

Fabrication and Characterization of Steel Wire Embedded Gfrp Composites

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ABSTRACT

The aim of this study is to examine the effect of the impact performance on a bidirectional glass fibre/steel wire embedded laminates and to investigate the ability of the steel wire through thickness reinforcement to improve the delamination resistance of laminates. Laminates with lay-ups [90/0/0/90], of steel wire placing at $\frac{1}{4}$ th & $\frac{3}{4}$ th thickness with 3, 5 & 7mm pitch distances have been fabricated and drop weight impact tests were conducted with different drop height (400 mm, 500 mm and 600 mm). From the experiment conducted, peak energy damage force, total energy and damage area were found for both plain GFRP and steel wire embedded GFRP specimens. From the obtained results it is found that the delamination and the damage area are reduced due to the inclusion of steel wire in the laminates at various thickness level.

KEY WORDS: Fabrication, embedded, steel.

1. INTRODUCTION

Amin Ajdari (2011), investigate the crushing behavior and energy absorption of honeycombs made of a linear elastic-perfectly plastic material with constant and functionally graded density were studied using finite element simulation, results provide new insight into the behavior of engineered and biological cellular materials, and could be used in development of a new class of energy absorbent cellular structures, Serge Abrate (2014), investigate the composite structures in contact with water are subjected to impacts by projectiles large and small, while the presence of water is known to affect the dynamics of immersed structures, its effects on the impact dynamics is unclear, Borrelli (2011), was conducted drop tests on water on semi-cylindrical composite structures. The objectives of such test campaign were to improve the knowledge about the water impact behavior of composite structures and to build an experimental database to support the validation of reliable simulation tools to be used during the design and certification process of aircrafts, Florian Pascal (2013), investigate the study of oblique medium velocity impacts (~70m/s) on the lower surface of helicopter blades is assimilated to a composite sandwich panel with a thin woven composite skin stabilized with a foam core. This modelling is accurate enough to be used to analyze the damage mechanisms of woven composite laminates during medium velocity impacts, Saghafi (2013), study the influence of the curvature type (convex or concave) and preloading on impact response of curved laminates is considered results show that the effect of preloading on damaged area of concave laminates is lower than for convex ones, Pietro Russo (2014), analyses the response of film-stacked composite laminate plates subjected to falling weight impact tests, recycled polyolefin show lower impact parameters with respect to the latter ones even if a partial improvement of the performances can be obtained by modification of the matrix by an adequate coupling agent, Lukasz Pieczonka (2014), study on impact damage detection in light composite sandwich panels in three different nondestructive testing methods, the c-scan was the most time consuming and required the immersion of the panel in water during testing, Antonucci (2014), was to investigate the response of laminates fabricated by a new vacuum assisted technology, labelled as "pulse infusion", under dynamic loads and the residual strength was evaluated, Rajesh (2014), involves the fabrication of epoxy and polyester resin composites using aluminum oxide, silicon carbide with different proportion of Al₂O₃ and SiC along with GFRP the epoxy resin shows higher strength as compared to composites with polyester resin.



Figure.1. Falling Weight



Figure.2. Clamping

Material: Specimens were manufactured from four layers of E-glass woven roving of weight 600 gsm Laminates with lay-ups [90/0/0/90], of steel wire placing at $\frac{1}{4}$ th & $\frac{3}{4}$ th thickness with 3, 5 & 7mm pitch distances have been fabricated using hand layup process. An epoxy resin LY556 with hardener HY 591 was used 1:10 ratio, the panels were cut into specimens of 300 x 300 mm with an average thickness of 3mm.