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Studies on mechanical and morphological of TIG welded aluminum alloy

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ABSTRACT

An automated TIG welding system was employed to increase the welding strength and weld quality of pure Aluminum (Al) plate in terms of bead width and depth of penetration. The control parameters during the welding process are the most critical factors, such as welding speed and arc length. TIG welding is a procedure that involves maintaining an electric arc between a non-consumable tungsten electrode and the weldable component. Due to its strong corrosion resistance, AA5059- aluminium alloy is the most often used in the ship industry sectors as a hull material.

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1. Introduction

Metals and Non-Metals are joined through the mechanism of Plastic deformation. Here more friction and mechanical action are combined process is induced. Numerous FSW's advantages such as induced residual stress, smooth microstructure, less porosity, and less cracking. It can be automated easily also. FSW welding may be used on aluminium, magnesium, and copper alloys [1]. There has been increasing interest in using FSW technology to weld high melting point materials such as steel, aluminium alloys, nickel alloys, and titanium alloys in the last decade. Aluminium and aluminum-based alloys are widely utilized in the automotive and aerospace sectors because to their high specific strength, superior formability, and corrosion resistance [2]. Aluminium alloys haven't gained a lot of traction in the car business. The FSW technique of joining Al and its alloys is frequently used. Joining aluminium laminates has been a source of worry due to the difficulties of fusing aluminium fully using fusion welding methods. Threaded, square, cylindrical, tapered, and triangular pin profiles were employed in the welding trials. The authors came to the conclusion that pin profiles have a substantial impact on weld quality [3–5]]. There are two sides to the movement of the metal and the properties of the welds. In recent days, TIG welding process is an efficient technique for producing high-quality structural components. It is an arc welding practice in which the material accumulates as a result of the high temperature produced by an electrical source established between negative (a non-consumable tungsten electrode) and the positive (workpiece). The material's faying surface is melted and cemented during welding, and an inert gas purging out of the TIG flame protects the weld pool from outside contamination [6–8]. It is generally known that the weld bead shape has a significant impact on the quality of the weld connection. The load-bearing capability of symmetrical and fully penetrated weld connections is outstanding, which is a prerequisite for structural components. Structural components are usually made up of a variety of elements with varying thicknesses ranging from thin to mid-thickness [9]. It also lowers welding distortion and production costs while increasing productivity significantly. A-TIG welding offers a wide range of uses. Stainless steel, carbon steel, nickel base alloys, and titanium alloys are the most common materials utilized in A-TIG welding today [10]. It is primarily concerned with the addition of an active agent to AC welding in order to enhance the penetration of AA5059 alloy during AC welding.

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