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MEC299

STUDY OF HARDNESS PROPETIES OF BUTT WELDED JOINTS USING METAL INERT GAS (MIG) WELDING ON STAINLESS STEEL PLATE

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ABSTRACT

This proposal focused on hardness properties off butt welded joints using Metal Inert Gas (MIG) welding on stainless steel plate. MIG welding is one of the well -known welding techniques nowadays but is this type of MIG welding strong and hard. In addition, are there any porosity defects to the samples welded using MIG welding. Therefore, this research paper will continue the study to find out whether this type of MIG welding is suitable for welding stainless steel and whether there are any porosity defects after the welding is done. in this study, the stainless-steel plate will be welded using MIG type welding with butt joint type. Vickers hardness machine will be used to determine the hardness value of the sample that has been welded. Dye penetration test will be used in this study to detect whether there are any defects involving the porosity of the sample that has been welded.

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CHAPTER 1

INTRODUCTION

1.1 Research background

Welding is a critical fabrication process for joining materials in industries such as automobiles, aeroplanes, jet engines, and railways. It's a low-cost, flexible design-oriented, and permanent joining manufacturing process that's ideal for applications where a smooth appearance and a strong joint are important[1]. Because of its ease of use, higher welding speed, and thus high production rate, MIG welding is a widely used welding technique. MIG welding technology has become popular for welding metal alloys for various applications such as pressure vessels, automobile components, pipelines, building construction, and aerospace applications since welding was introduced as a joining method[2]. For joining large metal components, this is the preferred welding method. MIG welding, on the other hand, has some flaws, such as a lack of penetration, porosity, cracks, and a coarse structure. Several techniques, such as alternating magnetic fields and ultrasonic vibration, have been tried to improve the microstructural and mechanical behaviour of the weldments. Ultrasonic MIG welding has a much higher metal transfer rate and stability than traditional MIG welding.[2]

Welding is used to repair damaged steel tools and equipment such as shafts, gear teeth, and excavation buckets, among other things. Steel components are frequently damaged because of exposure to corrosive environments and areas of extreme wear.[3]

The most common MIG welding defects are porosity, lack of fusion, crack formation, and residual stresses. Porosity, lack of fusion, and crack formation were the main concerns of the researchers. Weld quality will be improved by further research into the mechanism of residual stresses and their relationship to mechanical properties.[2]. Improvements in copper or stainless-steel arc welding, particularly the requirements of grooving and workpiece preheating, as well as the appearance of porosity and cracking in the weld, are urgently needed to promote the practical application of copper or stainless-steel joints[4]. So, does there are any defect of porosity after the stainless steel being weld with MIG welding?

In automated welding production lines, metal inert-gas (MIG) welding has a wide range of applications. Welding quality detection is a necessary and important part of ensuring MIG welding quality. Currently, MIG welding quality detection is primarily based on offline measurements. The most common methods for detecting welding quality are destructive detection methods[5].

One of the most common defects in laser welding of aluminium (Al) alloys is porosity, which has a significant impact on welding quality. Online monitoring of porosity defects can help with process parameter adjustments to reduce the occurrence of porosity, which is gaining in popularity. Based on multi-sensing signals diagnosis and deep learning, this paper presents a novel method for recognising and detecting porosity defect during Al alloy's laser welding.[6]

1.2 Problem statement

To join aluminium and steel, some studies have used solid state and fusion welding processes. Diffusion bonding, friction welding, electromagnetic impact welding, resistance spot welding, impact welding, pulsed energetic ion beams welding, key-hole laser welding, ultrasonic butt welding, and vacuum brazing technology were some of the welding processes used. However, some of these methods require a lot of pressure or expensive equipment, and others can't guarantee the joint mechanical property for the production of excessively brittle intermetallic compounds. As a result, a high-efficiency and low-cost joining method for joining aluminium and steel remains a goal in promoting the use of hybrid structures[7]. As a part of the research, the study is to perform Butt-Welded Joints on Stainless Steel Plate using Metal Inert Gas (MIG) Welding.

Based on Pankaj's research, Pardeep discovered that filler wire was used to perform CO2 laser welding on austenitic stainless steel 1.4404 (X2CrNiMo 18 10) and ferritic steel (grades St 37 and St 52). They discovered that the weld zone of welded C-Mn steels had high proportions of bainite/martensite, resulting in higher hardness in the weld regions of ferritic similar and ferritic-austenitic dissimilar joints. As can be seen, the goal of this research is to investigate the hardness of stainless steel welded by MIG welding and tested with a Vickers hardness machine.