Tensile Properties of Double Braided Flax Fiber Ropes

Author(s)

Lawrence R. Msalilwa
Yordan Kyosev
Amit Rawal
Uttam Kumar

Abstract

In this study, the mechanical behavior of double braided tubular ropes under tensile loads is studied experimentally and analytically. The outer braid is referred as the braid cover and the inner braid is considered as an elastic tubular braid core. A predictive model of the mechanical response of the braids based on the constituent monofilament (yarn) properties and braid geometry based on known research works was used. The model has accounted for the changes in the braid geometry, including braid angle and diameter. Both braid angle and diameter are found to be critical design parameters. Image analysis is employed to experimentally characterize the structural parameters of the braids and their deformation. The structures are tested in tension and their stress–strain response is recorded. The experimental results have been compared to the theoretical stress–strain curves of braid cover-core structures and the results have been observed to agree well between them, though the theoretical model underestimates the Young's modulus of the braid cover-core structure.

Keywords

Double braiding Modeling Tensile strength Braid geometry Modulus