



## Ending project: Structural Timber by Individual Layer Fabrication (ILF)

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### Project summary

In project A08 a novel fabrication process named 'Individual Layer Fabrication (ILF)' is being investigated, which allows the use of wood in the additive manufacturing of structural elements. In this process the parts are built up by laminating successive layers of individually contoured panels that are additively manufactured by selective binding of wood particles. By applying pressure during the fabrication of each layer, high mechanical properties and low binder contents can be achieved.

### Main outcome of 1<sup>st</sup> funding period

Process was automatized to a degree where all fabrication steps are done solely by machine

- Obtained objects have wood content of more than **80 wt%**
- Flexural strengths up to **50 MPa** and Modulus of Elasticity of up to **6 GPa**

### Key collaborations in 1<sup>st</sup> funding period



Exchange of information with project A02 on nozzle design to selectively apply adhesive

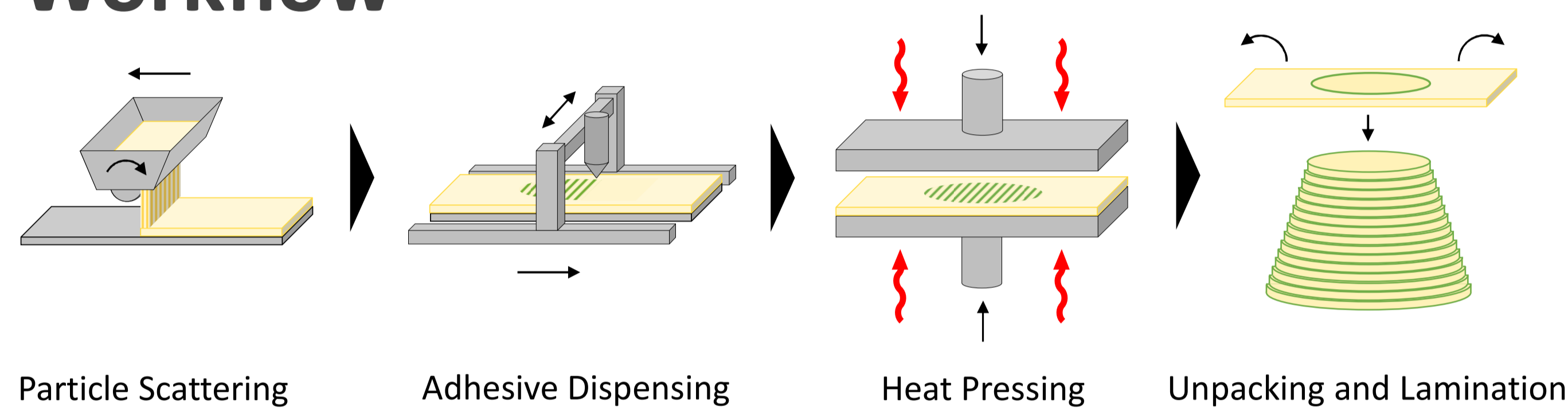


Exchange of ideas and designs with project A02 and A03 at the newly opened TUM AMC-Lab



