EUREKA NETWORK PROJECT

PRISCA

Nr. 9183

LIGHTWEIGHT COMPOSITES STAND UP TO HARSH TREATMENT

Researchers and industrial engineers teamed up to develop new cost-effective techniques for moulding longer-lasting fibre-reinforced plastics that stand up better to impact, fire and even vandalism!

With fuel costs on the rise and competitive pressure mounting, demand for light yet tough composite materials – used in aircraft, trains, cars and other applications where less weight means less cost – is growing.

Widely used methods for injection moulding, such as Prepreg, are less flexible during production and need costly additional facilities. Alternatives, such as resin transfer moulding (RTM), are already being used by some pioneering larger companies, but wider industrial uptake is held up by cost and processing bottlenecks.

A team of European research and industrial organisations set out to change that in a EUREKA project called 'Polyurethane reaction injection for structural composite applications'. PRISCA's innovative work has helped to impact-proof aircraft, vandal-proof rail car seat interiors, and future-proof and optimise the Polyurethane-RTM process needed to manufacture them cost-effectively.

"Aircraft nose cones, for example, need to withstand impacts like bird strike and railway seats are subjected to harsh treatment and vandalism, which can be costly and difficult to repair," explains Prof. Michael Niedermeier who was project partner in the PRISCA consortium. "So, these were a couple of areas we looked at improving in the project."

The idea to create an international consortium to tackle the challenge was first raised by Prof. Markus Henne of Hochschule Rapperswil, Switzerland. He and a colleague, Prof. Gion Barandun, brought together nine partners from Switzerland, Austria and Germany.

"With the partners each financed by their home country – for example the central innovation programme for SMEs (ZIM) of the Federal Ministry for Economic Affairs and Energy (BMWi) in Germany – we soon realised that a large-scale effort like this demanded collective expertise and funding," says Prof. Niedermeier.

In this case, the expertise was located in different countries, so it made sense to submit a joint EUREKA proposal, with Niedermeier's own team, specialising in lightweight design and composite structures at Hochschule Ravensburg-Weingarten, acting as a "driving force" alongside Rapperswil.

Already popular in the automotive and aeronautics sector, sturdy RTM plastics work well as an alternative to heavier steel and aluminium components. For example, the bodywork in BMW's i8 model is a type of reinforced plastic made entirely using RTM processes. Boeing's 787 'Dreamliner' and Airbus' A350 are also up to 50% (by weight) fibre-reinforced plastic.

Now, the PRISCA team has taken the technology a step further, and delivered on several key objectives, including better RTM sandwich elements for rail and public transport using innovative thermoformed sandwich cores. The resulting composites are more resilient to fire and vandalism, while being more durable and energy absorbent.

The researchers have also been able to develop and test processes for single-moulded (monolithic) aircraft components that can withstand heavy impacts and abrasion. The new processes are better suited to automation and larger production runs, but still offer flexibility – making them more cost-effective than current RTM.

> ***"Our innovative work has helped to impact-proof aircraft, vandal-proof rail car seat interiors, and future-proof and optimise the Polyurethane-RTM process***

Critical to the success has been strong cooperation between organisations of all shapes and sizes from industry and academia. For example, industrial SME partners like Rühl, SE Kunststoffverarbeitung and Isotherm worked alongside larger companies like 3A-Composites-Airex and FACC, and with university partners.

In addition to demonstrations and commercialisation plans by industrial partners, PRISCA has also engaged the scientific community with its findings. Numerous publications include a recent paper on fatigue-resistance in glass fibre-reinforced polyurethane and epoxy, presented by Daniel Hülsbusch from WPT - TU-Dortmund at the 21st International Conference on Composite Materials in China (see more).

MAIN PARTNER

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OTHER PARTNERS

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HS Ravensburg-Weingarten, Germany
Isotherm, Switzerland
LKT, Austria
Rühl Puromer GmbH, Germany
SE Kunststoffverarbeitung GmbH & Co. KG, Germany
TU Dortmund - WPT, Germany

TOTAL R&D INVESTMENT

€1.31 million

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COUNTRIES & NATIONAL FUNDING BODIES

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Swiss Commission of Technology and Innovation KTI
Austria: own industrial financing

EUREKA is a European network for market-oriented R&D.

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