Advanced natural z-pinned composite materials in offshore wind turbine blades

Background:

FRP composite material design technology has become a main factor in structural integrity to design of composite sub-structures in various engineering disciplines. In particular case offshore wind turbine blades are typically manufactured from FRP composites and delamination failure is an important issue in these structures. In extreme conditions, like ice impacting, multiple delaminations with a triangular shape is found in different parts of a composite wind turbine blade, introducing local damage, which can cause catastrophic failure under various loading conditions such as post-impact, fatigue and buckling. Most of previous researches were focused on the impact behaviour of delaminated composite structures manufactured from synthetic fibers in 2D with limited improvements. Recently we have developed new composite structures with 3D fibre configuration. Preliminary research has shown that the new composites have much better performance against various failure conditions such as delamination failure. However more work is needed to understand the interlaminar and intralaminar fracture mechanisms in 3D FRP and also the interaction between fibre and matrix phases. Support for a PhD student is needed to undertaken this research.

For an informal discussion on the project please contact Dr. Hessam Ghasemnejad:

h.ghasemnejad@kingston.ac.uk or 020 8417 4738

Recent relevant publications

1. H. Ghasemnejad, V.R. Soroush, P.J. Mason, B Weager, *To improve impact damage response of single and multi-delaminated FRP composites using natural Flax yarn*, in 'Materials and Design', In press, Elsevier, (2011).
2. H. Ghasemnejad, L. Occhineri, D.T. Swift-Hook, *Post-buckling failure in multi-delaminated composite wind turbine blade materials',* in 'Materials and Design', 32 (2011), pp. 5106–511, (2011).
3. J.M. Pereira, H. Ghasemnejad, J.X. Wen, V.H.Y. Tam, "*Blast response of cracked steel box structures repaired with carbon fibre-reinforced polymer (CFRP) composite patch*", in 'Materials and Design', doi.org/10.1016/j.matdes.2010.12.045, Elsevier, (2011).
4. H. Ghasemnejad, T Vineet, H. Hadavinia, "*Mixed-mode delamination failure of z-pinned hybrid laminated composites*" in 'Key Engineering Materials', 452-453, pp. 453-456. ISSN 1662-9795 (2011).
5. H. Ghasemnejad, A.S.M. Furquan, P.J. Mason, "*Charpy Impact Behaviour of Single and Multi-Delaminated Hybrid Composite Beam Structures*" in 'Materials and Design', 31(8), Elsevier, pp. 3653-3660., ISSN 0261-3069, (2010).