Study on effective properties of plain woven composite structures

E-mail: 324902@ mail.dyu.edu.tw

ABSTRACT

The study develops a prediction model of plain woven composite because composite structures are used in industrials extensively such as sports, bike, medical, and aerospace. The woven composite structures are used for the beauty or to solve the material directions of continuous fibers composite structures. However, it weakens the woven composite structures strength and stiffness in the composite structure components. Therefore, the mechanical prediction models of plain woven composite structures are needed. In the research, Finite Element Method (FEM) commercial software, ANSYS is used to analyze effective woven composite structures. Tensile experiments utilize Digital Image Correlation (DIC) method and strain gage to test the woven composite stiffness and surface strain. Furthermore, the experimental results will be compared with CAE analysis results. The results of the effective Young modulus and CAE analysis show the relationship among woven types, fiber tow width, and unit cell thickness. The DIC method testing techniques have overcome the problem that different woven structures have different strain. The differences between CAE analysis and experiments are under 0.05% ~ 3.02%, so the result has proven that woven composite structures prediction model is good to widely analyze most of the plain woven structures.

Keywords : Finite element method   Material testing   Effective material properties   Woven Composite   Digital Image Correlation   DIC

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