Near-net-shape fabrics in preforms

Invention
For a cost-efficient mass production of fiber composite components, it is essential to optimize the preparation of the near-net-shape textile preforms. The actual process consists of the manufacturing of standard textile semi-finished materials and therefore results in a discontinuous and cost-extensive procedure. The several working-steps – cutting to form, handling and fixing of the parts – are time-consuming and generate a big loss of valuable material. The process object of this invention takes advantages on the use of near-net-shape fabrics. Here single textile reinforcement elements are joined in a continuous process to form the final preform. The single parts are joined by warp-knitting. The resulting preform is finally shaped, impregnated and consolidated to a fiber composite component. Within the production of these non-crimp fabrics the lowest layer necessarily works as a supporting layer and extends over the complete width of the path. The remaining layers can also consist of smaller regular parts which are conveniently positioned on the lowest layer to form the near-net-shape fabrics or to be local reinforcing pieces. The supporting layer can consist of a worthy material such as carbon fibers or also of a cost-effective sacrificial layer. A suitable technology is not available for the precise transportation of several fiber layers in a warp knitted automatic machine. One issue is to avoid the displacement of the fibers while knitting several layers with different thickness in the direction of transport. For this scope it is necessary to continuously adapt the position of the pillar thread bar according to the thickness of the non-crimp fabrics. The extension of the offcuts is limited only by the dimension of the lower layer. For this scope it is necessary to continuously adapt the position of the pillar thread bar according to the thickness of the non-crimp fabrics. This invention discloses a method to adjust the vertical position of the pillar bar passively through a spring damper system. For this scope, a frequency sensitive viscous-type damper is used. For a high-frequency needle motion, i.e. a fast power transmission, the viscous-type damper is stiff ensuring a good penetration of the needle in the non-crimp fabrics. For slow changes of the thickness in the direction of the transport, one can move the damper with significantly less resistance. Therefore no complex active control and setting of the height of the pillar bar are necessary.

Commercial Opportunities
The process described increase significantly the productivity of the production process of preforms and constitutes therefore a basis for the serial production of fiber composite components. Furthermore this technology can be integrated in an existing chain process in order to upgrade it. On behalf of the RWTH Aachen, PROvendis offers the license to the technology and the possibility to establish a scientific cooperation for further development.

An invention of the RWTH Aachen University.

Competitive Advantages
- Low material consumption through reduction of the offcuts in the near-net-shape textile preforms
- Short production time through a continuous production process
- Lower price for the preforms
- Existing machines can be upgraded
- New potential applications for fiber-composite components
- Tested in a pilot facility at ITA
- Two pending international patent applications
  - WO2013139451
  - WO2013041203

Contact:
Ref. No. 2982 / 3200
Dr.-Ing. Ilona Gehrig
PROvendis GmbH
Schloßstrasse 11-15
45468 Muelheim an der Ruhr
Germany
Tel.: +49 (0) 208 94 105 22
Fax: +49 (0) 208 94 105 50
E-Mail: ig@provendis.info
Web: www.provendis.info