ISSN (Online) 2393-8021
ISSN (Print) 2394-1588

International Advanced Research Journal in Science, Engineering and Technology
Vol. 2, Issue 5, May 2015

Study of influence of Welding Parameters on Mild Steel

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Abstract: In this study, an effect of welding parameters on the weld ability of mild steel specimen having dimensions 80mm x 50mm x 6 mm, which is welded by Metal arc welding, butt joint, is investigated. The current and voltage are considered as welding parameters. The effect of welding parameters is investigated on depth of penetration and Heat input which are considered as output parameters of welding.

Key words: Mild steel, Arc welding, Welding current, welding voltage, Welding speed, Depth of penetration, Heat input.

I. INTRODUCTION

Welding process remains an important process for the fabrication of ships, rail road equipments, boilers, vehicle, air craft industries, and pipelines. welding is a fabrication process that joins two materials usually metals or thermoplastics by melting the workpices and adding filler material to the molten pool of materials ,that on cooling becomes a strong joint, with pressure sometimes used in conjunction with heat or by itself, to produce the weld. The process variables in arc welding are welding current, are voltage, welding speed which causes much more effect on various properties of welded joint such as strength, weld bead geometry. So in the present work. The effect welding current, are voltage on mechanical properties of mild steel elements have been investigated

II. LITERATURE SURVEY

[2]Welding is a wide process used for fabrication to join two materials .The authors considered welding parameters such as voltage, current and welding speed on depth of penetration. The material was carbon alloy steel(0.14%C) of dimension 75 x 50 x6mm,voltage 18v and current was 250amps.The maximum penetration takes place with minimum speed even by maintain constant voltage and current.

[3] The authors investigated effect of voltage and current on depth of penetration in welding by considering material mild steel .And it was came to know that by increasing speed of travel and maintaining constant arc voltage and current will increase penetration, and it reaches optimum value of penetration. Further increase in speed will result in decrease in penetration.

[4]The primary investigation was done to know effect of welding parameters such as current, arc voltage, welding speed, heat input rate on Heat affected zone. It was observed that there is change in structure of material from austenite into bainite which could improve strength and impact toughness. It was known that by increasing speed the width of HAZ decreases and it is necessary to control welding parameters to get better weld quality bead.

[5] The authors investigated on mechanical properties of mild steel 1018grade by using MIG welding. The welding input parameters considered are current, voltage and root gap. The variation in current influenced change in tensile strength and toughness of the material. The increase in welding current increases tensile strength and it was maximum at10amps with 35v.And it can also conclude that welding lowers hardness.

From literature survey it had came to know that, the most commonly primary variables in are welding arc welding current, voltage & speed, which would change characteristics of joint

2.1 Welding current: Welding current is an influential variable that control melting rate of electrode, there by the deposition of electrode rate on joint. It also controls the depth of fusion, and penetration

2.2 Welding Arc Voltage: Welding arc voltage is also called are arc voltage, is the electrical potential difference between tip of electrode and the surface of molten weld pool. It effects on shape of fusion zone, welding reinforcement electrode melting rate etc.

2.3Welding Speed: Welding speed is the linear speed at which are moves with respect to plate, along with the weld joint. If speed get increases the heat input to the joint decreases and if speed get decreases, heat input increases. And heat put rate is given by

DOI 10.17148/IARJSET.2015.2509

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Heat input rate=V x I x 60/ v J/mm

Where V= Arc voltage in volts

I= Welding current in ampere

v= Speed of welding in mm/min

III. EXPERIMENTAL SETUP

In this work metal arc welding is used. Arc welding is a welding process, where Coalescence is produced by heating with an electric arc or arcs, mostly without the application of pressure and with or without the filler metal.

