

Conceptual design of natural fiber composites as a side-door impact beam using hybrid approach

ABSTRACT

This paper presents the conceptual design stage in the product development process of a natural fiber composites of the side-door impact beam, which starts from idea generation to the selection of the best design concept. This paper also demonstrates the use of the integrated Theory of Inventive Problem Solving (Function-Oriented Search) (TRIZ (FOS)) and Biomimetics method, as well as the VIseKriterijumska Optimizacija I Kompromisno Resenje (VIKOR) method. The aim of this study was to generate design concepts that were inspired by nature and to select the best design concept for the composite side-door impact beam. Subsequently, eight design concepts were generated using the TRIZ (FOS)-Biomimetics method and finite element analysis were used to analyse their performance and weight criteria using ANSYS software. VIKOR method was used as the multiple criteria decision making tools to compare their performances, weight and cost criteria. As a result, design concepts B-03 and C-02 were ranked as the first and second best, with VIKOR value of 0.0156 and 0.1178, respectively, which satisfied the conditions in VIKOR method. This paper shows that the integrated method of TRIZ (FOS)-Biomimetics and VIKOR can assist researchers and engineers in developing designs that are inspired by nature, as well as in selecting the best design concept using a systematic strategy and justified solutions during the conceptual design stage.

Keyword: Theory of inventive problem solving; TRIZ (FOS); Biomimetics; VIseKriterijumska Optimizacija I Kompromisno Resenje; VIKOR; Side-door impact beam