

## Behavioural Studies on Multidirectional Reinforced 4-D Orthogonal Composites on Various Preform Configurations

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**Abstract :** The main advantage of multi-directionally reinforced composites is the freedom to orient selected fibre types and hence derives the benefits of varying fibre volume fractions and there by accommodate the design loads of the final structure of composites. This technology provides the means to produce tailored composites with desired properties. Due to the high level of fibre integrity with through thickness reinforcement those composites are expected to exhibit superior load bearing characteristics with capability to carry load even after noticeable and apparent fracture. However a survey of published literature indicates inadequacy in the design and test data base for the complete characterization of the multidirectional composites. In this paper the research objective is focused on the development and testing of 4-D orthogonal composites with different preform configurations and resin systems. A preform is the skeleton 4D reinforced composite other than the matrix. In 4-D preforms fibre bundles are oriented in three directions at 120° with respect to each other and they are on orthogonal plane with the fibre in 4th direction. This paper addresses the various types of 4-D composite manufacturing processes and the mechanical test methods followed for the material characterization. A composite analysis is also made, experiments on course and fine woven preforms are conducted and the findings of test results are discussed in this paper. The interpretations of the test results reveal several useful and interesting features. This should pave the way for more widespread use of the preform configurations for allied applications.

**Keywords :** multi-directionally reinforced composites, 4-D orthogonal preform, course weave, fine weave, fibre bundle spools, unit cell, fibre architecture, fibre volume fraction, fibre distribution

**Conference Title :** ICMME 2014 : International Conference on Mechanical, Mechatronics and Materials Engineering

**Conference Location :** Miami, United States

**Conference Dates :** March 10-11, 2014