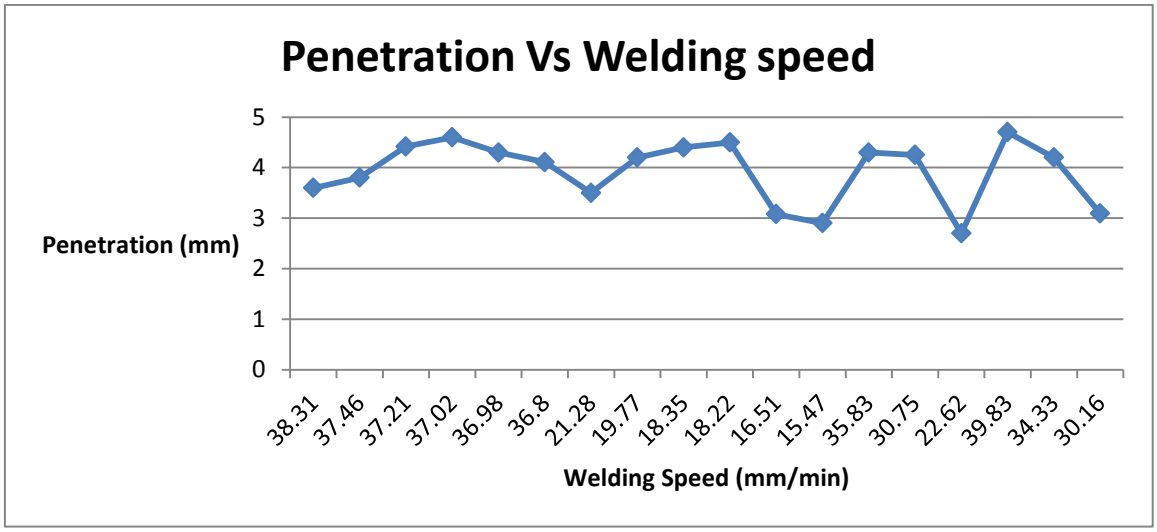
The 36 specimens of dimension 80mm x50mm x6mm are taken for experiments. Before welding the specimens are cleaned from dust, oil to avoid impurity in molten metal pool. Since welding was made by closed butt joint thus edges of the workpiece are suitably prepared. Work pieces are kept in position with respect to each other and welding was performed.

The safety precautions & corrective measures taken to avoid accidents and to get good quality weld beds.

In welding process speed of welding was varied along with the arc voltage and current. The voltage and current is varied in three steps as shown in following table3.1.

Table 3.1 Various parameters of welding

S.No	Welding voltage	Welding current(Ampere)	Welding time(min)	Welding speed(mm/min)	Heat Input J/mm	Penetration in mm
1.	15	209	38.31	82.07	2291.94	3.60
2.	15	209	37.46	83.96	2240.35	3.80
3.	15	209	37.21	84.47	2226.82	4.42
4.	15	209	37.02	84.92	2215.02	4.60
5.	15	209	36.98	85.44	2201.54	4.30
6.	15	209	36.80	85.02	2212.42	4.11
7.	20	88	21.28	79.15	1334.17	3.50
8.	20	88	19.77	84.96	1242.93	4.20
9.	20	88	18.35	91.81	1150.20	4.40
10.	20	88	18.22	92.51	1141.49	4.50
11.	20	88	16.51	102.09	1034.38	3.08
12.	20	88	15.47	108.83	970.32	2.90
13.	25	125	35.83	145.33	1290.16	4.30
14.	25	125	30.75	169.37	1107.04	4.25
15.	25	125	22.62	230.14	814.72	2.70
16.	25	125	39.83	130.73	1434.25	4.70
17.	25	125	34.33	151.67	1236.20	4.20
18.	25	125	30.16	172.61	1086.26	3.09



