DYNAMIC PERFORMANCE ANALYSIS OF KNITTED FABRIC TUNGSTEN-REINFORCED GLASS FIBER COMPOSITES

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Abstract

Lightweight design and high strength are of significant importance in engineering applications. For this reason, composite structures have been extensively studied for many years. In recent years, textile reinforced composite materials have particularly gained attention for use in a wide range of engineering fields. In cases where lightweight design is prioritized, vibration-related issues may arise in structures subjected to dynamic loading. In this study, glass fibre knitted fabric reinforced composites with and without tungsten filler were produced by hand lay-up. The knitted fabric reinforcements were manufactured on a 7-gauge V bed flat knitting machine by using 136 Tex glass multifilament yarns. During the production of the knitted fabrics, the input yarn tension and fabric take-up tension were kept constant. Four layers of knitted fabrics were stacked during composite manufacturing where 0◦ refers to the wale direction of the top fabric layer and 90◦ refers to the course direction of the top fabric layer. Composites with filler were manufactured with the application of micro sized (size $<$ 44microns) tungsten particles onto the top fabric layer by Huntsman Araldite LY1568 epoxy resin with Aradur 3489 harderner having a mixture weight ratio of 3:1. The elastic modulus, flexural rigidity, the first natural frequencies, and damping ratios of the composites were determined. It is observed that the addition of filler led to an increase in the elastic modulus, the first natural frequency parameter and flexural stiffness. On the other hand, the damping ratio decreased. While the weight per unit area of the tungstenreinforced composite structure increased, a more pronounced improvement in stiffness was achieved.

Keywords: Vibration, damping ratio, textile composite, tungsten, knit, filler

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