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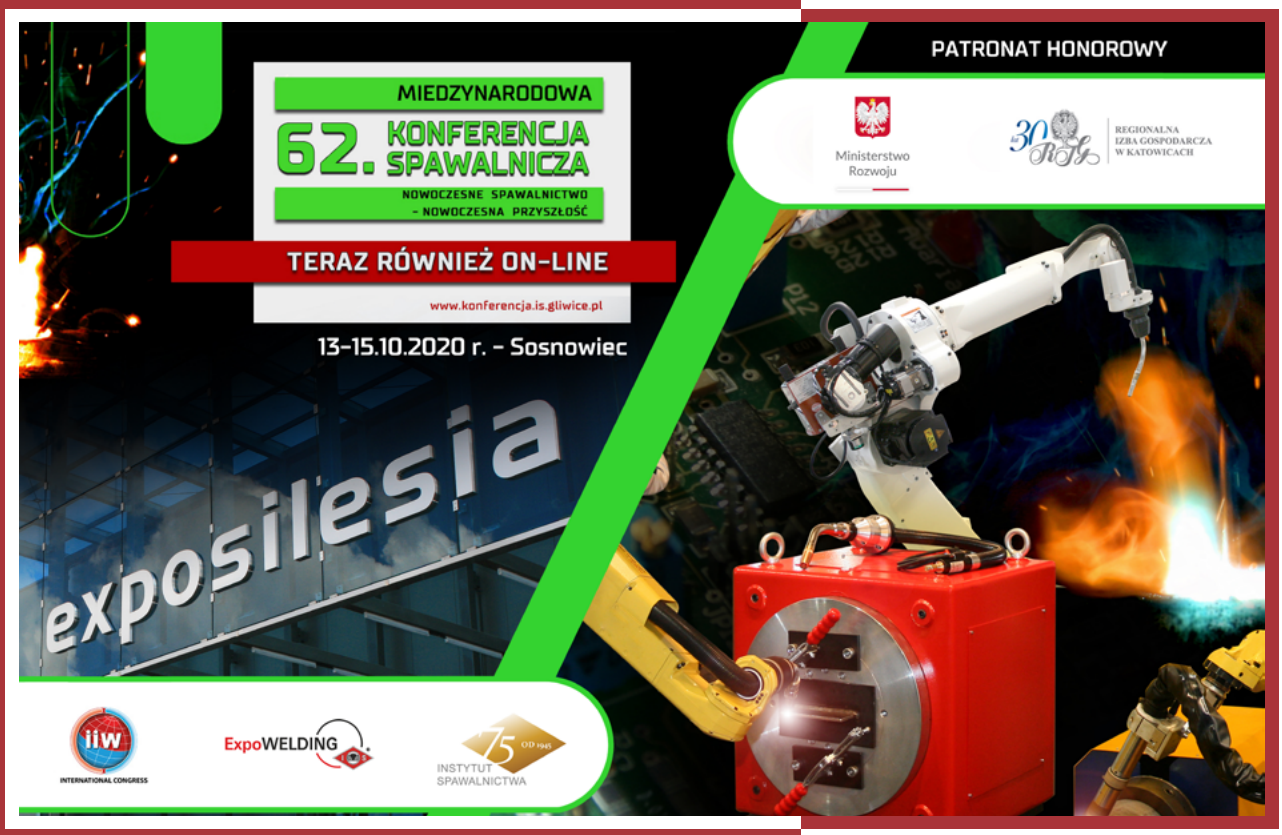

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INSTITUTE OF WELDING BULLETIN

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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

A. Merda, G. Golański, P. Wieczorek, K. Staszałek – The Analysis of the Microstructure of Welded Joints in Steel P5 after Service

DOI: *10.17729/ebis.2020.5/1*

The material subjected to the tests discussed in the article was a section of a welded joint made of bainitic steel P5. The joint subjected to analysis was sampled from a pipe section exposed to the effect of elevated temperature for more than 96 000 hours. The metallurgical tests revealed a relatively low degree of the degradation of the test joint. The microstructure contained retained bainite and precipitates of various morphology. The identification of precipitates revealed the presence of M23C6 and M2C precipitates in the joint. The M23C6 carbides were observed along the boundaries of former austenite grains. The above-named identification of precipitates also revealed the presence of M2C and M23 C6 carbides within the grains/laths. The insignificant exhaustion of the joint microstructure might be ascribed to the fact that the joint was subjected to relatively low temperature for a relatively short time.

