Investigations on joining of stainless steel tailored blanks by μ-PTA process

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ABSTRACT

Present work is focused on the autogenous joining of tailored blanks, that is, sheets of different thickness but of the same material (austenitic stainless steel grade SS 316L). A thin sheet (1mm) and a thick sheet (3 mm) were joined autogenously using Indigenously developed micro-plasma transferred arc (μ-PTA) process. Effects of current, torch travel speed and stand of distance (SOD) were investigated to determine their optimum levels of joint tensile strength. The produced joint was characterized using different methods such as optical microscopy, scanning electron microscopy, uniaxial tensile tests, Vicker's microhardness, and energy dispersive X-ray analysis. It was found that (19.4 A, 63 mm/min, 1.3 mm), (19.6 A,80 mm/min, 1.3 mm) and (19.8 A, 100 mm/min, 1.3 mm) with values of plasma flow rate at 0.4 Nl/min and shielding gas flow rate at 5 Nl/min, yielded sound weld Joint. Absence of heat affected zone was confirmed by very small variation in Vickers microhardness values across the fusion zone. This study establishes the capability of microplasma transferred arc process for joining stainless sheets of different thickness without any filler material and producing very good quality joint using much less power as compared to conventional fusion joining processes..

Keywords: Tailored blanks, Autogenous, Joining, μ-PTA, welding, weldability, strength.