

## Accepted Manuscript

Design and production of filament-wound composite square tubes

Lei Zu, Hui Xu, Bing Zhang, Debao Li, Bin Zi, Bingzhan Zhang

PII: S0263-8223(18)30469-0

DOI: <https://doi.org/10.1016/j.compstruct.2018.02.069>

Reference: COST 9419

To appear in: *Composite Structures*

Received Date: 31 January 2018

Revised Date: 13 February 2018

Accepted Date: 22 February 2018



Please cite this article as: Zu, L., Xu, H., Zhang, B., Li, D., Zi, B., Zhang, B., Design and production of filament-wound composite square tubes, *Composite Structures* (2018), doi: <https://doi.org/10.1016/j.compstruct.2018.02.069>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Design and production of filament-wound composite square tubes

Lei Zu <sup>a</sup>, Hui Xu <sup>a</sup>, Bing Zhang <sup>a,\*</sup>, Debao Li <sup>a</sup>, Bin Zi <sup>a</sup>, Bingzhan Zhang <sup>b</sup>

<sup>a</sup>*School of Mechanical Engineering, Hefei University of Technology, Hefei 230009, China*

<sup>b</sup>*School of Automotive and Transportation Engineering, Hefei University of Technology, Hefei 230009, China*

### Abstract:

Composite square tubes have gained increasing attention as energy absorbers due to their high specific energy absorption capacity and long stroke. One of the key important issues for producing filament-wound composite square tubes demands both windability and uniform coverage of winding patterns. Based on the analytic geometry, the spatial relation between the feed eye and the mandrel was outlined and the kinematic equations for coupling the motion of the mandrel and the feed eye were derived. Consequently, a design method for small-angle winding of composite square tubes was proposed, taking the non-slippage condition of winding trajectories into account. A periodically geodesic winding theory was presented and its winding error for various initial winding points was analyzed. The designed fiber patterns were then applied to the practical production of a composite square tube with small winding angles. The results show that the present design method for filament-wound square tubes is accurate and reliable. The obtained kinematic equations and motion laws of the feed eye and the mandrel satisfy the basic winding principle and manufacturability of filament-wound composite square tubes. The present method is able to provide a useful tool for design and production of composite square tubes.

**Keywords:** Composite materials; Filament winding; Square tube; Small-angle geodesic; Windability

\*Corresponding author. Tel.: +86 551 62901137; Fax: +86 551 62901137  
E-mail address: zhangb\_1981@163.com (B. Zhang).

Download English Version:

<https://daneshyari.com/en/article/6703731>

Download Persian Version:

<https://daneshyari.com/article/6703731>

[Daneshyari.com](https://daneshyari.com)