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NUMERICAL ANALYSIS OF ROTATIONAL MACHINING OF HARDWOOD

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The hardwood and its processing become one of the challenges due to rising temperatures and changing composition of forests. The milling is one of the operations that need to be analysed [1]. The European beech was chosen to be processed with a rotating knife at diameter of 165 mm. The model was built within explicit finite element method considering the material anisotropy on all levels. That included elasticity, plasticity [2] and fracture, which furthermore took into account the tensile–compressive failure asymmetry. This was achieved by incorporating the stress triaxiality into the damage model [3]. Only one slice of the wood was modelled in order to speed up the computations. Therefore, the plane strain was considered that is true inside the material during machining, but not on the side surfaces. Nevertheless, the plane stress on sides should constitute just a minor effect on the cutting forces and the plane strain should prevail. Resulting reaction forces might be compared to experiments and the calibrated model used for optimization of process parameters such that the feeding or rotation speed, which influence the quality of the final surface and the energetic efficiency of the whole process.

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