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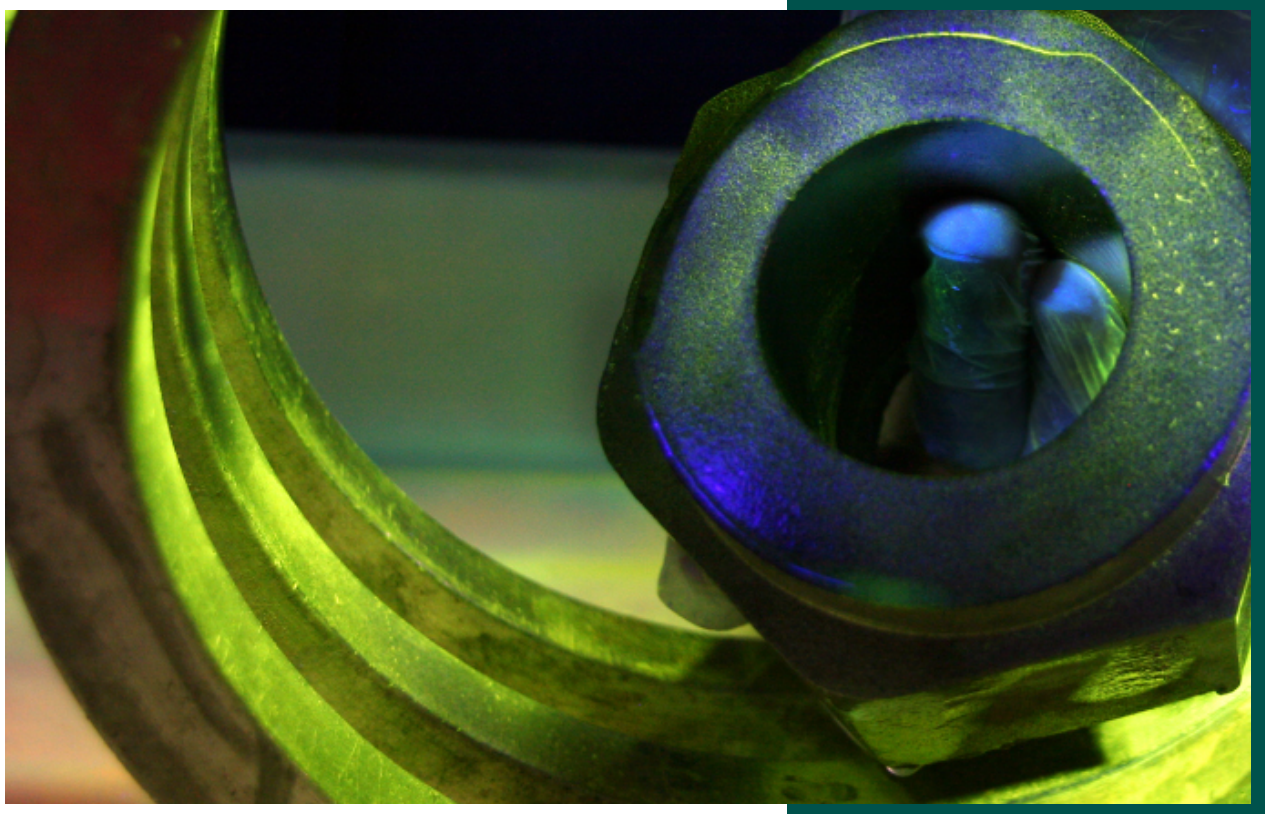

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CONTENTS

- ***Composite Rebars***
  Marek St. Węglowski 7
- ***The FEM-based Numerical Analysis of Welding Distortions in Spatial-Flat Elements of Large-Sized Welded Structures***
  Janusz Pikuła, Tomasz Pfeifer, Jerzy Niagaj 15
- ***The Development of Arc Stud Welding***
  Mateusz Kapler, Jerzy Nowacki, Adam Sajek 27
- ***The Effect of Temperature on the Hardness of High-Alloy Carbide-Chromium Alloys Surfaced with Flux-Cored Strips***
  Aleksander P. Woronczuk, Aleksander P. Żudra 39
- ***Gas-Shielded Metal Arc Welding***
  Anna Pocica 47
- ***Quantitative Evaluation of Eddy Current Signals Generated by Defects in Austenitic Heat Exchanger Tubes***
  Dominik Kukla, Andrzej Zagórski, Łukasz Sarniak 59
- ***Classical and Modified Mathematical Models of Electric Arc***
  Antoni Sawicki 67

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 – Composite Rebars

DOI: *10.17729/ebis.2019.4/1*

Economic development urges design engineers to search for alternative structural materials enabling the fast erection of structures without incurring high investment costs and, afterwards, high running costs. Reinforcement bars are indispensable elements to most civil engineering structures. The article presents information concerned with composite rebars, i.e. their mechanical and physical properties, production technologies and application areas as well as compares composite rebars with their steel equivalents.

