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Methods for Selecting Brittle-Crack-Resistant Structural Materials Based on Polish and International Standards – Part 1
Marcin Graba, Mariusz Janusz-Bielecki
DOI: 10.32730/mswt.2024.68.5.1

Key words: brittle cracking, materials, pressure equipment, construction products

The article describes the phenomenon of the brittle cracking of steel as a component of structural elements of pressure equipment and construction products. The study presents several methods of analysis used by specialists responsible for the design, fabrication and testing of the aforesaid products. The article also indicates numerous international regulations and standards which can be successfully used in many technical solutions. The methods discussed in the study were compared to enable the selection of appropriate material assessment methods ensuring the safe operation of structures.

Technical and Quality Requirements for Metallic Components of Nuclear Power Plants
Jerzy Niagaj
DOI: 10.32730/mswt.2024.68.5.2

Key words: nuclear power plant, metallic component, code, ASME, AFCEN, requirements, quality

The article discusses the requirements of the ASME and AFCEN nuclear codes for metallic equipment, components and systems in the pressure and civil structures areas of nuclear power plants as well as the requirements of the ISO 19443 and NQA-1 standards for quality assurance systems in the nuclear industry.

Assessment of the Structure and Properties of Manually Laser-Beam-Welded Joints of Steel DOCOL 1200M
Jacek Górka, Dagmara Jankowska, Sebastian Stano
DOI: 10.32730/mswt.2024.68.5.3

Key words: laser beam, manual welding, steel Docol 1200M, martensitic structure

The research work aimed to determine the effect of manual laser beam welding process parameters on the properties of butt joints made of 1.8 mm thick steel DOCOL 1200M. The test joints were subjected to non-destructive (visual and penetrant) tests as well as destructive tests including static tensile tests, bend tests, hardness measurements as well as macro and microscopic metallographic tests. The optimisation of welding process parameters enabled the obtainment of joints satisfying both visual and strength-related quality requirements. The tests revealed that the use of the so-called continuous-wave laser beam helped minimise the number of welding imperfections. As a result of the laser beam welding process, the hardness in the heat affected zone (HAZ) decreased to approximately 260 HV, if compared to that of 360 HV in the base material and 370 HV in the weld.

The Effect of Water Cooling on the Mechanical Properties of FSW Butt Joints Made of Aluminium Alloy AA7075-T651
Robert Kosturek, Lucjan Śnieżek, Janusz Torzewski
DOI: 10.32730/mswt.2024.68.5.4

Key words: aluminium, friction stir welding (FSW), mechanical properties, fatigue strength

The article presents test results concerning the mechanical properties of friction stir welded joints (FSW) and underwater friction stir welded joints (UWFSW) made of aluminium alloy AA7075-T651. The analysis of microhardness distribution revealed two positive effects of water cooling, i.e. the reduction of the heat affected zone (HAZ) and an increase in the microhardness of the low hardness zone by approximately 15 HV0.1. Static tensile test results revealed that water cooling led to an increase in the yield point of the FSW joint by approximately 18 % (58 MPa) and tensile strength by approximately 9 % (43 MPa). Under low-cycle fatigue conditions, the UWFSW joints were characterised by higher stress amplitude, lower plastic strain amplitude and a lower number of cycles preceding the failure (of the UWFSW joints) than that preceding the failure of the "classical" FSW joints.

Microstructure of Joints Made of Duplex Steel LDX 2101 Using Concentrated Beams and Various Welding Rates
Mirosław Łomozik, Michał Urbańczyk, Piotr Śliwiński, Sławomir Andruszkiewicz
DOI: 10.32730/mswt.2024.68.5.5

Key words: duplex steel, welded joint, laser beam welding, electron beam welding, electrolytic etching, microstructure.

The article presents tests concerned with the welding of duplex steel LDX 2101 using a laser beam, an electron beam and various welding rates. Flat butt joints were made using the laser beam and welding rates of 1 m/min and 2 m/min as well as the electron beam and welding rates of 0.2 m/min and 2 m/min. Microscopic metallographic examinations involved the use of light microscopy. The microstructure of individual areas of the test joints was revealed using colour electrolytic etching. Structural components in individual areas of the joints were identified using NIS Elements-AR software tools (Nikon). The same software was used for measuring the width of the joints and the height of excess weld metal. Test results were used to formulate related conclusions.

Welding of Lifting Equipment Structures Made of Steel DOCOL 1300 M

Tomasz Węgrzyn, Bożena Szczucka-Lasota, Adam Jurek, Piotr Jurek

DOI: 10.32730/mswt.2024.68.5.6

Key words: welding, civil engineering and transport, lifting equipment, steel DOCOL 1300M

Because of their high temporary tensile strength and significant fatigue strength, DOCOL steels from the AHSS group (AHSS – Advanced High-Strength Steel) are often used in the fabrication of mobile platforms. The welding of the above-named steels is difficult due to the dominant martensitic structure and requires extensive experience. The article discusses the identification and adjustment of welding parameters appropriate for steel DOCOL 1300M and presents the assessment of the effect of selected process parameters, i.e. filler metal wires, shielding gas mixture and, primarily, the correct preheating temperature, on the quality of welded joints.

Starting of Synchronous Motors

Stanisław Gawron

DOI: 10.32730/mswt.2024.68.5.7

Key words: synchronous motor, starting

The starting of synchronous motors can be asynchronous or frequency or by using an additional motor. The choice of the starting method requires detailed knowledge related to starting conditions, i.e. load torque during the start and the short-circuit power of the power grid at the motor power supply point. The aforementioned condition is essential to the correct design of the starting system. The article discusses the three above-named starting methods.