Abstract No: 192 ***Physical Sciences***

EDDY CURRENT INSPECTION-BASED DAMAGE DETECTION OF CARBON FIBRE-REINFORCED POLYMER COMPOSITES

A.G.C.S. Amarasinghe, R.R.D. Ranawaka, E.H.N. Dilshan, I.P. Dharmathilaka, G.A.A.I. Tennakoon and H.M.C.M. Herath*

Department of Engineering Technology, Faculty of Technological Studies, Uva Wellassa University, Badulla, Sri Lanka

**madhubhashitha@uwu.ac.lk*

Carbon fibre-reinforced polymer composite is used in many aerospace, automobile, and civil engineering industries. During the manufacturing stage and end-user stage, carbon fibre composite material is subjected to different kinds of damage, such as delamination, de-bonding, and fibre breakages. Those damages may lead to destroying the application with a life-threatening catastrophe. To identify these kinds of damages, several non-destructive testing (NDT) techniques are used, such as visual, ultrasonic, and optical fibre sensing. However, when considering the initiation and propagation of the damage, microlevel and invisible cracks are crucial. This study used plain weave carbon fibre fabric with an appropriate resin-hardener mixture to make carbon fibre-reinforced composite sheets by hand layer-up process. Subsequently, the samples were subjected to drop weight impact tests with 0.6 j, 1.2 j, 3.0 j, 6.0 j, and hammer impact tests. By using an Ectane-2 eddy current inspection equipment, both sides of the carbon fibre samples were scanned before and after the impact damage. The defect's location could be seen on the c-scan plane, while the crack propagation could be seen on the impedance plane of the Ectane-2-magnify software screen. Variations in voltage showed an irregular pattern on the impedance plane because of the damage to the carbon fibre strips that affected the electrical conductivity of the composite. The eddy current inspection method is capable of identifying the damage location and propagation of plain weave carbon fibre-reinforced polymer components. In the future, fibre weaves such as twill and unidirectional need to be investigated.

Keywords: Carbon fibre (CF), Composite materials, Eddy current, Non-destructive technology (NDT), Woven fabrics