Laser Welding Process For Stainless Steel And Mild Steel - Review

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Abstract- *In the paper, we are going to study about thewelding process in the stainless steel and mild steel. These stainless steel and mild steel becoming progressively striking for producing industrial applications. The main application is the airport structure, especially in boiler. The purpose of this project is to study the welding parameter such as laser power , gas flow and welding speed to investigate the tensile properties, microstructure, micro hardness and strength. This paper is used to find the optimum parameter. To identify the hardness of the welding element in the Laser Welding (LW) stainless steel and mild steel based on the experimental approach*

Keywords- Laser welding stainless steel and mild steel, Process parameter.

I. INTRODUCTION

Majority of recent developments in welding have been driven by the requirement of higher productivity and lower cost. It is very difficult to join dissimilar material combination to large difference in their physical and chemical properties of metals.

The high power density and low energy input of laser provides solution to a number of problem commonly encountered with conventional joining techniques. Joints between dissimilar metal are particularly common in components used in solar panel, power generation and chemical, petrochemical, nuclear and electronics industries.

The use of different metals and alloys in product provides the designer and production engineer with greater flexibility and often results in technical and economic advantages over components manufactured from a single material. Expensive material with specific properties can be used in critical locations; with less expensive alloys being in supporting Continuous welding is the simplest form of the laser welding.

The conduction welding mode is employed for micro-joining purposes. Penetration welding permits aspects ratios (ratio of depth to width) much higher than unity. In continuous welding the effect of process parameters such as the welding speed, the focal length of the beam, type focusing lens, the work piece position relative to the beam focal point and the shielding gas type and flow characteristic on weld strength. Experimentation will be based on the shear test (weld strength). Shear test will be performing on sample of dissimilar metals on tensometer to observe the strength of continuous weld.

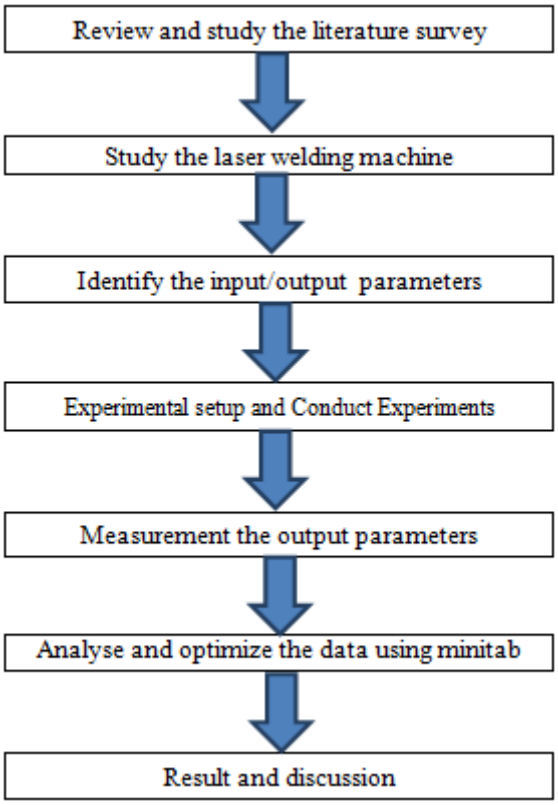

Figure 1.1 Methodology of the process

II. LITERATURE REVIEW

Most of the works have been carried out to study the design and development of SAW process parameters.

Mild steel IS2062 5mm thickness plate was optimized for the process parameters of welding current, welding speed and welding voltage on weld bead thickness

and bead hardness. But microstructure analyse has not been carried out.

Experiments are conducted for submerged arc welding process parameters (welding current, arc voltage and welding speed) on mild steel of 12 mm thickness. The researchers proposed the effect of these parameters depend on depth of penetration. From the study of literature survey 6mm thickness plate is consider, to analyse the effect of these parameters considering the weld strength.