K. Kudła, K. Wojsyk, K. Makles, M. Macherzyński – Deep-Penetration Welding as a Method for Saving Materials and Increasing the Load-Carrying Capacity of Welded Structures

DOI: *10.17729/ebis.2020.5/2*

The study presents possible savings resulting from the use of deep-penetration welding processes in the fabrication of welded structures. The study-related tests revealed 80% savings of filler metals and the 50% reduction of welding distortions without compromising the maximum load-carrying capacity of welded joints. The tests involved steel grades S355J2, S460NL, S700MC, S690QL and 450HBW (Hardox) having thicknesses restricted within the range of 8 mm to 20 mm as well as filler metal grades G4Si1 and G69.

K. Kwieciński, M. Urzynicok, A. Ferrara, V. Barsan –Welding of Joints in New Generation Martensitic Steel THOR 115

DOI: *10.17729/ebis.2020.5/3*

Present development of the materials used in power industry for elements of power boilers operated at supercritical parameters creates new challenges for welding. There are implemented new combinations of alloy additives to improve mechanical properties of the steel, including creep resistance and oxidation. It affects weldability of the new types of steel. Martensitic steels containing 9% of Cr are indicated as creep-resistant but not resistant to oxidation over 600°C, whereas steels containing 12% Cr, i.e. VM12-SHC lub X20CrMoV12-1, are significantly more resistant to oxidation, but less durable in higher temperature. In 2018 Italian company Tenaris developed new type of steel Thor ™ 115 (Tenaris High Oxidation Resistance) consisting of 12% Cr. The article presents test results of welding steel pipes using different consumables (W CrMo91, S Ni 6082 and EPRI P87). There have been conducted non-destructive (VT, PT, RT) and destructive tests (tension, bending, impact strength, hardness tests), also macroscopic and microscopic metallographic tests to confirm high quality of welded joints.

Ł. Rawicki, J. Słania – Selected Aspects of Ultrasonic Testing of Advanced Materials

DOI: *10.17729/ebis.2020.5/4*

Welding is considered as a "Special Process", which means that its quality cannot be readily verified and its successful application requires specialist management, personnel and

procedures. It is important to conduct proper testing of the welded joints, including volumetric testing. In this case there are conducted ultrasonic testing, which enable detecting volumetric discontinuities. Ultrasonic testing meets many problems while testing joints with large anisotropy. The problems are caused by the physical phenomena, e.g. transformation, dispersion and absorption of the wave. It is connected with the structure of the material, which cause different propagation of the ultrasonic beam. The article presents the review of the factors affecting the quality of ultrasonic testing.

K. Pańcikiewicz – The Use of Arc Welding Processes in the Additive Manufacturing of Metallic Products

DOI: *10.17729/ebis.2020.5/5*

The article presents examples of additive manufactured products obtained using MIG /MAG welding processes (13). The research-related tests revealed that it is possible to make products of unalloyed steels having the structure similar to castings subjected to heat treatment. Products made of maraging steel require homogenising (heat treatment). It is possible to produce bimetallic products, e.g. unalloyed steel-bronze.

M. Szymura, A. Czupryński – The Effect of a Welding Technology on the Abrasive Wear Resistance of Joints in Abrasion-Resistant Plates

DOI: *10.17729/ebis.2020.5/6*

The article presents results of tests concerning the metal-mineral abrasive wear resistance of butt welded joints with abrasion-resistance overlay weld HARDPLATE 100S 5+3 made using a covered electrode with the solid core and the flux core as well as a self-shielded flux-cored wire. The significance of the above-named effect was determined using a completely randomized design. The scope of tests also included the analysis of the chemical and phase compositions, hardness measurements as well as the macro and microscopic metallographic tests of welded joints in abrasion-resistant plates.

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