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Optimization of Plasma Arc Welding Parameters by Using the Taguchi Method with the Grey Relational Analysis

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Abstract

The optimal parameters process of plasma arc welding (PAW) by the Taguchi method with Grey relational analysis is studied. The Grey relational grade is used to find optimal PAW parameters with multiple response performance characteristics. The welding parameters (welding current, welding speed, plasma gas flow rate, and torch stand-off) are optimized with consideration of the multiple response performance characteristics (the penetration of root, the weld groove width, and the weld pool undercut). As a result, the improvement percentage of the Grey relational grade with the multiple performance characteristics is 31.8%. It is shown that the multiple response performance characteristics are greatly improved through this study.

Keywords:

Analysis of variance (ANOVA) Dyeing machinery Grey relational analysis Keyhole
Multiple performance Optimization Orthogonal array Penetration Plasma arc welding (PAW)
S/N ratio Taguchi method Torch stand-off Undercut Welding current

Notes

Total mean value of the grey relational grade = 0.5517.

Related Research Data

Process parameter selection for optimizing the weld pool geometry in the tungsten inert gas welding of stainless steel
Source: Journal of Materials Processing Technology
Use of the Taguchi Method and Grey Relational Analysis to Optimize Turning Operations with Multiple Performance Characteristics
Source: Materials and Manufacturing Processes
Optimising removal rate and reliability of polishing of ceramic blocks using a combination of Taguchi and grey methods
Source: Materials Science and Technology
Optimization of machining parameters of Wire-EDM based on Grey relational and statistical analyses
Source: International Journal of Production Research
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