Manuscript ID : 00000-45428

Source ID : 00000009

International Journal of Industrial Engineering Research and Development

Volume 3, Issue 2, July-December 2012, Pages 42-50, Page Count - 9

EFFECT OF HEAT INPUT AND SPEED OF WELDING ON DISTORTION IN MIG WELDING

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Abstract

The objective of this research is to simulate the complex arc welding process by using the finite element method(ANSYS)[1]. After the model is built and verified, the main objective of the research is to study the effects of varying the welding process parameters on the thermomechanical responses. In addition to that, the aim of this research is also to find a relationship between welding parameters and thermo-elasto-plastic responses.

In this research paper, the responses of single pass corner-joint of arc welding are evaluated through the finite element software (ANSYS). The study of this research paper covers only the effects of varying heat input, welding speed on the thermo mechanical responses of the weldment after cooling down to room temperature.

Author Keywords

Heat, Weld speed, Distortion, strain, FEA

ISSN Print: 0976-6979
ISSN Online: 0976-6987
Source Type: Journals
Document Type: Journal Article
Publication Language: English
DOI:
Abbreviated Journal Title: IJIERD
Access Type: Open Access
Publisher Name: IAEME Publication
Resource Licence: CC BY-NC
Major Subject: Physical Sciences
Subject Area classification: Material Science
Subject area: Materials Chemistry
Source: SCOPEDATABASE

References (35)

1. Dean Denga,, Wei Liang , Hidekazu Murakawa
Determination of welding deformation in fillet-welded joint by means of numerical simulation and comparison with experimental measurements

(2007) Journal of Materials Processing Technology, Volume 183, Page No 219–225,

2. Shi Qingyu, Lu Anli, Zhao Haiyan, Wu Aiping
Development and application of the adaptive mesh technique in the three-dimensional numerical simulation of the welding process

(2002) Journal of Materials Processing Technology, Volume 121, Issue 2-3, Page No 167–172,
DOI: https://doi.org/10.1016/S0924-0136(01)00830-5

3. D. Akbari, I. Sattari-Far
   Effect of the welding heat input on residual stresses in butt-welds of dissimilar pipe joints

   (2009) International Journal of Pressure Vessels and Piping, Volume 86, Issue 11, Page No 769–776,
   DOI: http://dx.doi.org/10.1016/j.ijpvp.2009.07.005

4. X.K. Zhu, Y.J. Chao
   Effects of temperature-dependent material properties on welding simulation

   (2002) Computers and Structures, Volume 80, Issue 11, Page No 967–976,
   DOI: https://doi.org/10.1016/S0045-7949(02)00040-8
   Article Link: https://www.sciencedirect.com/science/article/abs/pii/S0045794902000408

5. Faruk Sen1 and Metin Sayer
   Elasto-Plastic Thermal Stress Analysis In A Thermoplastic Composite Disc Under Uniform Temperature Using Fem

   (2006) Mathematical and Computational Applications, Volume 11, Issue 1, Page No 31-39,

6. Viorel Deaconu
   Finite Element Modelling of Residual Stress - A Powerful Tool in the Aid of Structural Integrity Assessment of Welded Structures

   (2007) 5th International Conference Structural Integrity of Welded Structures,

7. Li Yajiang, Wang Juan, Chen Maoai and Shen Xiaoqin
   Finite element analysis of residual stress in the welded zone of a high strength steel

   (2004) Bulletin of Materials Science, Volume 27, Issue 2, Page No 127–132,

8. Chin-Hyung Lee, Kyong-Ho Chang
   Finite element computation of fatigue growth rates for mode I cracks subjected to welding residual stresses

   (2011) Engineering Fracture Mechanics, Volume 78, Page No 2505–2520,

9. C.M. Chen, R. Kovacevic
   Finite element modeling of friction stir welding-thermal and thermomechanical analysis

   (2003) International Journal of Machine Tools & Manufacture, Volume 43, Page No 1319–1326,

10. W.-H. Kim, S.-J. Na
    Heat and fluid flow in pulsed current GTA weld pool

    (1998) International Journal of Heat and Mass Transfer, Volume 41, Page No 3213-3227,

11. Andrea Capriccioli, Paolo Frosi
    Multipurpose ANSYS FE procedure for welding processes simulation

    (2009) Fusion Engineering and Design, Volume 84, Page No 546-553,

12. C. Heinze , C. Schwenk , M. Rethmeier
    Numerical calculation of residual stress development of multi-pass gas metal arc welding under high restraint conditions

