

Investigation of the mechanism of failure behaviour of wood based materials using acoustic emission analysis and image processing

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Abstract

Very few investigations exist on the fracture behaviour of wood based materials [1, 2,3,4,5,6].

Niemz and Hänsel [1] examined cracking processes by means of acoustic emission, photogrammetry and scanning electron microscopy. A location of the acoustic signals was not possible with the methods then available. Within the scope of this work, the failure behaviour of different wood based materials was examined with the nowadays-improved methods of acoustic emission analysis (acoustic emission source location) and the ascertainment of displacements via image correlation. The main goal was to analyse the possibilities in order to predict the location of the crack sites. This should generate inputs for the structural optimisation of the materials.

Tensile strength, modulus of elasticity under tension and failure behaviour were ascertained for particleboards, OSB, plywood and MDF with two raw density grades by means of acoustic emission analysis. The strain distribution over the sample surface under load was determined with video image correlation.

Fracture sites can be predicted relatively well using optical measurements of the deformation under load. A combined observation of narrow and broad surface sides of the specimens is advantageous. Prediction of the cracks is easier for inhomogeneous materials like OSB (fig. 1) and plywood than for the more homogeneous materials MDF and particle boards. With the acoustic emission analysis the location of cracks can also be determined to a comparable degree.

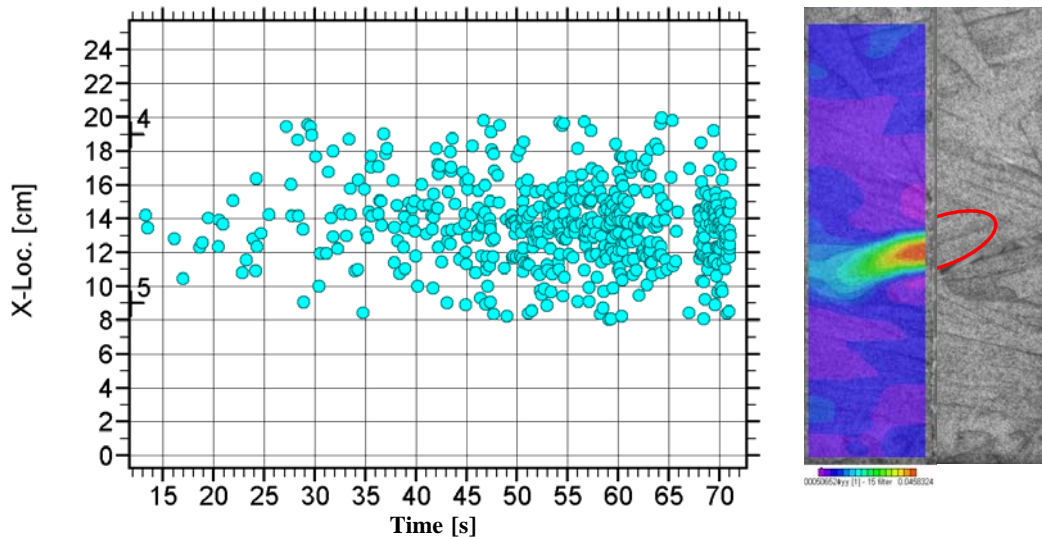


Fig.1: Crack location of OSB \perp with SEA and VIC2D (longitudinal direction)

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