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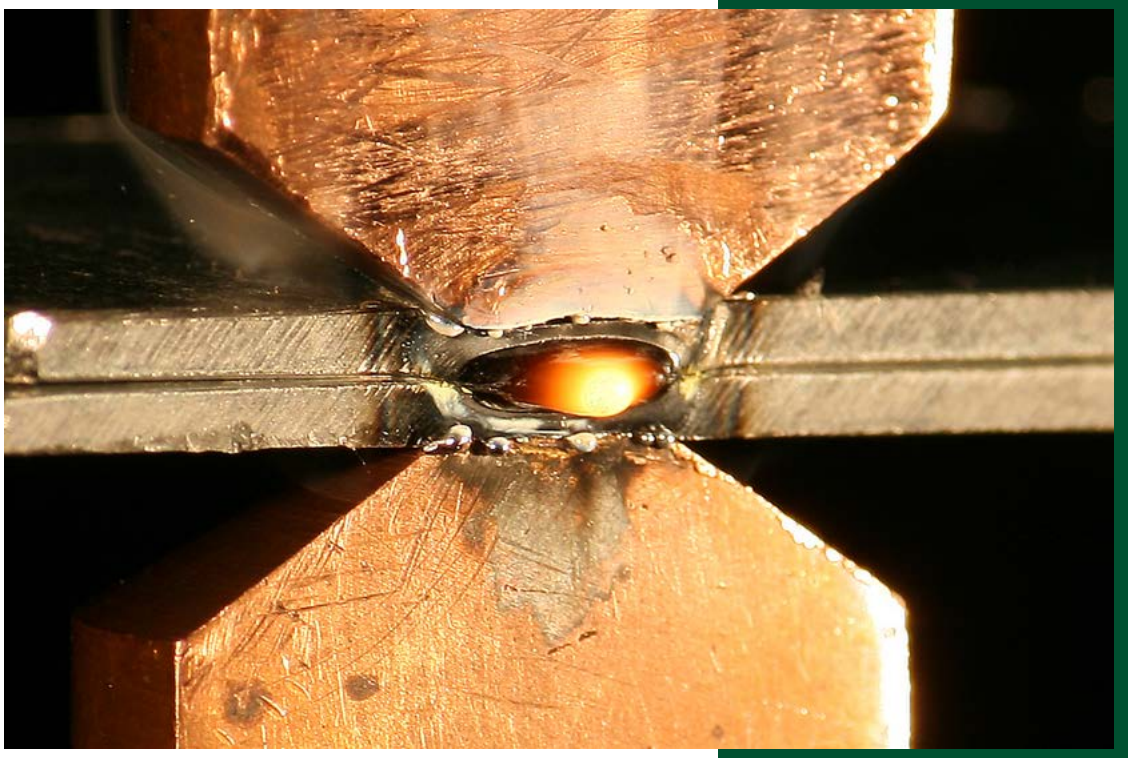

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CONTENTS

INSTITUTE OF WELDING

The International Institute of Welding
and The European Federation for Welding,
Joining and Cutting member

Summaries of the articles

M. St. Węglowski, J. Dworak, S. Błacha – Electron beam welding and its characteristics

The article presents the characteristics of electron beam welding and describes phenomena taking place during the interaction between an electron and an atom of a material being bombarded. The study also presents the basic electron beam welding parameters and structural material weldability characteristics as well as enumerates the advantages of the technology and indicates its possible areas of application.

E. Turyk, W. Grobosz – Beginnings of submerged arc welding

On the basis of available publications and patent descriptions it was possible to put together facts related to the beginnings of submerged arc welding in Poland and worldwide. The overview of reference publications confirms the information according to which the authorship of welding under a flux layer providing a metallurgical shield for the welding zone should be ascribed to D.A. Dulczewskij, whose patent was published in 1929. The article presents the issues of the first research, structural and implementation works connected with submerged arc welding and surfacing carried out at Instytut Spawalnictwa in early 1950s.

W. Oborski, H. Pasek-Siurek – Use of modern analytical methods in designing induction heating devices

The article presents induction heating and its application range, discusses factors significantly affecting the course of an induction heating process and characteristic phenomena such as electromagnetic induction, skin effect and proximity, enumerates the advantages and downsides of modern numerical and experimental methods as well as characterises (giving emphasis to FEM) and compares numerical methods used during designing induction heating systems and devices. The article also contains an overview related to FEM-based commercial software applications used for analysing issues connected with the simultaneous presence of electromagnetic and thermal phenomena.

T. Kik – Numerical analysis of MIG welding of butt joints in aluminium alloy

Analyses based on FEM calculations have significantly changed the possibilities of determining welding strains and stresses at early stages of product design and welding technology development. Such an approach to design enables obtaining significant savings in production preparation and post-weld deformation corrections and is also important for utility properties of welded joints obtained. As a result, it is possible to make changes to a simulated process before introducing them into real production as well as to test various variants of a given solution. Numerical simulations require the combination of problems of thermal, mechanical and metallurgical analysis. The study presented involved the SYSWELD software-based analysis of MIG welded butt joints made of 5251 aluminium alloy sheets. The analysis of strains and the distribution of stresses were carried out for several different cases of fixing elements and for different times of releasing elements welded.

A. Sawicki, M. Haltof – Damping factor function in AC electric arc models. Part 4: Arc model selection criteria and determination of time constant in low current arc

Causes of problems in strict classification of arcs into two categories: low and high current have been described. Assumption has been taken that processes in column can be approximated with one of two models: Mayr or Cassie.

A new criterion of arc classification has been proposed, based on minimal deviation of harmonic relation of real voltage on arc column comparing to theoretically estimated data. Using MATLAB-Simulink program, errors in determining time constant value have been analyzed in Mayr model of arc described with different mathematical models with and without random noise.

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