

# Analysis of Welding Parameters of MIAB Welding for T91 Material

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**Abstract**—Magnetically Impelled Arc Butt Welding (MIAB) is a process of hybrid solid-state welding. It suits only for butt joining hollow cylindrical sections such as pipes and tubes. The MIAB welding equipment is robust and it is relatively simple in design, and requires low upset pressures compared to processes like Friction welding. In this process the rotating electric arc is used for heating the extremes of two tubes, which is impelled due to the electromagnetic force created by the interaction of arc current and magnetic field has been generated by external magnetic system. This paper presents the attempts made to design and develop a laboratory MIAB welding module operated hydraulically to realize the principle of the process. Trials are conducted with alloy steel tubes (44.5mmdiameter and 5.5mm, 4.5mm and 3.5mm thickness) by varying the various input parameters and subsequently recording the observations. The experimental procedure involves a series of trials to develop and evaluate the knowledge base for MIAB welding alloy steel tubes. Based on the penetration and bead of the weld the appropriate ranges of various input process parameters identified are presented.

**Key words:** MIAB Welding, T91 Material

## I. INTRODUCTION

### A. Welding

Welding is a materials joining process which produces materials joints by heating them to suitable temperatures with or without the application of pressure or by the application of pressure alone and with or without the use of filler material.

### B. MIAB Welding

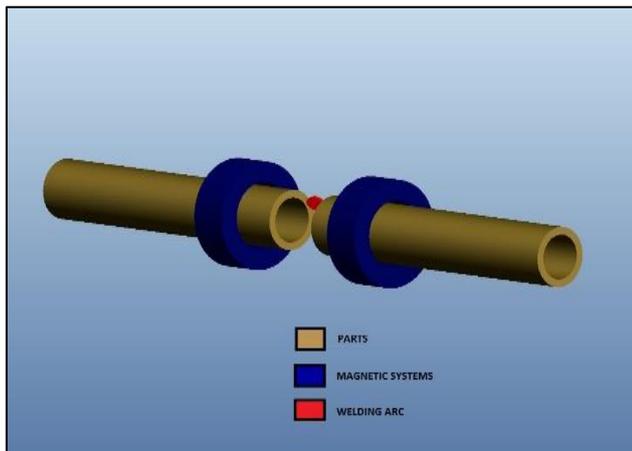


Fig. 1: MIAB Welding Process.

Magnetically Impelled Arc Butt (MIAB) welding is a type of pressure welding used for steel tubes and pipes. MIAB welding is a unique process in that it utilizes relatively simple equipment, but relies on very complex interactions between an arc and both an applied and induced magnetic field. This interaction is made even more complex by the changes that occur during the heating of the parts being welded.

### C. T91GRADE Steel Tubes



Fig. 2: T91grade steel tubes.

The properties of Grade 91 wholly depend on its chemical composition and microstructure. As per the chemical composition the minimum Carbon content should be 0.08%, minimum Niobium content should be 0.03% and minimum Nitrogen of 0.02% is specified to ensure adequate creep strength. It requires 9% Chromium, 1% Molybdenum and minimum 0.18% Vanadium with 0.3 0.6% Manganese, 0.02% Phosphorous maximum, 0.01% Sulfur maximum and 0.2-0.5% Silicon. If the Titanium is added Niobium level can be taken lower.

## II. PROBLEM IDENTIFICATION

Nowadays while using welding process time consumption is high. While using TIG welding for non-metallic materials the melting state of the pipe ends is affected by polarity. For reducing these problems we prefer the MIAB welding to reduce time and polarity. For these problems we conduct the experiment of Analysis of Welding Parameters of MIAB Welding for T91 Material. Because the MIAB welding is more effective when compare to other welding process.

### III. METHODOLOGY

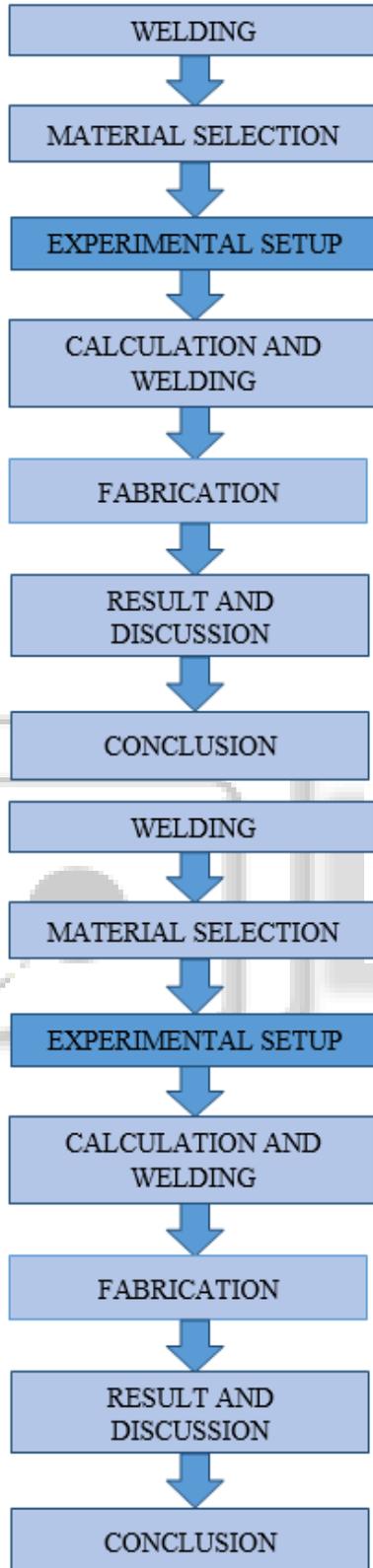


Fig. 3: Methodology flow chart.

### IV. EXPERIMENTAL SETUP

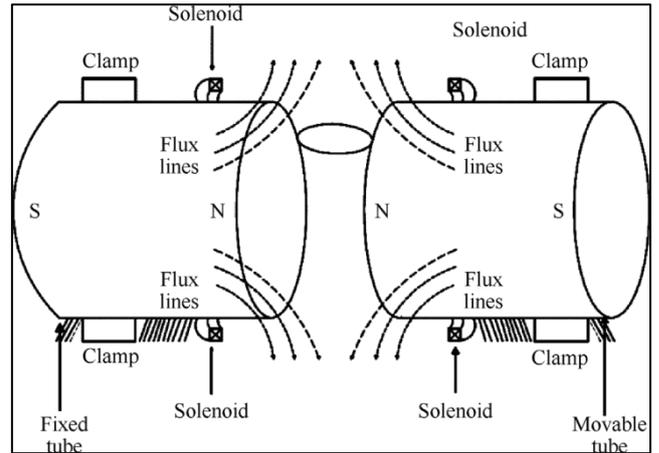


Fig. 4: Experimental Setup.

### V. CONCLUSION

In this project we learned about MIAB welding for t91 material and it is observed that the materials can be welded using MIAB welding the different parameters were identified and based on these parameters weld is done in the respective t91 tubes and after welding process these tubes are tested based on three tests they are tensile test, hardness test and NDT based on these test results it is found that three parameter welded tubes are found to have good stability at the welding section.

### REFERENCE

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