High performance textile structures for composites through open reed weaving

Summary

A German university offers licenses for enforcement fabrics for textile composites that combine the advantages of multiaxial reinforcement and good drapeability. The production is based on open reed weave. Application potential is in shell components. The feasibility has been proven. Industrial partners are sought for licensing agreements.

Creation Date	06 January 2016
Last Update	10 July 2017
Expiration Date	13 January 2018
Reference	TODE20160106001

Details

Description

Current textile products have many limitations regarding their effectiveness and lifetime due to the limited needle shifting in state of the art weaving systems. Fiber properties are highly dependent on loading direction and even a small angle deviation can cause a significant performance drop. Only small areas of multiaxial fabric can be obtained by the existing production methods and the load path is constantly interrupted.

Scientists at a German university filed a patent relating to the production of the multiaxial enforcement fabrics for textile composites with ORW (Open Reed Weave). The technology helps avoid load path interruptions in composites with textile enforcement. An overlapping of two yarn systems in the textile is created by means of a special weaving pattern. It leads to a continuous load path in bias direction, thus producing a “triaxial” fabric, which is the main approach of the investigation.

The angle of additional reinforcement direction is adjustable and the calculated necessary overlapping is 16.28 mm length. The capability of the system was verified by conducting three-point bending tests. These are performed varying the overlapping length, testing carbon and glass fibers and using reference samples as follows: [0/90°] fabrics and [0/90/45°] fabrics with continuous reinforcement. The results were successful in all cases.

Application:

The developed new textile structure has a high potential for reinforcing shell components with complex load cases. By the additional load bearing direction within the fabric the general part stability can be increased significantly where usually, +/-45° layers have to be used. These +/-45° layers cause a lot of waste, especially in complex geometries where woven fabrics have to be used due to their good drapeability.
The use of the newly developed triaxial fabrics can reduce this waste about 25 %. Additionally,

the number of necessary process steps for the lay-up can be reduced due to the integrated fiber orientations.

Industrial partners are sought for licensing agreements. Partners could be manufacturers of fiber reinforced components, e.g. shell components. They should participate in the ongoing further development tasks.

Advantages and Innovations

- Integrated third load bearing direction in woven fabrics
- Combines advantages of multiaxial reinforcement and good drapeability
- Time and resources savings by reducing waste and production steps
- Design flexibility of ORW for precise load path tracing
- Vast commercial potential for shell structures with complex load cases

Stage of Development

Under development/lab tested

Comments Regarding Stage of Development

The invention could prove its feasibility in numerous experiments.

Further investigations are still needed in this field. The machine setup has to be adapted for being able to realize the developed weave design. Additionally, more material combinations have to be investigated. For these materials, an extensive characterization of the fabric and composite properties is required for an industrial application. Based on these data, rules for a most efficient fabric design with optimized material efficiency have to be established.

IPR Status

Patent(s) applied for but not yet granted

Comment Regarding IPR status

An international PCT patent application has been filed. Further International applications are still possible.

Profile Origin

Private (in-house) research

Keywords

Technology

02007	Materials Technology
02007005	Composite materials
02007018	Advanced Textile Materials
03005008	Weaving related to Textiles Technology
03005009	Woven technical textiles for industrial applications

Market

08001004	Fibre-reinforced (plastic) composites

08001009	Speciality/performance materials: producers and fabricators
09004003	Textiles (synthetic and natural)

NACE

M.72	Scientific research and development

Network Contact

Issuing Partner

ASTER - SOCIETA CONSORTILE PER AZIONI

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Open for EOI : Yes

Dissemination

Send to Sector Group

Textile and Fashion

Client

Type and Size of Organisation Behind the Profile

University

Year Established

0

Already Engaged in Trans-National Cooperation

Yes

Languages Spoken

English
German

Client Country

Germany

Partner Sought

Type and Role of Partner Sought

Industrial licensees are sought. They can be manufacturers of composites, e.g. shell components that need reinforcing. They should be interested in joining the investigations regarding new material combinations and machine set-up.

Type of Partnership Considered

License agreement

Attachments

illustration.jpg

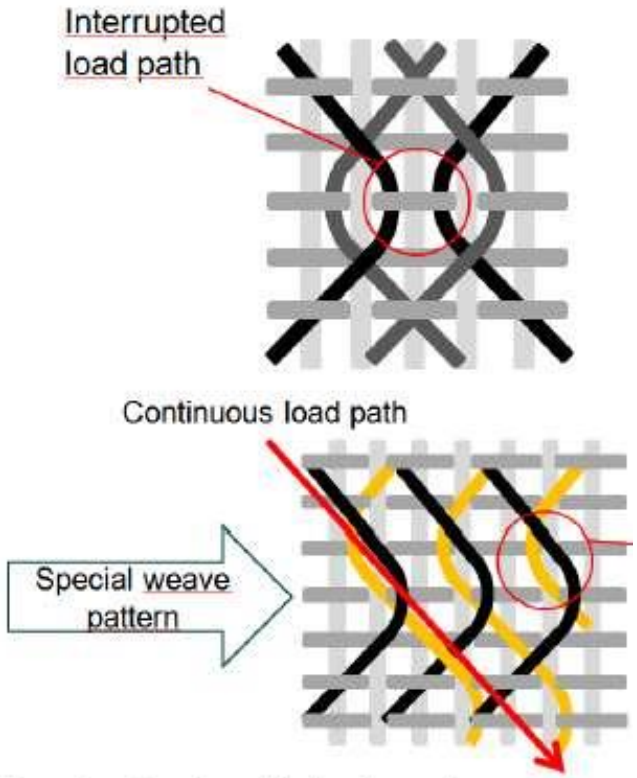


Fig.: Overlapping: joining through matrix material