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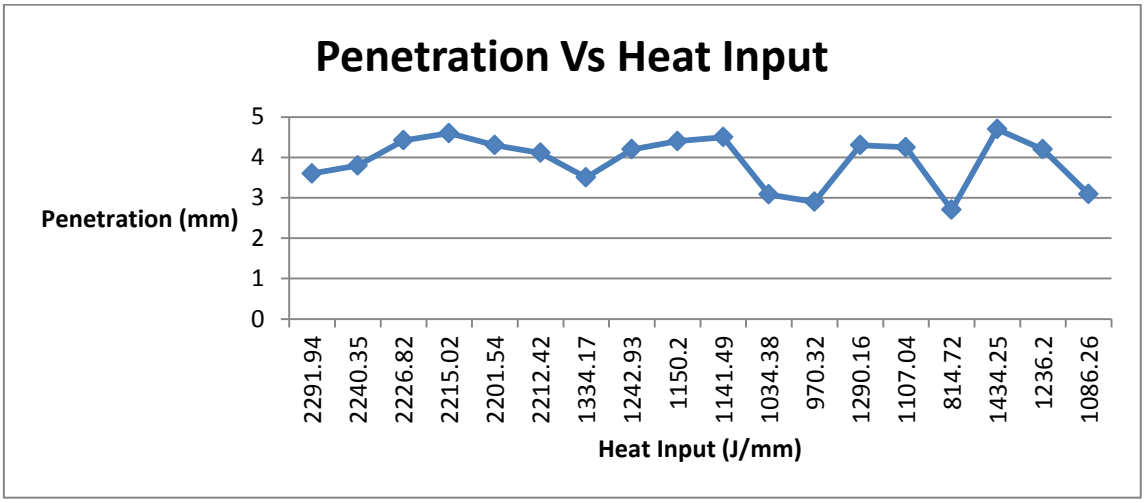

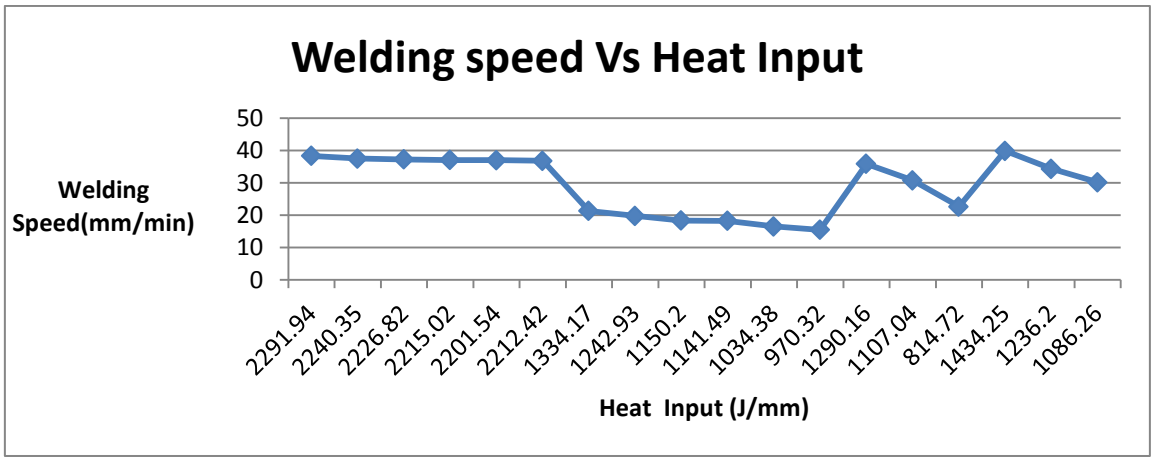

IV. RESULTS AND DISCUSSION

The speed of the welding was calculated for each welded specimen and the depth of penetration was measured by cutting cross section perpendicular to direction of welding. The variation of depth of penetration ,welding speed and heat input is analyzed from graph 1,2and 3.From graph it was observed that depth of penetration linearly increases by decreasing the speed and reaches maximum depth and later it get decreases, even though by maintaining constant voltage and current.

The depth of penetration is increases at each case of voltages and current with the increased heat input upto maximum and gets decreases gradually as heat input decreases. And least depth of penetration2.8mm was observed at lowest heat input814.72J/mm value even by maintaining constant voltage and current. And maximum depth of penetration is at heat input value 2215.02 J/mm. The graph welding speed Vs Heat input shows that by maintaining constant welding speed a heat input remains constant with small variation .So it can be stated that at different voltage, current and welding speed effects on depth of penetration and heat input.

V. CONCLUSION

Even by maintain constant voltage and current, depth of penetration varies with welding speed and maximum depth was observed at speed of 38.83mm/min for voltage 25V and current 125amps. So it can be concluded that increase in speed and by maintaining constant voltage and current depth of penetration increase up to maximum value and if speed increases beyond the optimum value results to decrease in depth of penetration.

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