    (2012) Materials and Design, Volume 35, Page No 201–209,

13. L.-E. Lindgren
    Numerical modelling of welding

(2006) Computer Methods in Applied Mechanics and Engineering, Volume 195, Page No 6710–6736,

14. M. Abida,, M. Siddique
    Numerical simulation to study the effect of tack welds and root gap on welding deformations and residual stresses of a pipe-flange joint

    (2005) International Journal of Pressure Vessels and Piping, Volume 82, Page No 860–871,

15. Dean Deng , Hidekazu Murakawa
    Prediction of welding distortion and residual stress in a thin plate butt-welded joint

    (2008) Computational Materials Science, Volume 43, Page No 353–365,

16. R. Melicher , J. Mesko , P. Novak , M. Zmindak
    Residual stress simulation of circumferential welded joints

    (2007) Applied and Computational Mechanics, Volume 1, Page No 541 – 548,

17. H. Renunemalm, S. Hyun
    Three-dimensional welding analysis using an adaptive mesh scheme

    (2000) Computer Methods in Applied Mechanics and Engineering, Volume 189, Page No 515-523,

18. Zhi Zeng, Lijun Wang, Pingan Du, Xunbo Li
    Determination of welding stress and distortion in discontinuous welding by means of numerical simulation and comparison with experimental measurements

    (2010) Computational Materials Science, Volume 49, Page No 535–543,

19. G R Bradley, M N James
    Geometry and Microstructure of Metal Inert Gas and Friction Stir Welded Aluminium Alloy 5383-H321

    (2000)

20. Y. P. Yang G. Jung R. Yancey
    Finite Element Modeling Of Vibration Stress Relief After Welding

    (2005) American Society of Materials,

21. Nasir Ahmed
    New developments in advanced welding

22. Bai-Qiao Chen
    Prediction of Heating Induced Temperature Fields and Distortions in Steel Plates

    (2011)

23. Muhammad Siddique
    Experimental and Finite Element Investigation of Residual Stresses and Distortions in Welded Pipe Flange Joints

    (2005)

24. Friedman E
    Thermomechanical Analysis of the Welding Process Using the Finite Element Method

(1975) Transaction of the ASME, Page No 206-213,

25. Goldak J., Bibby M., Moore J., House R., and Patel B
Computer Modeling of Heat Flow in Welds

(1986) Metallurgical Transactions B, Page No 587-600,

26. Goldak J., Chakravarti A., and Bibby M
A New Finite Element Model for Welding Heat Sources

(1984) Metallurgical Transactions B, Volume 15B, Page No 229-305,

27. Celso Kenzo Takemori, Daniel Tiago Muller, Moises Alves De Oliveira
Numerical Simulation of Transient Heat Transfer During Welding Process

(2010) International Compressor Engineering Conference ,

28. Fenggui Lu , Shun Yao, Songnian Lou , Yongbing Li
Modeling and finite element analysis on GTAW arc and weld pool

(2004) Computational Materials Science, Volume 29, Page No 371–378,

29. Dragi Stamenkovic, Ivana Vasovic
Finite Element Analysis of Residual Stress in Butt Welding Two Similar Plates

(2009) Scientific Technical Review, Volume 59, Issue 1, Page No 57-60,

30. Guo Li-Feng
Modelling of Laser Cladding of Magnesium Alloy With Preplaced Powders

(2005) The Hong Kong Polytechnic University,

31. Z. Barsoum
Residual Stress Prediction And Relaxation In Welded Tubular Joint

(2007) Welding In The World, Volume 51, Issue 1-2, Page No 23-30,

32. Ill-Soo Kim
Numerical and experimental Analysis for the GMAW Process

(1995) University of Wollongong,

33. Zuheir Barsoum
Residual Stress Analysis and Fatigue Assessment of Welded Steel Structures

(2008) Royal Institute of Technology,

34. Djarot B. Darmadi, John Norrish and Anh Kiet Tieu
Analytic and Finite Element Solutions for Temperature Profiles in Welding using Varied Heat Source Models

(2011) World Academy of Science, Engineering and Technology, Volume 81, Page No 154-162,

35. A. Bonifaz
Finite Element Analysis Of Heat Flow In Single-Pass Arc Welds

(2000)Page No 121-125,