J. Pikuła, T. Pfeifer, J. Niagaj – The FEM-based Numerical Analysis of Welding Distortions in Spatial-Flat Elements of Large-Sized Welded Structures

DOI: *10.17729/ebis.2019.4/2*

The issue of welding distortions concerns both large welded structures such as bridges, storage tanks and elements of welded building structures as well as small and precise elements. Particularly susceptible to welding distortions are thin-walled structures, in which hard-to-predict welding distortions are responsible for serious technical problems. This paper presents the results concerning the welding of spatial and flat elements used in large-sized welded structures in terms of welding distortions. Due to their geometry, large welded structures may be the source of complex welding distortions, e.g. corrugations. The research-related works discussed in the article were carried out using the finite element method (FEM). The validation of FEM model of the welding process was performed using an optical system measuring welding distortions of an actual structure.

M. Kapler, J. Nowacki, A. Sajek – The Development of Technologies used in the Arc Welding of Steel Studs

DOI: *10.17729/ebis.2019.4/3*

The article analyses the origins and initial stages of the development of the drawn arc welding of steel studs. The analysis is focused on the evolution of welding-related professional terminology in various languages. The article presents the properties and areas of application of shear connectors – some of the most popular connectors, used particularly often in civil engineering investments.

A. P. Woronczuk, A. P. Żudra – The Effect of Temperature on the Hardness of High-Alloy Carbide-Chromium Alloys Surfaced with Flux-Cored Strips

DOI: *10.17729/ebis.2019.4/4*

The development of surfacing materials deposited on elements exposed to extreme wear at high temperature is based on investigating the correlation between the hot hardness of the weld deposit and its alloy system. The article discusses the methodology and results concerning the hot hardness of deposited high-chromium cast irons characterised by various doping degrees, e.g. 450H30M, 500H22B7, 500H22B7M7W2F and 300H25S3N2G2 as well as nickel-carbide-chromium alloy 500H40N40S2GRC.

Related tests revealed that the hot hardness of the weld deposit depends primarily on the presence and types of carbides formed in the weld pool. The hardness of relatively low-alloy high-chromium cast irons decreases along with an increase in temperature and increases along with an chromium content of up to 30% and a carbon content of up to 5%. Chromium, niobium, molybdenum, tungsten and

vanadium-surface alloyed alloys retain their hardness up to a temperature of 650°C. In terms of the above-named alloys, an important role is played by niobium, acting as a modifying agent and moderating the growth of primary chromium carbides and forming hard cubic niobium carbide. Because of the high content of higher chromium carbides in the nickel-based matrix, the nickel-carbide-chromium alloy is characterised by high hardness at a temperature of up to 650°C.

A. Pocica – Gas-Shielded Metal Arc Welding

DOI: *10.17729/ebis.2019.4/5*

The article discusses the history of MIG/MAG welding, pointing out the primary achievements and patents connected with the evolution of the MIG, MAG and Arcogaz (steam-shielded) welding methods, as well as presents related Polish welding equipment and works related to the implementation of the above-named method in the Polish industry.

D. Kukla, A. Zagórski, Ł. Sarniak – Quantitative Evaluation of Eddy Current Signals Generated by Defects in Austenitic Heat exchanger Tubes

DOI: *10.17729/ebis.2019.4/6*

The research discussed in the article involved the analysis of impedance characteristics originating from various non-standard defects detected in the material of an austenitic tube. Research-related test results were obtained when scanning a tube made of steel 316, using an internal probe and a MultiScan 5800 device. The tests involved the use of the classical ECT vortex current method applied to examine both the tube containing artificial defects, simulating the most common defects in industrial heat exchanger tubular inserts, and reference tubes containing standard defects. The non-standard defects (created artificially) simulated combinations of cracks, pits or other defects formed as a result of exposure to aggressive chemical and mechanical factors present in industrial conditions. The tests involved the scanning of the entire length of the tube at a constant rate. The tests were performed using a transient probe recording electrical impedance changes in a relative mode and in an absolute mode. The interpretation of results related to the non-standard defects was based on a comparison with the results obtained in relation to the standard reference defects. Values obtained in relation to the non-standard defects enabled, among other things, the identification of their volume and position in relation to the measurement probe. In most cases it was not possible to interpret the geometry of a given defect. The foregoing could be achieved using other non-destructive testing techniques.

A. Sawicki – Classical and Modified Mathematical Models of Electric Arc

DOI: *10.17729/ebis.2019.4/7*

The article presents classical mathematical models of electric arc characterised by undetermined or unreduced ignition voltage. The aforementioned models include the well-known Mayr and Cassie models and their well-known Schwartz extensions with the power functions of the Mayr and Cassie voltage as well as the increased dissipation of energy within the high-current range. The modified models contain residual conductance, enabling the determination of arc ignition voltage. A similar approach was applied to modify the approximating functions of voltage and current characteristics used in the Pentegov model. Computer simulations were used to examine the influence of the parameters of the mathematical models on the shapes of static and dynamic characteristics of arc located in a circuit with sinusoidal current excitation.

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