Design of large scale demonstrators in close collaboration with project C02

### Workflow



### Project status

#### Particle Scattering

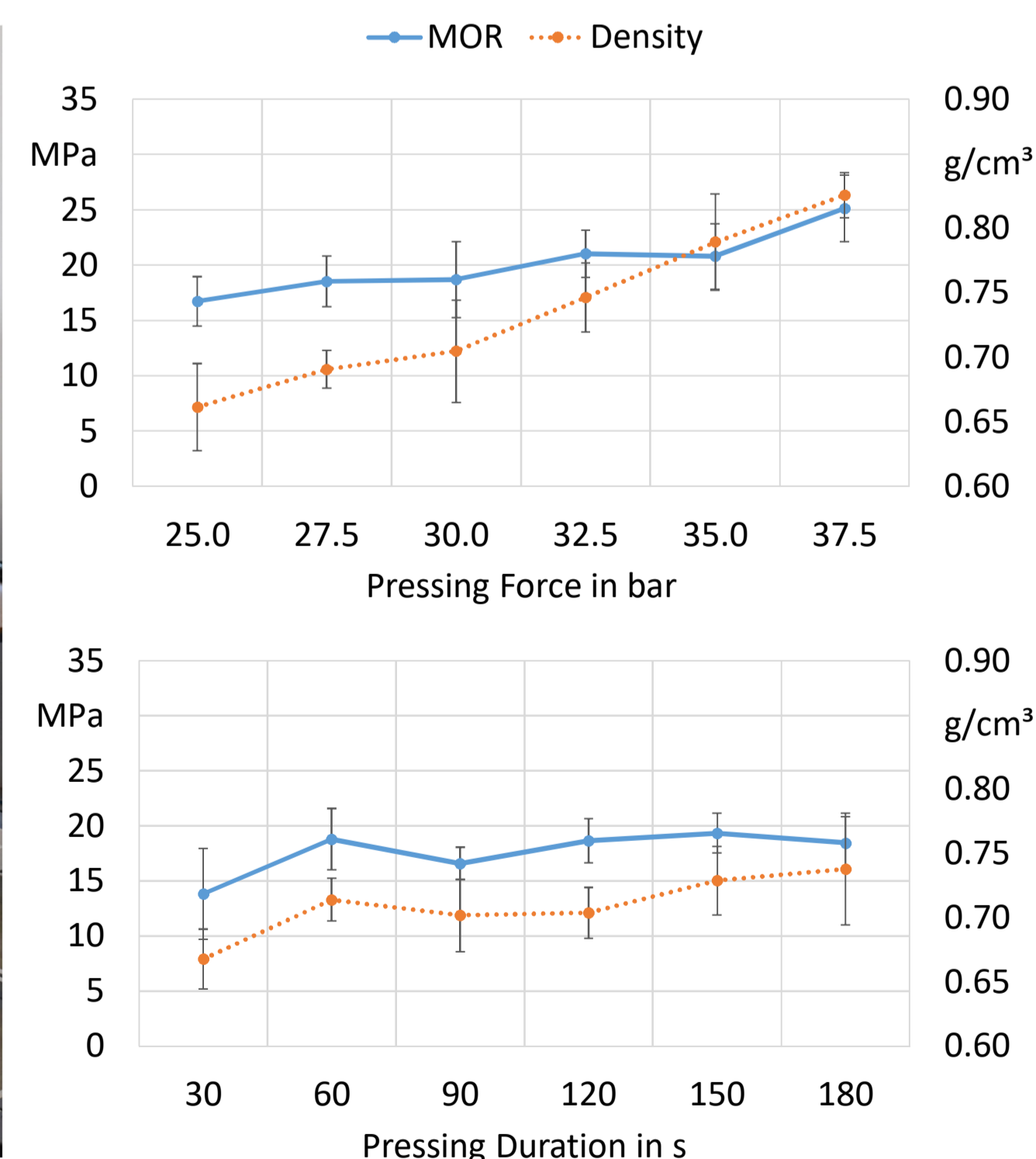


#### Adhesive Dispensing

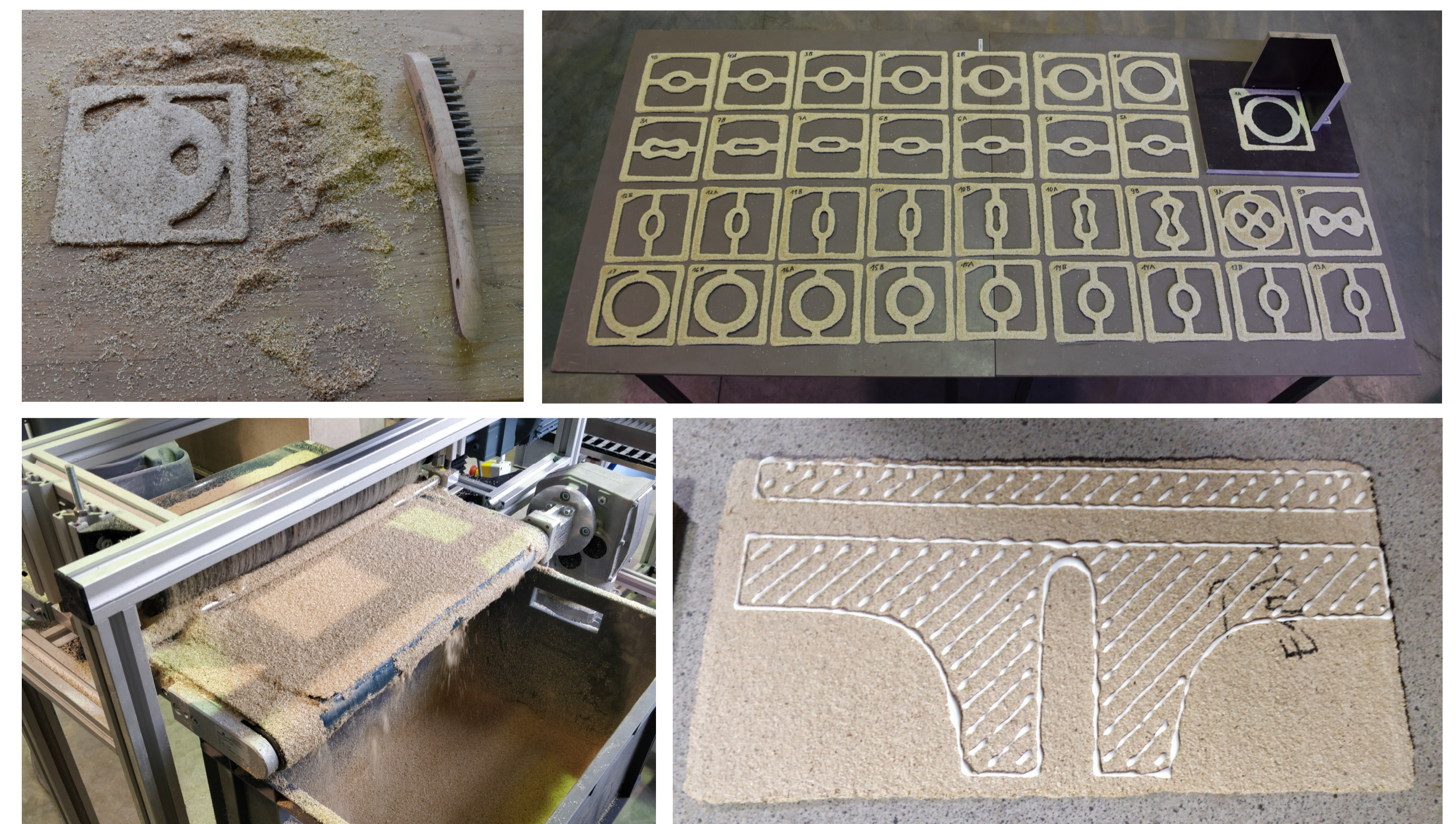


**Figures Particle Scattering:**  
Left: layer of scattered wood particles  
Top right: close up picture of wood particles  
Bottom right: wood particles in fibre shape analysis  
**Figures Adhesive Dispensing:**  
Left: adhesive dispensing with heated nozzle  
Top right: not fully intruded adhesive in particle layer  
Bottom right: fully intruded particle layer  
**Figures Heat Pressing:**  
Left: panel fabrication machine with heat press in the back  
Top right: the influence of pressing force on part density and flexural strength  
Bottom right: the influence of pressing duration on part density and flexural strength  
**Figures Unpacking and Lamination:**  
Top left: cleaning of the panels by hand  
Top right: orientation of panels for manual lamination  
Bottom left: cleaning of a panel with brush roller machine  
Bottom right: automated dispensing of adhesive for lamination

#### Heat Pressing



#### Unpacking and Lamination



### Large scale demonstrator

Slab designed by concurrent and shape optimization through project C02 (left) and fabricated by Individual Layer Fabrication (ILF) through project A08 (right).

Dimensions: 190x45x20 cm<sup>3</sup>  
Weight: 30 kg



### Outlook

Project A08 ends after the 1<sup>st</sup> funding period. The ILF process has reached TRL 4 within the 4 years and is planned to be raised to TRL 6 with industry partners through public funding outside of TRR 277.