Porosity Detection by Analyzing Arc Sound Signal Acquired During the Welding Process of Gas Pipeline Steel

M. F. M. Yusof, M. A. Kamaruzaman, M. Ishak, M. F. Ghazali
Faculty of Mechanical Engineering, University Malaysia Pahang, Pahang Malaysia

ABSTRACT

Detection of severe defects such as porosity underneath the weld bead during the welding process is vital during installation of a gas pipeline network because such defects might lead to fatigue crack. In this study, the work associated with detection of porosity through analysis of the acquired arc sound is presented. Air-borne acoustic signal was acquired during the metal inert gas welding process on API 5L X70 gas pipeline steel. Then, the acquired signal was analyzed using Hilbert Huang transform (HHT), which uses empirical mode decomposition for the purpose of filtering unrelated-to-damage signal components, and Hilbert spectral analysis to obtain the energy-frequency-distance plot. Results showed a significant energy amplitude pattern at the region where both surface- and subsurface-pores existed. Thus, the application of HHT analysis to the acquired arc sound signal has significantly assisted in identifying hidden information that is related to the existence of defects. This finding would enhance the development of an online welding defect detection system during the welding process.

KEYWORDS:

Porosity; Metal-inert gas welding; Arc sound; Hilbert-Huang transform

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