

Laserfix – Laser fixation of topologically designed fiberweb

Objective

The aim of the project was a further development of a textile technology for flat semi-finished products made of staple fibres with a topological material distribution appropriate to the load. The basic idea behind this was the innovative pre- or final bonding of a topologically designed fiber web using defined laser technology before or instead of needle punching technology.

It was to be investigated which parameters regarding intensity and geometry of the laser system have to be used in order to further process fibre nonwovens mixed with thermoplastic fibres without additional post-treatment or to fix them using felting needles. The thermoplastic fibres are melted by the energy input of the laser beam, placed around the crossing points of the reinforcement fibres and then fixed. At the same time, the thermoplastic fibres serve as a matrix for the fibre composite components.

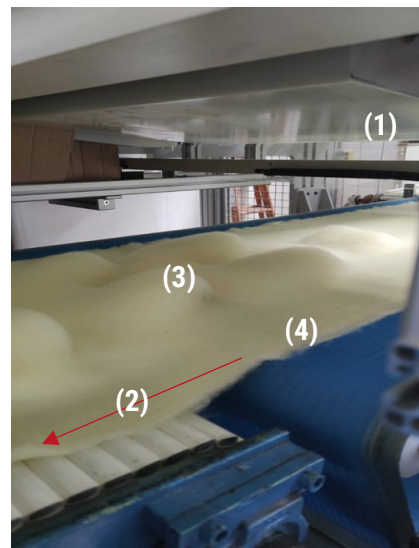
The precise mass distribution in the fiber web that can be achieved in this way is able to compensate for distortions in critical forming areas (e.g. tight radii) and ensure a higher level of specific structural properties. In addition, significant mass savings and lower energy consumption thanks to the new bonding technology contribute to increased cost-effectiveness.

Approach and results

A laser source (1) was installed and adjusted by the company LASER on demand GmbH, Burgdorf, across to the machine direction (2) of a laboratory needle loom with a working width of 500 mm directly after the partial deposition of fibres (3) through 3D-Lofter (Oskar Dilo Maschinenfabrik KG, Eberbach) on a nonwoven layer (4). The laser beam hit flat or topologically designed fibre web and solidified the upper layer of the web linearly to a depth of 10 mm.

Individual adjustment of the laser beam was necessary for each thermoplastic fibre and each nonwoven structure. The speed, power and focal length of the laser beam were adjusted to the fibre type and the structure to be bonded.

The successful implementation of the project objective has created a further bonding technology for nonwovens as well as the possibility of producing textile, load-optimised semi-finished products that generate a significant reduction in mass and precise mass distribution.



Arrangement of the laser source in the laboratory needle loom

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The final report on this project is available on request.

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