DESIGN/FABRICATION OF BI-AXIAL TENSILE TESTING MACHINE AND NUMERICAL MODELING OF POLYMER COMPOSITE UNDER BI-AXIAL STRESS STATE

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In real engineering applications, materials are subjected to different types of loads applied in several directions. Characterizing materials using the Uni-axial tensile testing can be only enough for Isotropic materials. But it is not accurate when testing the Anisotropic materials where the properties vary with different crystallographic orientations. The main scope of this research is to Design & Fabricate the Sri Lankan first ever Bi-Axial Tensile Testing Machine to Characterize Polymer Composites. This study enabled to fabricate a full-scale Bi-Axial Tensile Testing machine for the first time in Sri Lanka. The machine uses four linear actuators which allow cruciform specimen subjected to load from two independent directions. A non contact strain measurement technique using digital Image correlation has been used to measure the strain induced in the specimen. MCalibration – an optimization numerical tool was used to calibrate the best fit material model for the particular application under the biaxial stress state, and a commercial FEA software ABAQUS was used to build and analyze the tested material for its anisotropic nature.

Keywords: Biaxial Loading, Digital Image Correlation, Polymer Composite, Finite Element Analysis.