



NRC Publications Archive Archives des publications du CNRC

Assessment of friction stir weld integrity for process control

Lévesque, Daniel; Dubourg, Laurent; Mandache, Catalin; Gougeon, Patrick;
Cao, Xinjin; Jahazi, Mohammad

NRC Publications Record / Notice d'Archives des publications de CNRC:

<http://nparc.cisti-icist.nrc-cnrc.gc.ca/npsi/ctrl?action=rtdoc&an=11343994&lang=en>

<http://nparc.cisti-icist.nrc-cnrc.gc.ca/npsi/ctrl?action=rtdoc&an=11343994&lang=fr>

Access and use of this website and the material on it are subject to the Terms and Conditions set forth at

http://nparc.cisti-icist.nrc-cnrc.gc.ca/npsi/jsp/nparc_cp.jsp?lang=en

READ THESE TERMS AND CONDITIONS CAREFULLY BEFORE USING THIS WEBSITE.

L'accès à ce site Web et l'utilisation de son contenu sont assujettis aux conditions présentées dans le site

http://nparc.cisti-icist.nrc-cnrc.gc.ca/npsi/jsp/nparc_cp.jsp?lang=fr

LISEZ CES CONDITIONS ATTENTIVEMENT AVANT D'UTILISER CE SITE WEB.

Contact us / Contactez nous: nparc.cisti@nrc-cnrc.gc.ca.



IMI 2008-118024-9
CNRC 50498

Assessment of friction stir weld integrity for process control

D. Lévesque¹, L. Dubourg², C. Mandache², P. Gougeon¹, X. Cao² and M. Jahazi²

¹Industrial Materials Institute, National Research Council Canada,
75 de Mortagne Blvd, Boucherville, Quebec, J4B 6Y4 Canada

²Institute for Aerospace Research, National Research Council Canada,
1200 Montreal Road, Ottawa, Ontario, K1A 0R6 Canada

Phone: (450) 641-5240, Fax: (450) 641-5106, e-mail: daniel.levesque@cnrc-nrc.gc.ca

This presentation reports on the development of innovative inspection methods for the evaluation of typical defects in friction stir welds (FSW). The main defects related to material conditions or welding parameters are lack of penetration, worm holes and kissing bonds (vertical) in butt joints, and hooking, worm holes and kissing bonds (horizontal) in lap and T joints. Kissing bonds originate from the remnants of trapped oxide layers and are known as the most challenging problem for inspection of FSW joints. Ultrasonic immersion or laser-ultrasonics combined with the synthetic aperture focusing technique (SAFT) is investigated. Laser-ultrasonics uses lasers for the generation and detection of ultrasound and is therefore non-contact, ultimately for joint quality assessment during welding. Another promising method is pulsed eddy current (PEC) technique, which induces electrical currents in conductive parts, while measuring the direction and magnitude of the resulting magnetic fields as an indication of material condition. Various FSW lap and butt joints for aerospace applications are examined, including dissimilar metal welds. Very good performances are achieved with the two methods for lack of penetration in butt joints, the limit of detectability coinciding with the conditions of reduced mechanical properties. Also, discontinuities such as wormholes, hooking and voids in lap joints are clearly detected using SAFT. The detection of kissing bonds seems to be possible in lap joints using high frequency laser-ultrasonics.

*Abstract submitted for presentation at the 19th AeroMat Conference & Exposition
to be held in Austin, Texas, USA in June 2008.*