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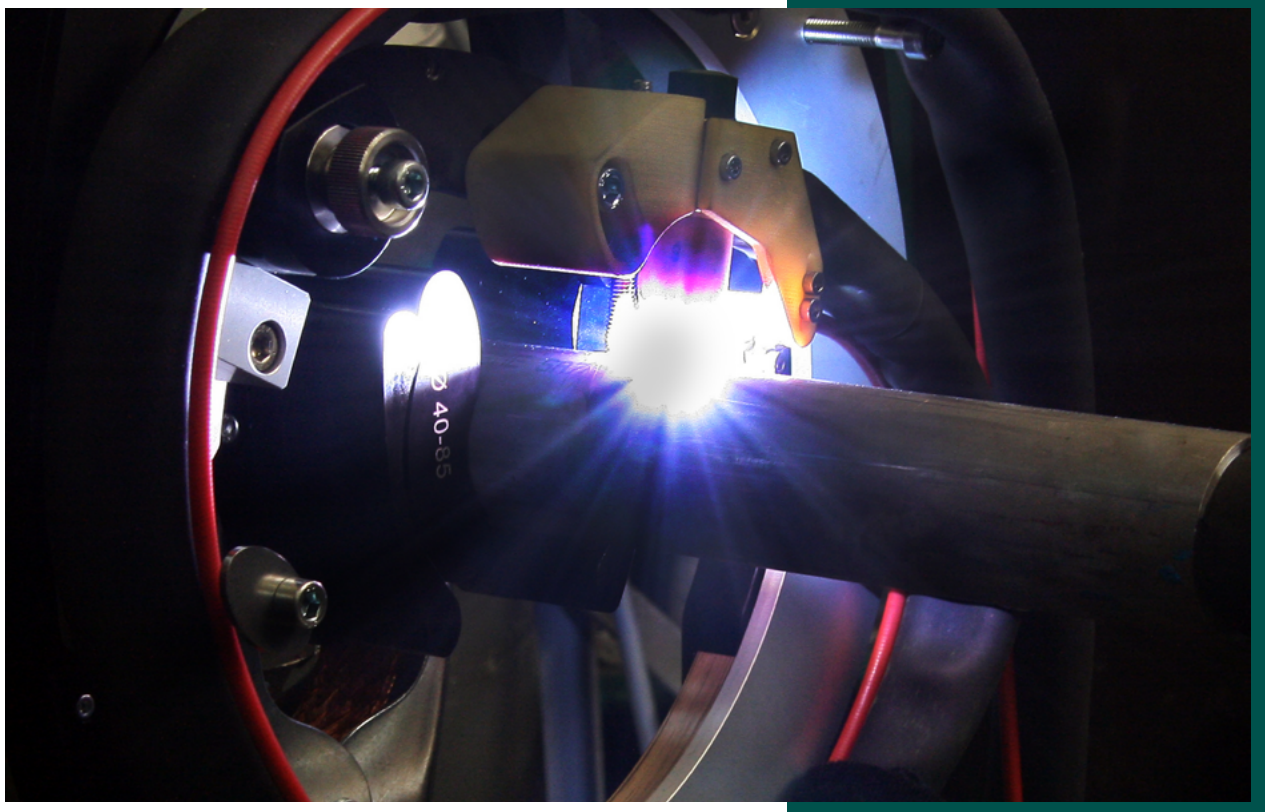

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INSTITUTE OF WELDING BULLETIN

BIULETYN INSTYTUTU SPAWALNICTWA

No. 2 BIMONTHLY

CONTENTS

INSTITUTE OF WELDING

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

Z. Mikno, Sz. Kowieski, A. Pilarczyk – Projection welding of nuts with full projections with use of electromechanical operating force system

DOI: 10.17729/ebis.2019.2/1

The projection welding of nuts performed using the pneumatic force system (PFS) was subjected to numerical and experimental analysis enabling the identification of the window of welding parameters taking into consideration boundary conditions including expulsion, torsional strength and the deformation of the nut thread. The welding process was subjected to optimisation involving the use of a new, i.e. electromechanical force system (EFS). The optimisation-related approach involved the reduction of welding current and the extension of a welding current flow time in comparison with those obtained when using the pneumatic force system. It was assumed that the acceptance criterion would be the breaking torque not lower than that obtained under the most favourable welding conditions performed using the PFS. The research work involved comparative numerical calculations (performed using the SORPAS software) in relation to both, i.e. the PFS and EFS. The technological welding tests were performed using inverter welding machines (1 kHz) provided with various (electrode) force systems. The research work also included metallographic tests and torsional strength tests. As a result of the application of EFS and a special innovative hybrid algorithm for controlling the initial electrode force, a wider and higher weld core was obtained. The depth of "penetration" into the sheet was also greater. As a result, the welded joint has a higher strength (by 30%). Technological welding tests for the new EFS system were carried out for a 25% lower welding current compared to PFS. Despite the lower welding current for EFS, the welding energy is slightly lower but the welding quality for EPS is significantly higher.

