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KEY WORD: TIG PULSE/SHIELDING GAS/DELTA FERRITE/316L AUSTENITIC STAINLESS STEEL/WELDING POSITIONS
EKKARUT VIYANIT: EFFECT OF TIG PULSE PARAMETERS AND SHIELDING GAS COMPOSITIONS ON WELD BEAD FORMATIONS AND MICROSTRUCTURE OF THE 316L AUSTENITIC STAINLESS STEEL AT THE 6 HOUR 8 HOUR 9 HOUR 10 HOUR AND 12 HOUR POSITIONS. THESIS ADVISOR: ASSIST. PROF. GOBBOON LOTHONGKUM, Dr. -Ing. THESIS CO-ADVISOR: MR. PHANSAENG CHOOMUNG. 110 pp. ISBN 974-331-453-9.

The objective of this work is to investigate the influence of parameters in TIG pulse welding of the AISI 316L stainless steel plate with 3-mm thickness. The weld bead profile corresponded to the DIN 8563 class BS. The welding positions were 6, 8, 9 10 and 12 h. The studied parameters were welding speed, pulse current, base current, pulse frequency, % On time, and shielding gas Ar + N_2 (0-4 vol.%) with flow of 8 liter/ min both for shielding and backing gases.

From the preliminary experiments, the suitable base current, pulse frequency, and %On time at the welding position of 6 h with a welding speed of 4 mm/s and argon gas shielding were 61 A, 5 Hz, and 65% On time respectively. These parameters were kept at these levels for all experiments.

At base currents of 61 A, pulse frequency of 5 Hz, and 65 %On time, the effects of welding speed and shielding gas composition on pulse currents were studied at the 6, 8, 9, 10 and 12 h welding positions. For complete penetration with weld bead profile corresponded to the DIN 8563 class BS, it was found that pulse current decreased form the welding position of 6 to 9 h and increased from the welding position of 9 to 12 h. Nitrogen in argon shielding gas decreases the pulse current because nitrogen has lower ionization energy than argon. At the welding position of 6 and 12 h, the maximum welding speed was 6 mm/s. Slag inclusion was found at welding speed of 7 mm/s. At the welding position of 8, 9 and 10 h, the maximum welding speed was 5 mm/s. Incompletely filled groove was found at the welding speed of 6 mm/s.

The depth/width ratio of welds were 0.34-0.40. Increasing welding speed decreased the weld width but increased the depth/width ratio. The weld microstructure compose of 6-10 vol.% δ-ferrite with a confidence interval of 95%. The δ-ferrite contents in the cross sectional and parallel sectional surface of welds are different less than 5%. At the welding position of 9 h, the δ-ferrite contents in weld metal were less than that at the other positions, because of higher nitrogen contents in the weld metal. By X-ray test no pore was found in all accepted welds.

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