III. LASER WELDING

Laser welding (LW) is a common gas welding process that involves the formation of an gas(co2) is a continuously fed into the workpiece.

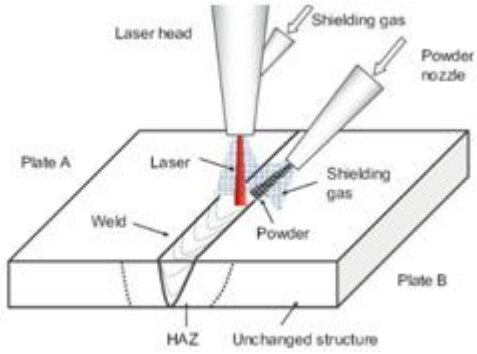

Fig 3.1 Laser Joining

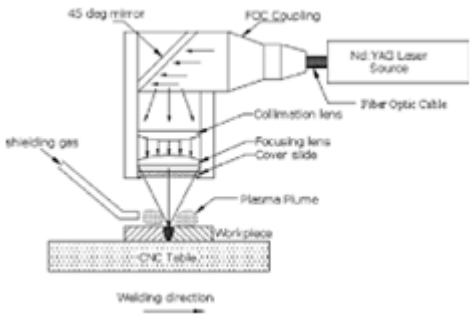

Fig 3.2 General arrangement

IV. EXPERIMENTAL PROCEDURE

In order to understand the effect of LW parameters such as welding speed ,laser power and gas flow on the mechanical properties of stainless steel(316L) and mild steel the as welded test specimens were evaluated by weld geometry measurements to find the relationship between the welding parameters and weld geometry parameter

Murugan and Gunaraj (2005) suggested that mechanical strength of welds is influencednotonlybythecompositionofthemetalbutalsobythewe ldbeadshape in SAW. So the selection of the process variables and control of weld bead shape has become essential.

Ghosh et al. (2011) suggested that in submerged arc welding process parameters play a significant role in determining the quality of a weld. So for such applications, optimum welding process parameters must be selected providing desired weld properties.

4.1 MATERIAL TO BE USED

Alloy steels such as mild steel may require preheat in the 100-122F range, the chemical composition of mild steel is given below. Table 1 Chemical composition (wt. %) of the mild steel.

Element	Percentage
C	0.16-0.18
Si	0.40
S	0.04
Mn	0.70-0.90
P	0.04
C	0.16-0.18

4.2 STAINLESS STEEL

In metallurgy stainless steel also known as ion steel or ion steel alloy with a minimum of 11% chromium content by mass and a maximum of 1.2% carbon by mass. Stainless steel is most notable for their corrosion resistance which increasing chromium content. Stainless steel is rolled into sheet, plates,bars,wires and tubing application is construction material in large buildings (Chrysler).

Element	Percentage
C	<0.03
Cr	16-18.5
Ni	10-14
Mn	<2
Si	<1
C	<0.03

4.3 LASER FLUX

Role of fluxes in SAW is largely similar that of coating in stick electrodes of SAW. protection of weld pool from inactive shielding gases generated by thermal decomposition of coating material. SAW fluxes can influence the weld metal composition appreciably in the form of

addition or loss of alloying elements through gas metal and slag metal reactions.

V. ANALYSIS OF SAW BENEITS AND IMPORTANCE

1) Non-contact process
2) Low power consumption.
3) Can work with many different materials.
4) Incredibly precision.
5) One laser can be used for multiple applications.

VI. CONCLUSIONS

An overview in to the evaluation and advances in laser technology has been presented. The process said to have evolved significantly leading to some industrial application in two decades. Optimization techniques like Taguchi approach, are adopted to minimize the experimental runs during the welding of dissimilar metals. Various analysis methods like ANOVA and Grey relational approach are also used while investigating the relations between the parameters and their influence on the properties of the welded joints.

Dissimilar metal welding process have more challenging in micro structure and required mechanical properties , but by using the laser beam welding achieved better microscope and mechanical properties.

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