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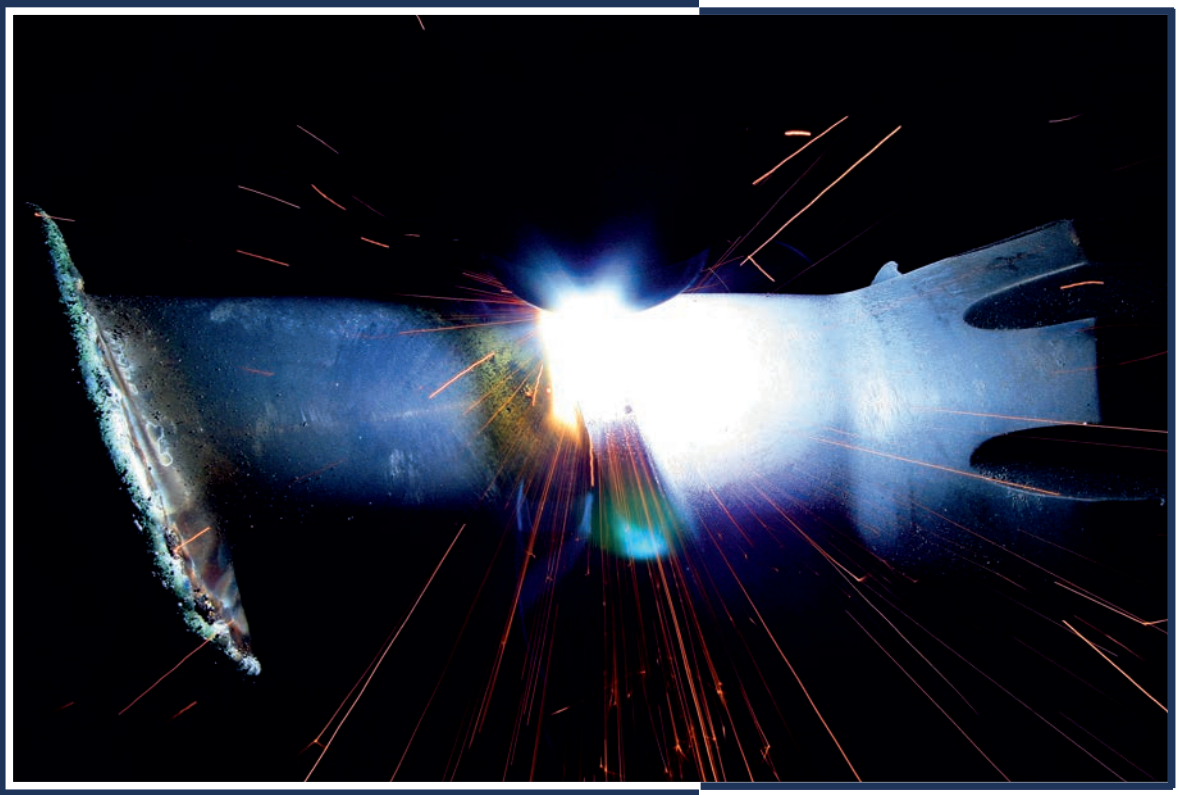

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CONTENTS

ŁUKASIEWICZ – UPPER SILESIAN INSTITUTE OF TECHNOLOGY
CENTRE OF WELDING

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

Summaries of the articles

Borys Bednarek, Tomasz Kik: The Ultrasonic Test-Based Detectability of Cavities in Joints Made of Aluminium Alloys

DOI: *10.17729/ebis.2023.1/1*

The primary objective of the study involved determining the Phased Array technique-based detectability of internal gas pores in aluminium joints. The test agenda included the making of joints containing artificial discontinuities, the experimental adjustment of test parameters, the performance of tests using a selected testing technique and the comparison of test results with actual dimensions of defects located in metallographic specimens.

