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## T-RTM lauded perfect combination for modern lightweight construction

**Continuous fibers, short cycle times, welding and recycling capability: KraussMaffei's Thermoplastic Resin Transfer Molding (T-RTM) procedure unites the benefits of reaction process machinery, thermoplastic materials and shaping in the RTM procedure.**


*The new RimStar 8/8 T-RTM metering system enables on-demand melting of the caprolactam components.*

Promise goes: short cycle time for automotive component in hybrid design made of fibers, plastic and metal. To prove the real thing lives up to it at the K 2016 trade show booth in October in Düsseldorf, KraussMaffei was demonstrating the production of a fiber composite frame under series production for the roof shell of the Roding Roadster R1 sports car. Partner in developing component design and hybrid concept of this technology demonstrator was Forward Engineering.

This mentioned roof frame is based on a hybrid construction of fibers in conjunction with plastic and metal, making it possible to process both glass and carbon fibers with reliability. The production process at the trade show booth lasted just a few minutes. The system thus demonstrated the feasibility of automated and process-reliable integration of metallic inlays into T-RTM components. The use of what is called the near net shape approach, which takes a part close to its final form, means there is no need for complex post-mold processing such as milling the border area.

### Multi-preforms with a hybridized NCF layup

The multi-preform solution with four sub-preforms enables a load path oriented layup. This, combined with the high fiber-volume-fraction in the T-RTM process, increases the mechanical performance and allows a cost-down by substituting carbon with glass fibers. Instead of combining thin glass and carbon non-crimp-fabric (NCF) layers, a hybridization of cheaper heavy tow carbon and glass fibers in one thicker NCF layer is chosen and gives the part its zebra-look. All preforms are net shape trimmed to reduce the material input rate of the fiber reinforcement and to have no resin impregnated fiber waste in the production.

The process integrated metal inlays fulfill the demands for composites. The linkage between the coated inlays and the resin is achieved by adhesion and form-locking. The overflow of the inlays with pure resin prevents galvanic corrosion between the inlays and the carbon fibers.

### Melting on demand

An important component of the complete line is the new KraussMaffei RimStar 8/8 T-RTM metering system, which makes the melting process on demand. Only the material for a few shots is melted at a time. This makes it possible to prevent a mate-

rial aging of the two caprolactam components (caprolactam base material and activator or catalyst) by minimizing the thermal load on the melt. The new metering system also offers outstandingly accurate temperature control, from melting to injection into the cavity. These properties, taken together, ensure consistently higher product quality and thus underscore the suitability for series production.

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*In zebra look: Frames for the roof shell of the Roding Roadster R1 sports car – the T-RTM process enables processing of both glass fibers (white) and carbon fibers (black).*