

Vertex angles effects in the energy absorption of axially crushed kenaf fibre-epoxy reinforced elliptical composite cones

ABSTRACT

Experimental quasi-static crushing tests were conducted by using a universal testing machine format kenaf-epoxy composite elliptical cones. The work focused on the vertex angle's effects on energy absorption capability; the vertex angles vary from 0° to 24° in 6° increments. The failure modes of the kenaf fibre epoxy composite elliptical cones were observed utilising delegate photos taken during the quasi-static crushing test. Load-deformation curves and deformation histories of typical specimens are presented and discussed. Moreover, the effects of cone vertex angles on the load carrying capacity and the energy absorption capability are also discussed. The results show that the energy absorption abilities significantly influence the ellipticity vertex angle as the load carrying capacity. We concluded that the quasi-static axial crushing behaviour of elliptical mat laminated composite cones is strongly affected by their structural geometry and the specific energy absorbed by the composite elliptical cones with vertex angles of 6° , 12° , 18° , and 24° , which is more than an elliptical cone with the vertex angle of 0° (the elliptical tube) at any given deformation. However, the specific energy absorption for the elliptical composite cone showed a positive correlation, i.e., the more the angle increased, the more energy was absorbed. In this regard, an elliptical composite cone with a 24° angle exhibited the best energy absorption capability.

Keyword: Kenaf fibres; Composite materials; Elliptical cone; Vertex angle; Collapsible; Energy absorption