Effect of Weld Geometry Parameter on Tensile Strength for AISI304

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Abstract— Welding is an area in which technological developments out match the developments in its science base which is primarily driven by the phenomenal industrial demand for welded structure. Reliability, Reproducibility and Viability requirements are forcing Technologists to look at weld defects such as distortion, hot cracking, in a systematic and logical approach than on experimental basis. Distortion is an unwanted physical change from specifications in a fabricated structures is caused by non-uniform expansion and contraction of the weld metal during heating and cooling cycle of the welding process many factors viz., material properties, welding process and procedures adopted make accurate prediction of distortion difficult. Groove angle, Root gap and root face was taken to analyze tensile strength in butt weld joints

Key words: Shielded Metal Arc Welded Joint, Welding Processes

I. INTRODUCTION

The term joining is generally used for welding, brazing, soldering, and adhesive bonding, which form a permanent joint between the parts. A joint cannot be easily separated. The term assembly usually refers to mechanical methods of fastening parts together. Some of these methods allow for easy disassembly, while others do not. We begin our coverage of the joining and assembly processes with welding, Welding is a materials joining process in which two or more parts are coalesced at their contacting surfaces by a suitable application of heat and/or pressure. Many welding processes are accomplished by heat alone, with no pressure applied; others by a combination of heat and pressure; and still others by pressure alone, with no external heat supplied. In some welding processes a filler material is added to facilitate coalescence. The assemblage of parts that are joined by welding is called a weldment. Welding is most commonly associated with metal parts, but the process is also used for joining plastics. Our discussion of welding will focus on metals. Welding is a relatively new process. Its commercial and technological importance derives from the following: Welding provides a permanent joint. The welded parts become a single entity. The welded joint can be stronger than the parent materials if a filler metal is used that has strength properties superior to those of the parents, and if proper welding techniques are used. Welding is usually the most economical way to join components in terms of material usage and fabrication costs. Alternative mechanical methods of assembly require more complex shape alterations (e.g. drilling of holes) and addition of fasteners (e.g. rivets or bolts). The resulting mechanical assembly is usually heavier than a corresponding weldment. Welding is not restricted to the factory environment. It can be accomplished in the field.[3]

A. *Objectives:*

Objective of this study is listed below

- Identification of process parameter (current, groove angle, rib thickness and root gap) and response variables such as ultimate tensile strength in SMAW process.
- Design of experiments to perform experiment.
- investigation of best welding process parameter

II. EXPERIMENTATION

A. *Sample Material:*

The experimental study work is to be carried out to investigate the efeect of process parameter on AISI 304 material. The chemical composition of work material is given following Table

C	Mn	S	P	Si	Ni	Cr	N
0.057	1.02	0.003	0.036	0.27	8.04	18.29	0.045

Table 1: Chemical Compositions of AISI 304 Stainlesssteel

Levels	Groove Angle (Degree)	Rib Face (mm)	Root Gap (mm)
Level 1	30	1	0
Level 2	45	1.5	1.5
Level 3	60	2	2

Table 2: Process Parameters and their Level for Experimentations SMAW

B. *Design of Experiments:*

Groove Angle (Degree)	Root Face (mm)	Root Gap (mm)
30	1	0
30	1.5	1
30	2	1.5
45	1	1
45	1.5	1.5
45	2	0
60	1	1.5
60	1.5	0
60	2	1

Table 3: L9 thogonal arrays for SMAW

C. Sample Preparation for Tensile Strength:

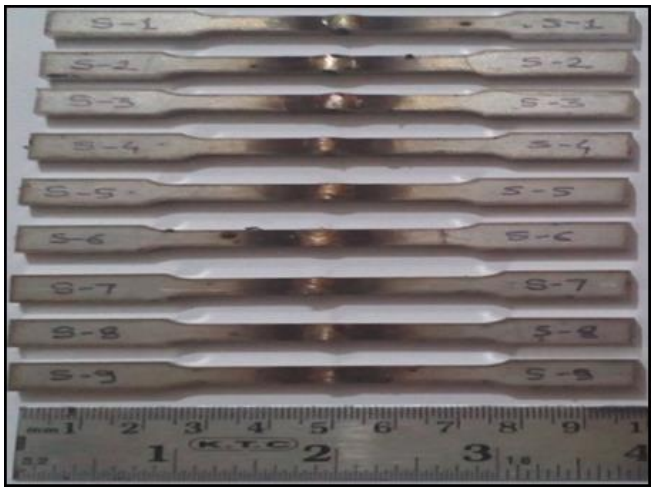

Fig. 1: Photograph of Tensile Test Sample for SMAW Joints

III. EXPERIM4ENTAL RESULTS

Exp. No	Groove Angle (Degree)	Root Face (mm)	Root Gap (mm)	Ultimate Tensile Strength (MPa)
1	30	1	0	304
2	30	1.5	1	275
3	30	2	1.5	222
4	45	1	1	542
5	45	1.5	1.5	549
6	45	2	0	541
7	60	1	1.5	546
8	60	1.5	0	494
9	60	2	1	487

Table 4: Ultimate Tensile Strength and Micro hardness of SMAW & TIG for Experimentation

IV. CONCLUSION

1) A strong joint of AISI304 is produced by SMAW technique.
2) Experimental investigation result of SMAW has observed the effect on tensile strength of V-butt weld joint. Maximum tensile strength is 549 MPa for SMA welding at 45 Groove angle,1.5 root gap and 1.5 root face°.
3) 3.The butt joint produced by SMAW at 45 groove angle, 1.5 mm rib thickness and1.5 root gap produces higher ultimate tensile strength549 MPa. The ultimate tensile strength of SMAW butt welds reaches to 83 % of the base metal ultimate tensile strength

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