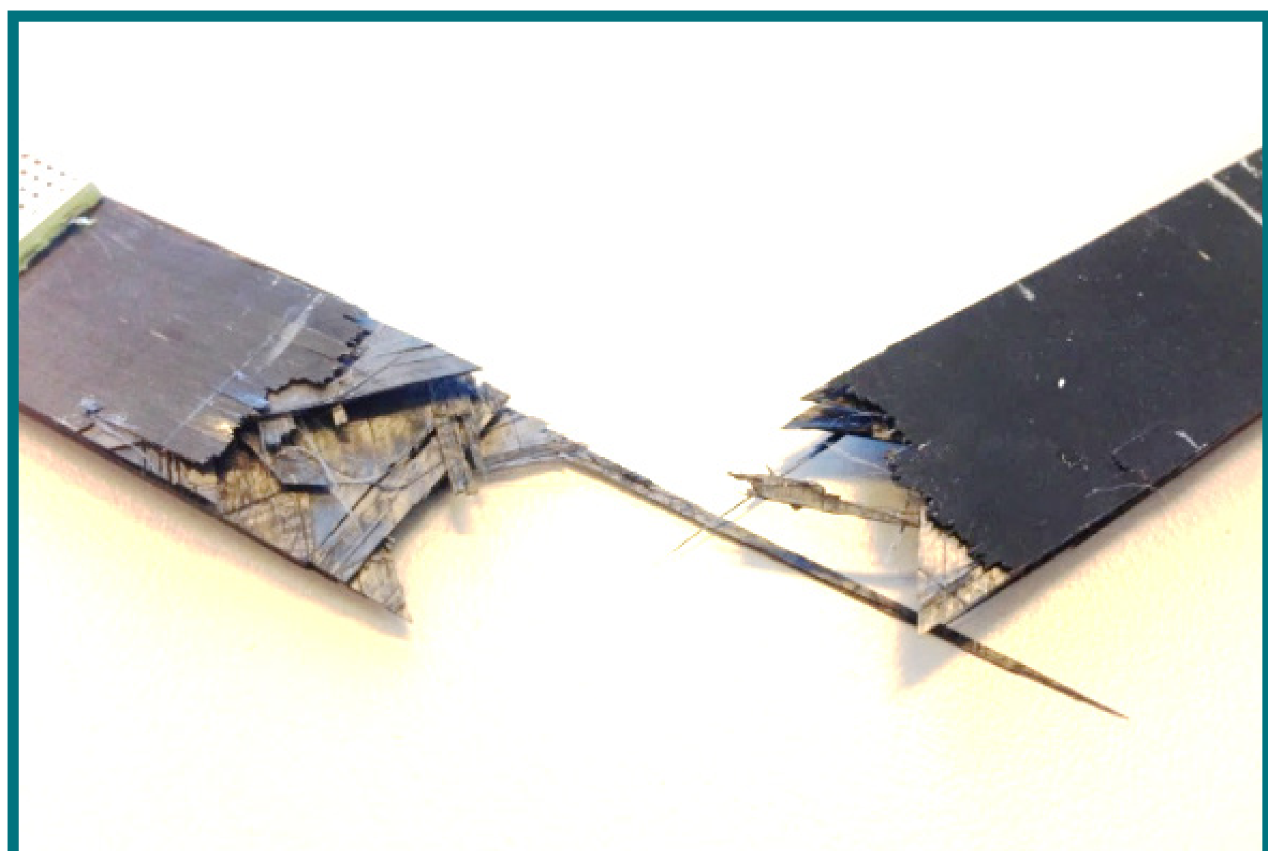
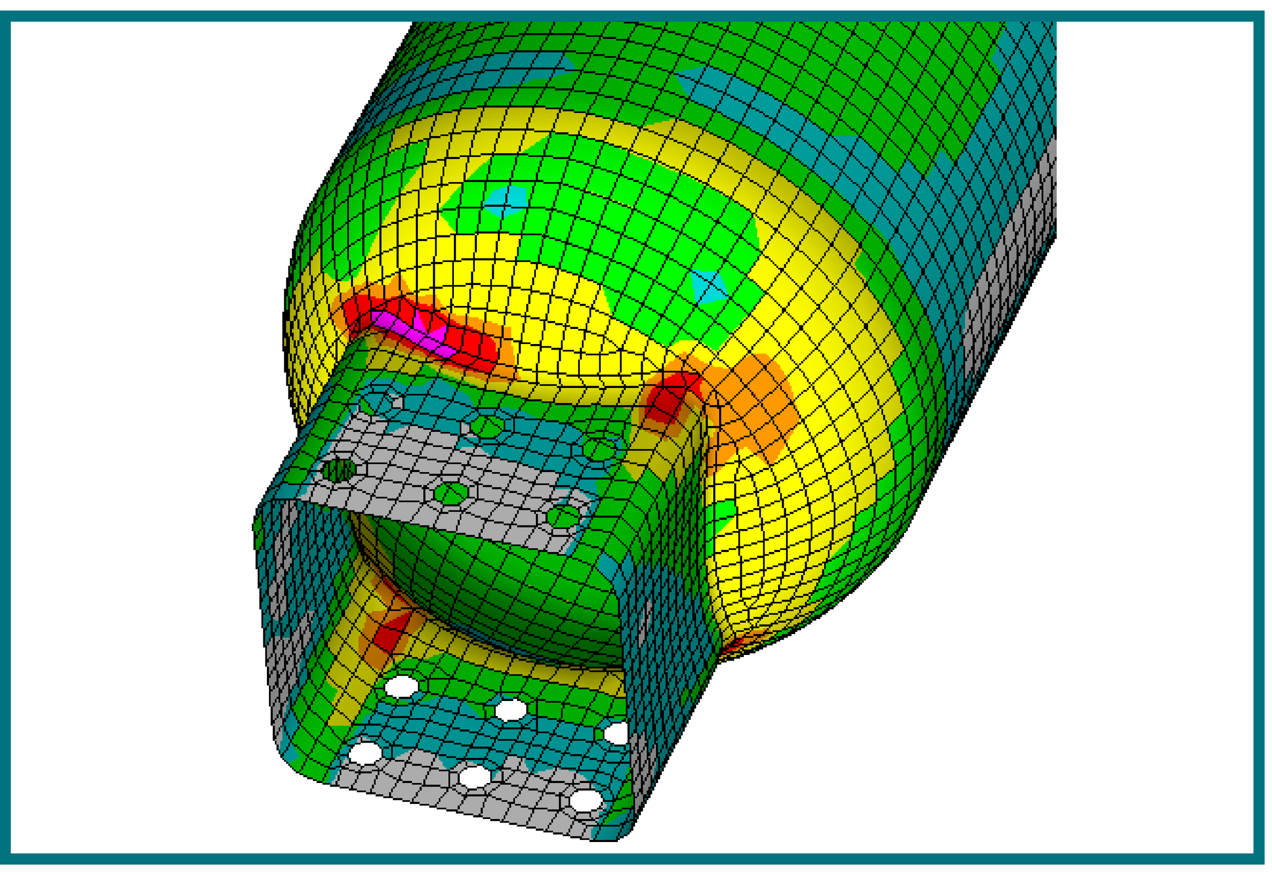
The usage of continuously carbon fiber reinforced polymers (FRP) instead of metals seems self-evident in many cases because of their high specific strength and the low specific weight. The available material-data of this material group from datasheets, however, are mostly static values like tensile strength and fracture elongation.



Effect of fibre orientation on fatigue life



Fatigue failure of a quasi-isotropic laminate



Damage simulation in continuously fibre reinforced polymers

For the dimensioning of dynamically loaded components concerning the fatigue life, the knowledge of the local Wöhler-curves is necessary. The Wöhler-curves, determined by the material, are essentially influenced by component specific effects, such as fiber orientation, type of loading, mean stress, temperature, production process and many more. For fatigue life prediction of continuously fiber reinforced polymers an assessment method was established, which takes into account the fiber orientation and considers different types of failure mechanisms like fiber fracture, inter fiber fracture and delamination based on the well-known static failure criterion of Puck. The method is implemented into a standard fatigue software tool (FEMFAT®) and verified so far with component tests.

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PROJECT: Fatigue prediction methology for automotive composite parts based on an enhanced Wöhler approach

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