

Accepted Manuscript

A yarn interaction model for circular braiding

J.H. van Ravenhorst, R. Akkerman

PII: S1359-835X(15)00436-4

DOI: <http://dx.doi.org/10.1016/j.compositesa.2015.11.026>

Reference: JCOMA 4139

To appear in: *Composites: Part A*

Received Date: 28 May 2015

Revised Date: 13 November 2015

Accepted Date: 15 November 2015



Please cite this article as: van Ravenhorst, J.H., Akkerman, R., A yarn interaction model for circular braiding, *Composites: Part A* (2015), doi: <http://dx.doi.org/10.1016/j.compositesa.2015.11.026>

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.

A yarn interaction model for circular braiding

J.H. van Ravenhorst*, R. Akkerman**

*Chair of Production Technology, Department of Mechanical Engineering, University of Twente,
P.O. Box 217, NL-7500 AE Enschede, The Netherlands*

Abstract

Machine control data for the automation of the circular braiding process has been generated using previously published mathematical models that neglect yarn interaction. This resulted in a significant deviation from the required braid angle at mandrel cross-sectional changes, likely caused by an incorrect convergence zone length, in turn caused by this neglect. Therefore the objective is to use a new model that includes the yarn interaction, assuming an axisymmetrical biaxial process with a cylindrical mandrel and Coulomb friction. Experimental validation with carbon yarns and a 144 carrier machine confirms a convergence zone length decrease of 25% with respect to a model without yarn interaction for the case analysed, matching the model prediction using a coefficient of friction of around 0.3.

Keywords: C. Analytical modeling, A. Automation, E. Braiding, E. Preform

1. Introduction

Overbraiding is a manufacturing process for the production of bi- and triaxial tubular preforms of composite material. A mandrel is used to define the inner surface shape of the preform. After braiding, the preform is usually impregnated and cured using resin transfer moulding. Optionally, the mandrel is removed afterwards. Hundreds of yarns can be deposited simultaneously, providing a fast fiber deposition. The interlaced structure of braids can reduce the tendency of the

*Principal corresponding author. Tel. +31 6 16098368.

Web: www.braidsim.com

**Corresponding author. Tel. +31 53 489 3471.

Email addresses: j.h.vanravenhorst@braidsim.com (J.H. van Ravenhorst),
r.akkerman@utwente.nl (R. Akkerman)

Download English Version:

<https://daneshyari.com/en/article/7891326>

Download Persian Version:

<https://daneshyari.com/article/7891326>

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