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CONTENTS

Summaries of the articles

M. Łomozik – Mechanical Properties of Joints Made in Steel S1300QL Using Various Welding Methods

DOI: *10.17729/ebis.2020.3/1*

The article presents applications of high-strength quenched steels in various industrial sectors and the chronological development of various grades of the aforesaid steels. The research-related tests involved flat butt joints made in 7 mm thick steel grade S1300QL, welded using the following methods: TIG, A-TIG, MAG involving the use of a hard flux-cored surfacing wire, MAG method involving the use of a solid wire, T.I.M.E. method involving the use of a solid wire, laser welding method without the use of the filler metal, hybrid (HLAW) method involving the use of a metallic flux-cored wire, electron beam welding without using the filler metal. The research also involved the performance of the mechanical properties of the welded joints made in quenched steel S1300QL using various welding methods. The joints made using the laser welding method, hybrid welding method and the electron beam welding method were characterised by tensile strength higher than the minimum yield point of steel S1300QL, amounting to 1300 MPa. In turn, the tensile strength of the joints made in steel S1300QL using arc welding methods was lower than the minimum yield point of the steel. All of the test joints were subjected to non-destructive digital radiographic tests. The tests concerning the mechanical properties of the joints with respect to various welding methods were subjected to comparative analysis. The research work finished with the formulation of concluding remarks concerning the mechanical properties of the joints.

J. Winczek, K. Wojsyk - New method of calculating the amount of heat input to the weld

DOI: *10.17729/ebis.2020.3/2*

A new method of calculating the amount of heat introduced into the welded joint is presented. Instead of the previously used measure of heat input per unit length, heat input per unit volume was proposed. The proposed method and general formula are based on the basic technological parameters of the welding process (i.e. energy generated by the electric arc and welding speed) and the cross-sectional area of the fusion zone in the welded joint. A simplified method of calculating heat input per unit volume is presented by using simple formulas to calculate the surface area of the fusion zone in cross-section of the weld for the most common shapes in classic welding methods. The proposed general formula allows for a more accurate way of calculating the heat input per unit of volume depending on the the energy generated by the electric arc (e.g. for pulse current) and the surface area of the reinforcement and fusion zone using other direct measurement methods.

R. Jachym, P. Gotkowski, J. Gazdowicz – Investigation of Reasons for Damage to a Steel Pipeline Used For the Injection of Formation Waters

DOI: *10.17729/ebis.2020.3/3*

The article presents results of the research on the causes of failure of the DN 80 steel pipeline used for injection of formation waters. Based on the research results, it was found that the cause of perforation and subsequent material losses in the DN 80 pipeline wall made of L360NB steel was under deposit corrosion.

S. Stano, R. Anioł – Applicability of Laser Welding in the Joining of Cast Elements of the Combustion Engine Manifold and Turbine. Part 2. Laser Welding of the Compensating Capsule with the Collector

DOI: *10.17729/ebis.2020.3/4*

The article presents attempts related to the laser welding of combustion engine manifold and turbine. The study discussed in the article made it possible to identify the potential and limitations connected with the application of laser welding technologies, workmanship accuracy and the positioning of elements to be welded. The study-related tests enabled the assessment of the effect of primary welding parameters on the shape of the weld both in terms of keyhole and melt-in welding processes. The first part of the research-related article discusses results concerning the laser welding of the compensating capsule with the collector.

J. Hilkes, J. Tuchtfeld – Underwater „Wet Welding & Cutting" with NAUTICA Stick Electrodes for Marine and Offshore Applications

DOI: *10.17729/ebis.2020.3/5*

The basics of diving and working under water have been highlighted and explained as such, while these circumstances have also great influence on the welding behavior of the consumables applied. The challenge is in the execution of the welds and repairs. The paper covers the diving, welding and metallurgical aspects of underwater „wet" welding & cutting using covered electrodes based on industrial examples and applications for joining and repair welding. Shielded Metal Arc Welding (SMAW) and covered stick electrodes are a very versatile, flexible, simple and practical welding process, for this reason often used for underwater maintenance and repairs.

A. Sawicki – Mayr-Pentegov Model of an Electric Arc with Selected Static Voltage-Current Characteristics

DOI: *10.17729/ebis.2020.3/6*

The basic properties of the Mayr-Pentegov mathematical model of the electric arc were described. A set of generalized functions has been selected to approximate static voltage-current characteristics. On their basis, derivatives of the conductance function relative to the squared current, which are used to calculate the non-linear damping function, were determined. Families of static characteristics dependent on parameters of approximating functions are presented. As a result of the simulations of processes in the circuit with the electric arc model, the family obtained dynamic voltage-current characteristics. By using wide ranges of parameter changes, the usability of the developed model using various approximations of static characteristics was demonstrated.

A. Pocica, D. Kochanek – Cutting of steel using various technologies

DOI: *10.17729/ebis.2020.3/7*

The article describes tests of steel after cutting with laser, plasma and abrasive waterjet. There are presented results of microstructure observation and changes in hardness after cutting, as well as the assessment of surface quality based on measurements of surface parameters.

M. Nowak, D. Wiśniewski, Ł. Czeladziński – Innovative robotic system for MAG welding with two wire feeders

DOI: *10.17729/ebis.2020.3/8*

It has been described innovative MAG robot welding method for shipyard elements, with two wire feeders and one torch, which enables welding of two different steel grades. Additionally, the robot application is equipped in off-line programming DTPS system (Desktop Programming & Simulation System), arc,

gas nozzle touch and laser touch sensors with function (seam finding) and welding parameters monitoring and archiving system.

L. Tuz, K. Sulikowski – Microstructure of welded joints of high strength steel made using robotic station for laser welding

DOI: *10.17729/ebis.2020.3/9*

The paper presents evaluation of weldability of non-alloy high strength heat-treated steel with the use of robotic station for laser welding. Based on the microstructure assessment and hardness distribution in butt welded joint, the key factors and properties for used of such welding technology are identified.

A. Kurek, M. Kowalski, D. Rozumek – Identification of the factors determining joint strength in ram test of metal composite steel – titanium – aluminium

DOI: *10.17729/ebis.2020.3/10*

The paper presents results of strength tests (ram test) of two types of three-layer material made in the technology of explosive welding. Clad materials differed in the overlay layer (A1050 and A3003). The results were analysed for factors influencing the achieved level of joint strength.

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