VDMA Forum Composite Technology

The Forum Composite Technology is made up of nine VDMA associations bringing together machinery manufacturers’ skills in the conversion of fibre composites. As central contact point for the industry, the forum is the interface to all firms, associations and institutes involved in the manufacturing or conversion process and the application of composites, offering all partners a platform for cross-technology exchanges.

The forum is chiefly concerned with:

- Markets and customers: cooperation and exchange between associations, clusters and other customer industry organisations.
- Exhibitions policy: as sponsor of the COMPOSITES EUROPE trade fair, the Forum is establishing an important trade fair hub in Germany.
- Understanding the process: fostering innovative ability based on a common understanding of the process along the entire supply chain.
- Research: networking of research and industry to promote pre-competitive research.
- Public relations: joint articulation of interests and concerted public relations activities.
- Sourcing service: the Forum’s member companies present their range of products and the services they offer in the Composite Arena.

Further flyer available on these topics:
- Thermoplastics compression moulding.
- Processing of thermosetting semi-finished products.

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The industrialisation of processes for the mass production of fibre-reinforced plastics (composites) has begun. The focus is on resin transfer moulding (RTM) and compression moulding processes (long fibre-reinforced compounds, prepreg, organic sheet, etc.) for surface structures and structural components.

Typical applications for RTM processes include components with a relatively complex geometry, such as wind turbine blades, aircraft manufacture, railway vehicle components, car components, boat building.

The last few years have seen the conventional RTM process diversified into a large number of sub-types. Work is currently being done on many aspects of the RTM process, steadily optimising the process as a whole. This is being driven mainly by the motor industry with its growing requirement for composite components.

The injection and curing time of the thermoset resin is the stage that determines the cycle time in the RTM process. All other processes can be accelerated e.g. using appropriate forms of automation.

Process characteristics:
- Closed, low-emission process
- Complex three-dimensional components possible
- Near-net-shape components, requiring little finishing
- Good surface quality on both sides
- Reproducible component quality with narrow manufacturing tolerances (thickness, fibre volume fraction, weight)
- Use of dry semi-finished fibre products and low-viscosity resins
- High fibre volume fractions possible
- Cycle times depend on injection and curing time of the resin
- Sophisticated plant technology (injection unit, moulding press, etc.)
- Manufacturing may be automated to increase productivity and reproducibility
- High investment costs for high level of automation

Image sources: U. Steinbrich & M. Schwarzenbeck/pixelio.de, Wikimedia Commons, Dieffenbacher, Kuka, Basler, Roland Berger

http://composites.vdma.org
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Supply chain for the manufacture of fibre-reinforced products

Resin Transfer Moulding – RTM
Relevant machine groups

Machines for the production and treatment of fibres

- Preparatory machines for natural fibres
- Drafting systems for filaments and tapes
- Machines for the production of aramid fibres
- Machines for the production of glass fibres
- Machines for the production of carbon fibres

Machines for the production of nonwovens

- Nonwovens
- 2D and 3D woven and non-crimp fabrics

Machines for the production of yarn

- Twisted yarns
- Warp knitting machines
- Filament windig machines
- Multiaxial warp knitting machines

Machines for the production of textile structures

- Multifilaments/rovings
- Multiaxial warp knitting machines
- Warp knitting machines
- Flat knitting machines

Machines for the manufacture of composites

- Forming machines
- Heating and cooling technology
- Coating machines
- Preform cutting machines

Machines for composites processing/machining

- Drilling and milling machines
- Heating and cooling technology
- Coating machines
- Forming machines

Machines for the production of textile structures

- Machines for the production of nonwovens
- Filament winding machines
- Braiding machines
- Fibre placement lines
- Flat knitting machines
- Warp knitting machines
- Multiaxial warp knitting machines
- Weaving machines

Machines for the production of carbon fibres

- Drafting systems for filaments and tapes
- Machines for the production of carbon fibres

Machines for the production of glass fibres

- Multi-filaments/rovings
- Nonwovens
- 2D and 3D woven and non-crimp fabrics

For less complex shapes, direct preforming processes are also possible, where forming takes place entirely in the press tool using the RTM or a similar process.

For resin transfer moulding, the process chain starts where forming takes place entirely in the press tool using the RTM or a similar process.

The resin is then injected into the closed mould under (high) pressure. After the mould tool has been vented or evacuated, the resin is cured by chemical reaction of the resin/hardener mixture at process temperature in the heated mould tool, with holding pressure applied if necessary.

For resin infusion the dry semi-finished textile product is inserted (by hand or machine) into a two-part candy tool. The tool is then hermetically sealed.

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For finishing with high precision machine tools, a distinction is made between the introduction of functional geometries and fine surface finishing. For functional geometries, methods such as drilling, milling, laser or laser beam and water jet cutting are used, while fine surface finishing is normally done by grinding and polishing.

The machining of fibre composites presents engineers with completely new challenges for tool development, since the familiar laws of metalurgy cannot simply be transferred.

Unlike metallic materials, the properties of composites are determined chiefly by the direction of the fibres in the component. This means that fibre composite materials cannot be machined equally well in all directions.

If the component consists of layers of fibres in different directions or composite layers are combined with layers of metal, the machining process is even more complex.

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