Ajay KUMAR KADIYALA

Technology centre: The Irish Composites Centre (IComp), University of Limerick (UL)
Academic Mentor: Dr. Anthony Comer
Commercial Partner: Taconic
Commercial Mentor: Cyril Stockil

Ajay received his bachelor's degree in Sri Jayachamarajendra college of Engineering, India. In 2007 he started his master's degree in Institute of Chemical Technology Mumbai, India, focusing on Effect of interfacial energy on properties of multicomponent polymer system. In 2011 Ajay started his doctoral degree in Indian Institute of Technology Delhi doing research on Development, investigation and failure analysis of high-performance adhesives. Ajay has over 10 peer reviewed journal papers in the area of polymer composites and tribology.

Dr. Anthony Comer

Dr. Anthony Comer has 8 years' experience in the field of composite materials. Anthony joined IComp in 2009, after previously working in the Structural Dynamics Group at Oxford University. Anthony has secured research funding of over €1 million since becoming a lecturer at the School of Engineering (2014) and has published over 14 peer reviewed journal papers.. Anthony is currently the UL principal investigator for three major projects. Anthony has supervised 5 postdoctoral researchers and currently supervises 3 PhD students, teaching modules in composites, mechanical design and advanced solid mechanics. He is deputy course director of the Aircraft Maintenance and Airworthiness Engineering Programme.

Cyril Stockil

Cyril Stockil has a BSc in Polymer Science from Athlone Institute of Technology, an MBA in Business Administration from Coventry University and a Degree in Production Engineering 1998 from the University of Limerick. He has over 20 years of experience working for Taconic at the European Headquarters of Taconic in Mullingar, Ireland with roles as Quality Manager, New Product Development Manager and Technical Manager. Mr. Stockil has been involved in numerous projects where concepts have been developed into products and brought successfully onto the market place. Cyril continues to play a key role in very large R&D projects on a regional and global basis in conjunction with Taconic's other sites (located in Asia and the US).

The Irish Composites Centre (IComp)

The Irish Composites Centre provides world class innovative R&D, consultancy and networking opportunities for industry throughout Ireland and across all sectors where there are opportunities to use composite materials and associated technologies. IComp provides the focal point in Ireland for academia and industry to work together to address some of the critical issues related to the use of composite materials which have been identified by IComp industrial members who include companies from the supply chain and, for example, the aerospace, land transport, construction, marine and renewable energy and consumer goods sectors.

Taconic

Taconic's Industrial Products Division produces PTFE and silicone coated fabrics, tapes and conveyor belts for a wide range of industrial applications including aerospace, automotive, chemical and plastic processing and composite moulding. For over five decades Taconic has been dedicated to finding a better way to meet the needs of the global industrial marketplace with high performance PTFE materials. As Taconic grows and expands into new markets, the company continues on its path of finding a better way to meet new challenges by innovating better products with better materials and processes to better meet our customers' needs.

Ajay's project

"Development of dry-fibre tapes for ATP using water-based dispersions"

Traditionally used in glamorous high-end applications (e.g. spacecraft, F1 cars), Polymer Composites are materials which are increasingly appearing all around us in everyday society. For example, the transport sector has embraced composite materials in aircraft, trains, automobiles and marine vessels. The renewable energy sector has long been associated with composites (all wind turbine blades are manufactured using composites).

Polymer Composites offer the potential to achieve lightweight load bearing, corrosion-resistant engineering components and are increasingly replacing metallic materials in industrial applications. Lighter transport vehicles mean less emissions and increased range for existing fossil fuel and new electric vehicles. Increased recyclability (reformable thermoplastics, bio-resins and sustainable reinforcements such as Basalt) also has positive benefits for the environment and society in general considering recent reports on the level of plastic micro-particle waste in the environment.

The proposed project aims to allow increased use of composite materials in society through increased automation at the point of manufacture. Composite manufacturing techniques are traditionally slow, labour intensive and manual preventing high rates of production. The proposed research aims to develop a tape consisting predominantly of very strong micro-fibres and some binder materials to stabilise the fibres into a tape form. The tape will be designed to be compatible with a robot, which can use the tape to build-up the shape of a part (also called preforming) in a process analogous to 3D printing. A second process is then employed to allow liquid resin (matrix) to flow through the tape and around the micro-fibres contained within. The fibre-matrix combination then solidifies to produce a very strong, stiff, lightweight component.

The tape for development in the proposed project looks at developing low cost, innovative materials and its development has significant positive benefits not only for the research fellow, industry partner and Technology Centre but also for society in general.