

# WELDING ENGINEERING: COMPARATIVE STUDY OF WELDING PROCESS WITH STRAIGHT, CIRCULAR AND ZIGZAG ELECTRODE MANIPULATION

<sup>1</sup>Bansal Suneev, Anil Saini, <sup>2</sup>Manjit Singh, Pandey, Kumar, <sup>3</sup>Dileep, Singh, <sup>4</sup>Karaj

<sup>1</sup>Associate Professor, Deptt. of Mech. Engg., RIMT-IET, Mandigobingarh.

<sup>2</sup>Assistant Professor, Deptt. of Mech. Engg., QGI, Jhanjheri.

<sup>3,4</sup>Student, Deptt. of Mech. Engg., QGI, Jhanjheri.

<sup>1</sup>suneev@gmail.com

**Abstract:** Over the years welding emerged as main metal joining technique. Out of this Arc welding is most commonly used welding technique due to small equipment, cheap process and portable machining equipment. Quality of weld depend upon various parameters like, value of current, type of base material, type of electrode, human skills and electrode manipulation. Present work demonstrates the effect of electrode manipulation over quality of weld. Three type of electrode manipulation were considered straight, circular and zigzag. To evaluate the quality of weld hardness and micro structure of the weld was considered. It was observed that circular manipulation produced best quality weld out of these three types of electrode manipulation.

**Key Words:** Arc Welding, Electrode formulation, Hardness, Microstructure, Substrate.

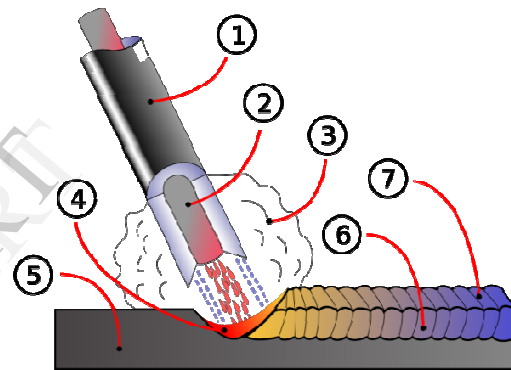


Figure 1: Arc Welding Process

1. Rod
2. Shield Gas
3. Fusion
4. Base metal
5. Weld metal
6. Solidified Slag

## I. INTRODUCTION

Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by causing coalescence. This is often done by melting the work pieces and adding a filler material to form a pool of molten material (the weld pool) that cools to become a strong joint, with pressure sometimes used in conjunction with heat, or by itself, to produce the weld. This is in contrast with soldering and brazing, which involve melting a lower-melting-point material between the work pieces to form a bond between them, without melting the work pieces.

## II. PROCEDURE OF EXPERIMENTAL

The experiment is divided into two parts:

Part A: Preparing Test Specimen

Part B: Testing Test Specimen

### 2.1 Part A: Preparing Test Specimen

To perform arc welding process three specimens were prepared. Specimens were prepared for welding process. All there specimen were joined with three manipulation of welding electrode.

- a) Straight Manipulation
- b) Circular Manipulation

## c) Zigzag Manipulation

## 2.2 Part B: Testing Test Specimen

The entire welding specimens were tested for welding quality. To know the welding quality two types of tests were performed.

- a) Hardness
- b) Microstructure

## III. RESULTS

Table 1 below shows the values of hardness at various electrode manipulations. It is observed that circular manipulation achieved maximum hardness.

Table 1: Hardness at different manipulation of electrode

S. No.	Type of Manipulation	Maximum Hardness
1	Straight	42
2	Circular	48
3	Zigzag	34

Figure 1 shows the microstructure of welded zone with straight manipulation of electrode. Figure 2 shows the microstructure of welded zone with circular manipulation of electrode. Figure 3 shows the microstructure of welded zone with Zigzag manipulation of electrode.

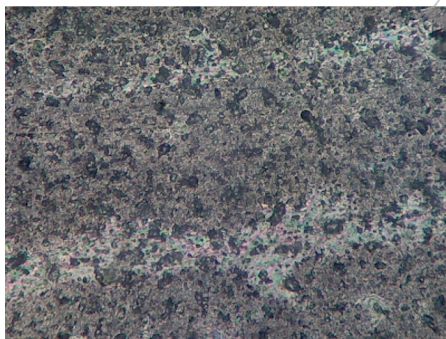


Figure 2: Straight Manipulation

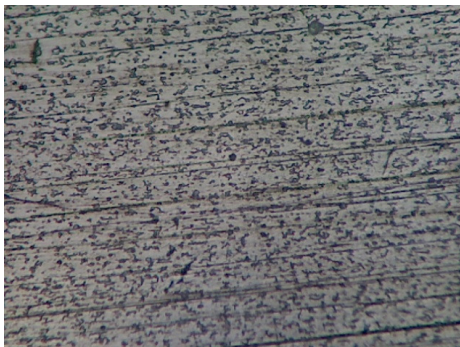


Figure 3: Circular Manipulation

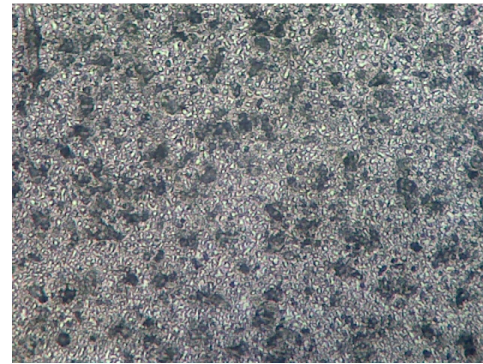


Figure 4: Zigzag Manipulation

## IV. CONCLUSION

Present work showed microstructure and maximum hardness value at different manipulation of electrode. From the result of hardness it is concluded that maximum hardness can be achieved by doing circular manipulation. The micro structure of circular manipulation is smoother and even than other two manipulations.

## V. ACKNOWLEDGEMENT

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