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Experimental method of the controlled cooling of steel sections with various wall thicknes
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DOI: 10.32730/mswt.2024.68.4.1

Key words: structural section, structural steel, accelerated cooling, microstructure, mechanical properties

The paper presents the results of controlled cooling experiments after austenitizing a V36 section made of S480W structural steel under conditions of variable cooling intensity on the cross-section. The aim of the tests was to investigate the possibility of modifying the microstructure and uniformly increasing the mechanical properties of steel sections with different wall thickness on the cross-section, in relation to air cooling. The cooling characteristics of the section were determined, using different parameters of compressed air blowing directed from nozzles onto selected surfaces of the section. As a result of the accelerated cooling tests, a fine ferritic-pearlitic microstructure was obtained with a ferrite grain size Dα in the range of 6.8–6.5 μm. A uniform hardness distribution was obtained on the cross-section and an increase in the yield strength Re and tensile strength Rm of the steel in the range of about 40–60 MPa, while maintaining a similar elongation value.

Effect of the Strain Rate on (D)CCT Transformation Diagrams of Steel 25CrMo4
Rostislav Kawulok, Lukáš Pindor, Radek Cieslar, Milan Plevko
DOI: 10.32730/mswt.2024.68.4.2

Key words: strain rate, transformation (D)CCT diagrams, austenite grain size

The transformation kinetics during cooling of steels is most often documented in CCT and DCCT transformation diagrams, in cases where austenite was deformed prior to cooling. In such cases, attention is paid to austenite transformations in steel 25CrMo4. Within the research work, one CCT diagram and two DCCT diagrams with different strain rates (1 and 20 s-1) were developed based on dilatometric tests and combined with metallographic analyses and hardness measurements. The work also involved the verification of the deformation effect shifting the onset of ferritic and pearlitic transformation to the left, i.e. towards higher cooling rates as well as the investigation of the effect of two strain rates. It was found that, compared to the lower strain rate (1 s-1), the larger austenitic grain size combined with the higher strain rate (20 s-1) delayed the transformation of ferrite and bainite. The above-named effect was explained by insufficient time for the full dynamic recrystallization process to take place during austenite deformation.

Effect of Higher Contents of Manganese and Magnesium on the Mechanical Properties of Twin-Roll Cast Aluminium Alloy EN AW-8011
Lukas Pavlasek, Martin Bernatik, Jan Trojan
DOI: 10.32730/mswt.2024.68.4.3

Key words: EN AW-8011, twin-roll casting (TRC), manganese, magnesium, mechanical properties

Because of their excellent formability and sufficient mechanical properties, aluminium alloys based on an aluminium–iron–silicon system are very popular materials, commonly used in the production of thin foils. Alloy EN AW-8011 contains approximately 0.50–1.00 wt. % of iron and 0.40–0.80 wt. % of silicon. The other elements, including manganese and magnesium, are present only as impurities. However, these two elements are generally very effective enhancers of mechanical properties. Due to their very low concentrations in alloy EN AW-8011, the influence of manganese and magnesium on mechanical properties is often overlooked. In the research work discussed in the article, the properties of two Twin-Roll cast aluminium alloy EN AW-8011 containing various amounts of manganese and magnesium were investigated using optical microscopy, scanning electron microscopy (SEM), energy dispersive X-ray analysis (EDX) and tensile tests. The test results revealed that higher contents of magnesium and manganese significantly changed the mechanical properties of the alloy.

Stray magnetic field around the transformer
Marcin Barański, Stanisław Gawron, Tadeusz Glinka
DOI: 10.32730/mswt.2024.68.4.4

Key words: distribution transformer, leakage magnetic flux density, measurement of leakage flux density

Distribution transformers installed in residential buildings should not disturb people's living comfort through: noise, fire hazard and changing magnetic field. The article presents the results of measurements of magnetic flux density with a frequency of 50 Hz in the space around oil transformers with a power of 1600 kVA, 800 kVA and 100 kVA and dry transformers with a power of 1600 kVA and 2500 kVA. Oil transformers generate magnetic flux density at the same distance in the space outside the tank, approximately four times smaller than dry transformers. For both oil-filled and dry transformers, the flux density at a distance of 2 m from the transformer is at the level of several μT and is approximately 10 times lower than the values permissible for human presence. Transformers, both oil-filled and dry, from the point of view of the variable flux density component of leakage, can be placed in residential buildings.