ABSTRACT

In the modern era, comfort has become a priority, especially in activities like playing video games. Gaming chairs have become an essential element for both professional and casual players. The gas cylinder, as a critical component, is affected by the load and the materials used. Designing a gas cylinder that is both strong and lightweight presents a challenge in enhancing the comfort and longevity of the product. This study aims to analyze the strength of a gaming chair's gas cylinder by applying a thin-walled bionic bamboo structure using the Finite Element Method (FEM). FEM simulations are conducted to understand the effects of using various materials such as stainless steel, aluminum alloy, and ABS plastic, as well as the variation in node diameters in the bionic bamboo structure. A load of 1500N is applied to represent the weight of the gaming chair user. The analysis aims to determine the stress distribution, deformation, and effectiveness of different node structures and materials. The Grey Relational Analysis (GRA) method is used to rank the design performance based on deformation and stress. The results show that the thin-walled bionic bamboo structure with hexagonal nodes of 2 mm diameter (BSS2-2) performs best, with lower deformation and stress compared to the existing gas cylinder design. The Grey Relational Grade of BSS2-2 reaches 0.9997, while the existing design only achieves 0.9620. In conclusion, the BSS2-2 design significantly improves the strength and durability of the gas cylinder. Further experimental testing is recommended to validate the simulation results and to consider alternative materials for higher efficiency.

Keywords: **FEM, GRA, *THIN-WALLED BIONIC BAMBOO, Cylinder Gas,* Deformation, Stress.**