M. St. Węglowski – Fabrication of reinforcement bars in unalloyed steel

DOI: 10.17729/ebis.2019.2/2

Modern civil engineering requires increasingly many concrete reinforcing bars, necessitating the satisfaction of increasingly restrictive operational, design and investment-related requirements. As a result, design engineers and contractors, including welding engineers, deal with bars fabricated using various technologies affecting both the properties and the structure of bars. The article presents basic information concerning individual technologies used in the production of concrete reinforcing bars as well as their microstructure and mechanical properties.

K. Gądek, L. Tuz – Microscructure and selected mechanical properties evaluation of ferritic-austenitic duplex steel butt-joint

DOI: 10.17729/ebis.2019.2/3

The paper presents the results of microscopic and mechanical properties examinations of duplex steel- X2CrNiMoN22-5-3 (1.4462) welded butt-joint welded by MAG(136). In research the metallographic examination of base material, heat affected zone, and weld metal, hardness measurements by the Vickers method, static tensile test, bending test and testing the ferrite content by ferritoscope were carried out. On the basis on obtained microstructure of the particular zones of the weld joint, quantitative analysis of occurring phases and results of the mechanical properties examinations the

conclusions regarding microstructure and mechanical properties of the examined joint and its influence of the joint properties were drawn.

A. Pocica – The origin of gas-shielded welding

DOI: *10.17729/ebis.2019.2/4*

The article presents welding techniques developed in the 1930s, giving rise to modern methods of gas-shielded welding, i.e. reducing gas-shielded (methanol or hydrogen vapour), arc-hydrogen welding and arc-gas welding. The above-named methods have contributed to presently apply gas-shielded welding techniques.

M. Kapler, J. Nowacki, A. Sajek – The current state of the art and the issues of the drawn arc welding of studs performed using a ceramic ferrule

DOI: *10.17729/ebis.2019.2/5*

The authors performed the state-of-art analysis of recent achievements concerned with drawn arc stud welding involving the use of ceramic ferrules. The research focused on surface preparation, technological parameters, process limits and magnetic arc blow. Because of the complexity and correlations of primary electromagnetic phenomena in stud welding processes as well as due to the lack of simple and practically applicable theoretical explanation of their effect on welding results, emphasis was given to demand for industrially applicable simulation tools enabling the forecasting of stud welding results. It is believed that the above-named goal could be achieved using the non-linear regression model of an artificial neural network based on empirical data obtained on a real-time basis from simple process controlling measurement circuits.

A. Sawicki – Modelling the effect of external disturbances in static characteristics of unspecified and determined ignition voltages on dynamic characteristics of arc in a circuit with the current source. Part. 1. Primary analytical correlations

DOI: *10.17729/ebis.2019.2/6*

The article presents a set of functions useful when approximating non-linear current-voltage characteristics of static arc disturbed by external factors. To this end, modified Ayrton and Nottingham functions were used. The study involved characteristics with undefined and determined arc ignition voltages. The mapping of the above-named arc and the simulation of processes in the electric circuit with the current source were performed using the generalized Pentegov model, involving the use of appropriately transformed components of functions approximating static current-voltage characteristics of arc (taking into consideration the effect of single-parameter disturbances of the column length, mass stream or gas pressure.

L. Tuz, K. Sulikowski – Microstructure and selected mechanical properties of welded joints in austenitic perforated bottoms made using the automated TOP TIG method

DOI: *10.17729/ebis.2019.2/7*

The article presents selected test results obtained during welding tests preceding a Welding procedure Qualification, performed using a robotic TOP TIG welding station. The test results revealed the obtainment of welded joints characterised by proper geometry and proper austenitic structure. In addition, the article presents typical welding imperfections observed in relation to the adjustment of welding process parameters, i.e. hot cracks in the weld root area and cavities.

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