Demonstration of graphene enhanced chemistry points towards lower cost and high performance composite tool designs

Press release

Major demonstration of novel graphene-enhanced-chemistry points towards lower cost and high-performance composite tool designs for the Aerospace Industry

Partners in a recently completed UK government funded NATEP technology programme - Composite Tooling and Engineering Solutions Ltd (CTES), SHD Composites Ltd (SHD) and Applied Graphene Materials plc (AGM) - have subsequently made a significant step forward in demonstrating the viability of an exciting new materials development that has the clear potential to offer significant time and cost savings to aerospace composite tool designers.

SHD, working closely with the project partners, has developed a prototype tooling material that combines cure at initial low temperatures (80-90°C), with the ability to be post-cured to achieve a maximum service temperature in excess of 300°C. This cure flexibility enables the use of low-cost pattern materials and progression to a final production tool without the need for an expensive, time consuming and accuracy-losing intermediate tool phase, or manufacture of an expensive, metallic master model.

The tooling resin chemistry has been enhanced by the addition of AGM's A-GNP35 graphene nanoplatelets, significantly enhancing the matrix toughness and providing extra resilience against variations in processing conditions and resin micro-cracking over repeated production cycles. The graphene can be applied into the tool structure by addition into the bulk tooling material or discreetly targeted at critical regions by means of AGM's Structural Ink® printing technology.

The new material has been developed with cost savings to major aerospace programmes in mind and in a technology zone where materials choice and tool design are inextricably and critically linked. The demonstrator was a 10m long CFRP AFP mandrel tool, engineered by CTES (manufactured by Retrac Composites Ltd, Swindon) and was purposely chosen as representative of the industry's latest and highly demanding requirements.

Over coming weeks, the project team will be disseminating more details through industry forums, however the outcome was very successful, delivering a fully functional composite tool and demonstrating the potential for significantly lower costs, while maintaining the highest performance.

Although the new materials technology remains at the prototype/prove-out stage, the project partners are already actively engaged with interested parties keen to access the benefits of the system. As well as proving out production robustness, development work has also progressed to the processing of the material "out of autoclave", as well as the potential for applications in prototype tooling for high performing thermoplastic materials.

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About

SHD Group

SHD has subsidiaries throughout the UK, Europe and the USA. SHD Group manufactures advanced composite tooling and component prepreg materials for a wide range of applications. The SHD group of companies have been strategically formed to be able to service the global composites market with the same range of high-performance prepreg materials from multiple manufacturing bases. SHD's fundamental ethos of service, quality and innovation remains at the core of the group, with a focus on short lead times and market leading customer support.

SHD Composite Materials Ltd: www.shdcomposites.com

Composite Tooling & Engineering Solutions Ltd

CTES based In Matlock, Derbyshire, is a specialist composites design engineering company. It provides design, engineering, manufacturing and project management solutions for aerospace composite component and tooling projects with the focus on better designed and more cost-effective composite tooling and jigging.

Due to their unique position in the supply chain as independent tooling designers they can evaluate multiple manufacturing processes and tooling technologies, resulting in highly optimised component manufacturing solutions. To support this, CTES Ltd, work with multiple partners in R&D programmes to develop 'game changing' tooling technologies and solutions.

Composite Tooling & Engineering Solutions Ltd: http://ctesltd.co.uk/

Applied Graphene Materials Plc

AGM works in partnership with its customers using its knowledge and expertise to provide custom graphene dispersions and formats to deliver enhancements and benefits for a wide range of applications. The Group's strategy is to target commercial application in three core markets: coatings, composites and polymers and functional fluids.

The Group has developed proprietary bottom-up processes which are capable of producing high-volume graphene nanoplatelets using a continuous process. The manufacturing processes are based on sustainable, readily available raw materials and therefore do not rely on the supply of graphite, unlike a number of other graphene production techniques. Applied Graphene Materials owns the intellectual property and know-how behind these processes.

Applied Graphene Materials Plc: **https://www.appliedgraphenematerials.com/**

Retrac Composites Ltd

Retrac, based in Swindon, is a major supplier of composite tooling and parts to the aerospace, automotive and motorsport industries. They have experience in the manufacture of large aerospace mould tools and have worked with CTES previously on several large tooling projects, making Retrac the best manufacturing partner for this demonstration tool.

Retrac Composites Ltd: **https://www.retrac-composites.com/**