Agnieszka Rzeźnikiewicz, Jacek Górka: Structural Changes and Chemical Composition Changes during the Plasma Cutting Process

DOI: *10.17729/ebis.2023.1/2*

Cutting is usually one of the initial and primary operations used when making welded structures and fabricating structural elements. Increasingly often, the preparation of elements involves the use of thermal, in particular plasma arc, cutting. The plasma arc cutting process consists in melting and ejecting liquid metal from the cut gap by highly concentrated plasma electric arc burning between a non-consumable electrode and a workpiece. The article presents results of tests concerning the influence of plasma gas on structural changes and chemical composition changes resulting from the cutting of unalloyed steel using air plasma arc. The tests revealed that the application of the air plasma arc cutting process led to the formation of an amorphous layer characterized by a very high nitrogen content (of approximately 1.6%) and a hardness of 750 HV 0.2. This high nitriding effect was triggered by the diffusion of nitrogen from the plasma gas. At the same time, the effect of air plasma arc gases on the liquid metal led to the carburising of the cut surface (up to approximately 0.5%) as well as to the burnout of alloying components (in accordance with the theory of selective oxidation of chemical elements). After the air plasma cutting process, the material structure revealed features intermediate between those of the structure formed through oxygen cutting and those of the structure formed as a result of nitrogen plasma cutting. The tests also revealed that the argon-hydrogen plasma cutting process had the lowest effect on the material subjected to cutting.

Jakub Kozłowski, Ryszard Krawczyk: Additional Requirements Concerning the Fabrication of Welded Structures in Accordance with the EN 1090 Standard

DOI: *10.17729/ebis.2023.1/3*

The manufacturer of welded structures should meet the requirements set forth in the EN 1090 standard, concerning, in particular, technological processes as well as their control and supervision. Additional requirements are concerned with the selection and evaluation of structural material properties. The so-called Z-test enables the assessment of plastic properties in the direction perpendicular to the material surface, whereas test SEP 1390 is used to evaluate the weldability of thick-walled materials (based on material ability to block the development of initiated cracks). These additional requirements aim to increase the safety and service life of crucial welded structures exposed to dynamic loads.

Mateusz Sowa, Bartłomiej Urbański, Kamila Stopińska: Passive Safety in Sports Cars – Safety Cells

DOI: *10.17729/ebis.2023.1/4*

The safety cell (depending on its producer also referred to as *safety cage*, *roll cage* or *crash box*) is an indispensable sports car element tasked with limiting results of a potential car crash. The aforesaid structure should be characterised by the highest possible and repeatable workmanship, providing strength assumed at the design stage. The collaboration of the Łukasiewicz Research Network – Upper Silesian Institute of Technology, Welding Research Centre and of the Polish Automobile and Motorcycle Federation (i.e. the institution supervising motor racing in Poland) enabled the implementation of the Certification Procedure for Safety Cages in accordance with the Homologation Regulations for Safety Cages of Federation Internationale de l'Automobile. The article discusses conclusions concerning tests performed within the Certification Procedure for Safety Cages, rescue aspects concerning the safety cell design and further research trends.

Łukasz Rawicki, Jacek Słania, Ryszard Krawczyk: Ultrasonic Tests of Dissimilar Joints

DOI: *10.17729/ebis.2023.1/5*

Machine building or the fabrication of industrial equipment elements often necessitate the use of welding methods enabling the joining of materials, the physical properties of which differ to a significant extent [1]. Dissimilar joints can often be found in power equipment, chemical systems or reactors. For instance, in power boilers, heat exchanger pipes made of austenitic steels and exposed to very high temperature are joined with system elements made of ferritic steels [2]. Austenitic-ferritic steels and duplex steels are used, among other things, in the construction of chemical tankers [3]. Dissimilar joints are also found in tank elements made of duplex steel joined with fixtures made of high-strength low-alloy steels [4, 5]. The article presents examples of ultrasonic tests concerning joints of heat-resistant steel 13CrMo4-5 with austenitic steel 316L.

Michał Macherzyński, Jacek Słania, Kwiryn Wojsyk: A New Methodology for the Determination of Linear Welding Energy

DOI: *10.17729/ebis.2023.1/6*

The article presents a new methodology enabling the determination of linear welding energy as well as discusses inaccuracy-related issues accompanying the calculation of the aforesaid energy using a commonly applied formula. In addition, the article describes the correlation between the cross-sectional fusion area and energy used to melt the base material and the filler metal. The article also discusses the determination of a coefficient applied successfully in the new methodology and presents its practical application, including the possibility of identifying the heat input also in highly problematic or entirely unquantifiable cases.