

Accepted Manuscript

Design and Development of force and torque measurement setup for real time monitoring of friction stir welding process

Bipul Das, Sukhomay Pal, Swarup Bag

PII: S0263-2241(17)30130-6

DOI: <http://dx.doi.org/10.1016/j.measurement.2017.02.034>

Reference: MEASUR 4619

To appear in: *Measurement*

Received Date: 21 March 2016

Revised Date: 28 January 2017

Accepted Date: 17 February 2017

Please cite this article as: B. Das, S. Pal, S. Bag, Design and Development of force and torque measurement setup for real time monitoring of friction stir welding process, *Measurement* (2017), doi: <http://dx.doi.org/10.1016/j.measurement.2017.02.034>

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 Development of force and torque measurement setup for real time monitoring of friction stir welding process

Bipul Das, Sukhomay Pal*, Swarup Bag

Department of Mechanical Engineering
Indian Institute of Technology Guwahati, Guwahati 781039, India

Abstract

The aim of the present research work is two folded. First, it is intended to describe the development of a low cost force measurement setup for friction stir welding (FSW) process and second, is to demonstrate the potential of force signals combined with artificial intelligence to accurately predict ultimate tensile strength (UTS) and yield strength of the joints. In FSW process, simultaneous rotation, and translation of the tool associated with severe plastic deformation of material around the tool pin brings challenges in measurement of torque and forces experienced during welding. An attempt has been made to design and develop a strain gauge based setup for the measurement of two dimensional forces and torque during FSW process. The force signals acquired using the developed setup is then utilized to develop support vector regression based data driven models for prediction of UTS and yield strength of the welded samples. For monitoring the FSW process a new statistical indicator derived from force signals is presented. The proposed indicator brings appreciable correlation with the UTS of the joints. The prediction performances of the developed models imply that the presented approach can be effectively put forward for real time monitoring of the process.

Keywords: force measurement; torque; strain gauge; support vector regression; monitoring

Introduction

Appropriate design of friction stir welding (FSW) process demands real time measurement of process forces and torque experienced by the welding tool. By virtue of the simultaneous linear and rotary motion of the tool in the continuously deforming material imposes forces and torque on the welding tool [1,2]; measurement and control of which can be of great importance for controlling the outcome of the process. Force system as experienced during FSW

*Corresponding author: Tel.: +91-361 2582656; fax: +91-361 2582699. E-mail address: spal@iitg.ernet.in (Dr. Sukhomay Pal)

Download English Version:

<https://daneshyari.com/en/article/5006756>

Download Persian Version:

<https://daneshyari.com/article/5006756>

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