Accepted Manuscript

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M. Rodríguez-Martín, S. Lagüela, D. González-Aguilera, J. Martinez

PII: S1350-4495(15)00150-4
DOI: http://dx.doi.org/10.1016/j.infrared.2015.06.013
Reference: INFPHY 1811

To appear in: *Infrared Physics & Technology*

Received Date: 14 April 2015

Please cite this article as: M. Rodríguez-Martín, S. Lagüela, D. González-Aguilera, J. Martinez, Prediction of depth model for cracks in steel using infrared thermography, *Infrared Physics & Technology* (2015), doi: http://dx.doi.org/10.1016/j.infrared.2015.06.013

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Prediction of depth model for cracks in steel using infrared thermography

M. Rodríguez-Martín*[1a], S. Lagüela[a,b], D. González-Aguilera[a], J. Martinez [b].

[a] *Department of Cartographic and Land Engineering. University of Salamanca, Polytechnic School of Avila. Hornos Caleros, 50, 05003, Avila (Spain)*
[b]*Applied Geotechnologies Research Group, University of Vigo, Rúa Maxwell s/n, Campus Lagoas-Marcosende, 36310 Vigo (Spain)*

Highlights:

- The depth of a crack in steel can be measured with infrared thermography
- A new approach to obtain the depth of cracks in steel has been deployed
- Establishing a relation between thermal data and depth of the crack is possible
- Measuring the depth in a crack open to surface with a dense point cloud is possible

Abstract:

Nowadays thermography is used as Non-Destructive Testing (NDT) for the detection and characterization of several types of flaws and imperfections. Testing cracks in steel and, particularly in welds presents enormous importance due to the danger of the cracking process. For this reason, the measurements of cracks are important for the prediction and valuation of the type of failure and its consequences. Open to surface cracks can be measured in the surface plane and in the depth plane (plane perpendicular to surface), being the surface plane the one that describes the surface of the welding. Since thermographic imaging directly gives information on the surface plane, the objective of this paper is to optimize the use of infrared thermography for inspection by proposing a method to predict the depth of surface cracks generated by the welding process. The study is implemented based on the analysis of the relationship between infrared (IR) data acquired with an infrared camera and geometric data into the crack extracted by applying a novel 3D macro-photogrammetric procedure. The 3D geometrical model is segmented in different sections and the depth profiles are correlated with the different temperature values along the corresponding sections. With the proposed technique, obtaining a correlation between depth data and thermal surface data is possible. It will allow the design of a depth prediction model which enables the inspection of depth of cracks using the thermographic technique.

Key words: weld**,** thermography, crack, depth prediction, point cloud, measurement.

[1] Corresponding author:
Mail: *ingmanuel@usal.es* or *mecmanuel@gmail.com*
Phone Nº: +34 669999251

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