National Composites Centre Uses Advanced Heraeus CAE Technology in Research

The National Composites Centre (NCC) in Bristol is using sophisticated Computer Aided Engineering (CAE) technology from Heraeus Noblelight to optimise the thermal input and control, necessary for selected composite pre-preg lay-up operations. CAE has been extensively employed to determine the precise positioning of infra-red modules during laying up of pre-preg material.

The NCC is a world-leading authority on composites, bringing together and developing the best minds and the best technologies, to solve the world's most complex engineering challenges. Through innovation and collaboration, its purpose is to accelerate the commercial adoption of high impact, sustainable engineering solutions in composites by being the catalyst to enhance UK capabilities and stimulate global growth. As part of the High Value Manufacturing Catapult it is also a ‘front door' to a hub of seven advanced manufacturing R&D facilities for companies of all sizes - reaching a broad range of industrial sectors.

For selected composite applications it is important to maintain uniform and precise application of heat to the pre-preg layers - this enables optimised deposition that is necessary for high integrity composite structures.

The NCC has engaged Heraeus, who use simulation and CAE, featuring ray tracing and Computational Fluid to describe and understand the behaviour of complex systems using mathematical models, programs and computers. The first task of Heraeus was to carry out a reflection measurement of the composite to establish the material property for the subsequent optical simulation. The product CAD files were then imported with a wireframe representation of the desired heating zones. Infra-red emitter models were then placed in the simulation model and irradiance detectors assigned to the different facets of the simulation model. The optical material properties of all objects in the model were then established, including reflection, transmission, absorption and surface scattering. The irradiance at all points on the product surface was then simulated by ray tracing and optimisation of the simulated set up was then carried out by varying the heated length, location and orientation of the emitters, to achieve the required homogeneity throughout the target area with the minimum of emitters.

Following the CAE work at Heraeus, an infra-red system using fast response medium wave emitters was installed in a specially built tool at the NCC. This consists of six separate zones, where each zone is PID-controlled and the local surface temperature is measured by a pyrometer.

The IR system is currently being used at the Centre. As Richard Entwistle, the project leader, explains, "We were impressed with the work carried out by Heraeus, both in their CAE expertise and the quality of the emitters supplied."

Heraeus specialises in the production and application of high quality energy sources covering the electro-magnetic spectrum from ultraviolet to infra-red. It has over 40 years experience in infra-red technology and, with its Application Centres and CAE capabilities, it offers the expertise, products and systems to provide efficient and effective solutions to drying, heating and curing problems throughout industry.

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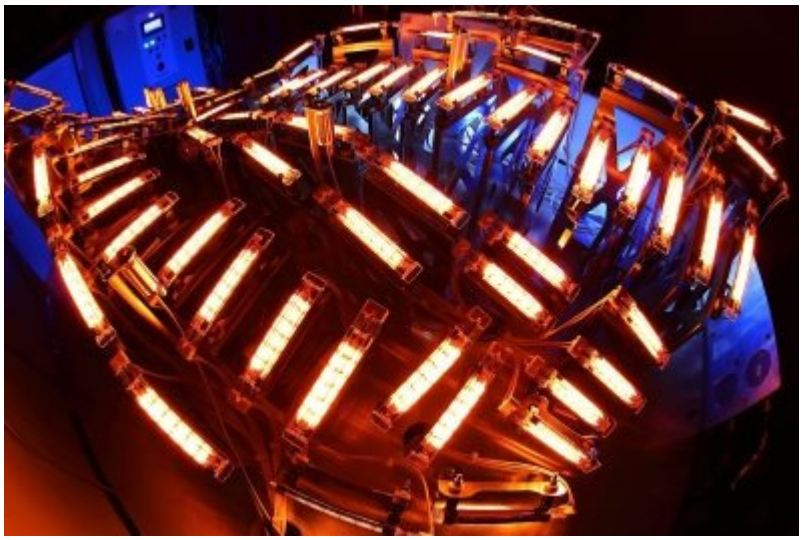

The complex Heraeus infra-red system at the NCC