



Smt. S.R.Patel College of Engineering,
Dabhi



Department of Mechanical Engineering

Presentation

On

Design and Development of Spot Welding Machine



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ABSTRACT

Design and Development of Spot Welding
Machine

This presentation includes description of various components of spot welding machine like Transformer, Limit Switch, Electrical cables, Copper Electrode, Timer etc. Also, it includes structural modelling of spot welding machine.

This spot welding machine can be used for commercial purpose. We have made wooden structure for this spot welding machine and grounded electrically. so, less chances of electric shock. We have prepared this model from wastage components. so, it is less costly than spot welding machines which is available in market.

INTRODUCTION

Design and Development of Spot Welding
Machine

Project background:-

Spot Welding was introduced by Elihu Thomson in 1877 and came into use in the period 1900-1905. Since 1933, resistance spot welding has been applied in a large industrial scale for the manufacturing of household appliance, electrical contacts, relays, lamp fixings and also in car body production. Newer techniques came into existences, the spot welding phenomena could be understood better; more & more young man took interest and got trained in this field and eventually many engineering institutes started teaching metal casting as an independent subject.

Project Objective:-

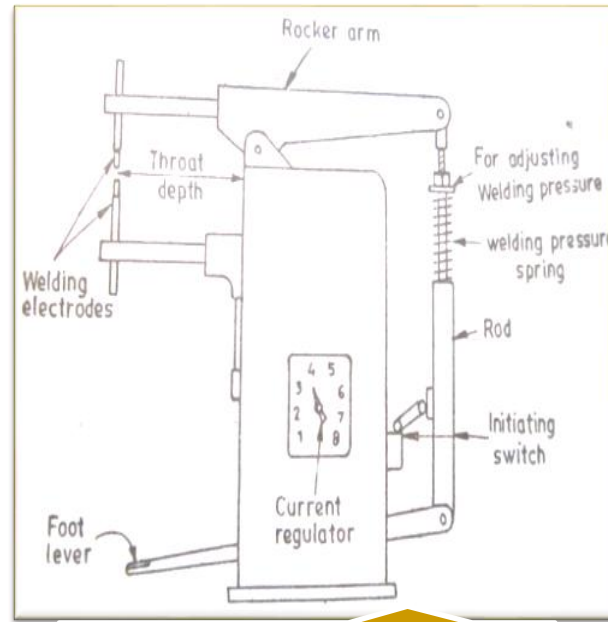
This project is developed to study about the automation process of foundry industries and productivity, efficiency and effectiveness of developed product. The main purpose of this project are listed below:-

- To improve the quality of spot welding machine .
- To make the wooden plate because we getting the cheap cost.
- To reduce the man effort.
- To reduce the time consumption.

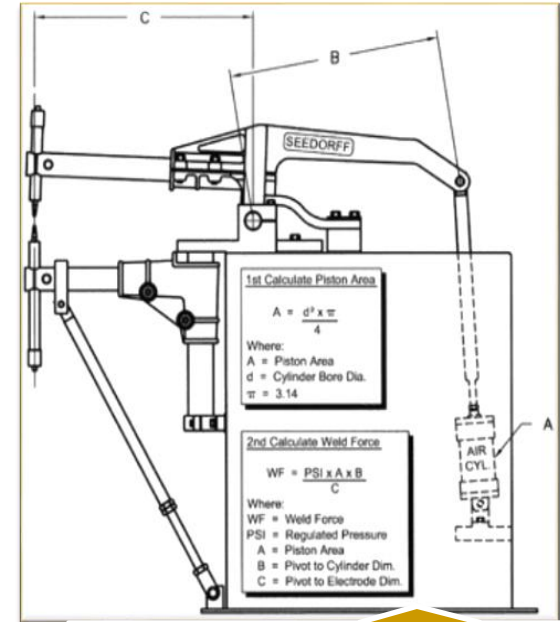
Type of spot welding m/c



Hand Operated Spot Welding m/c [12]

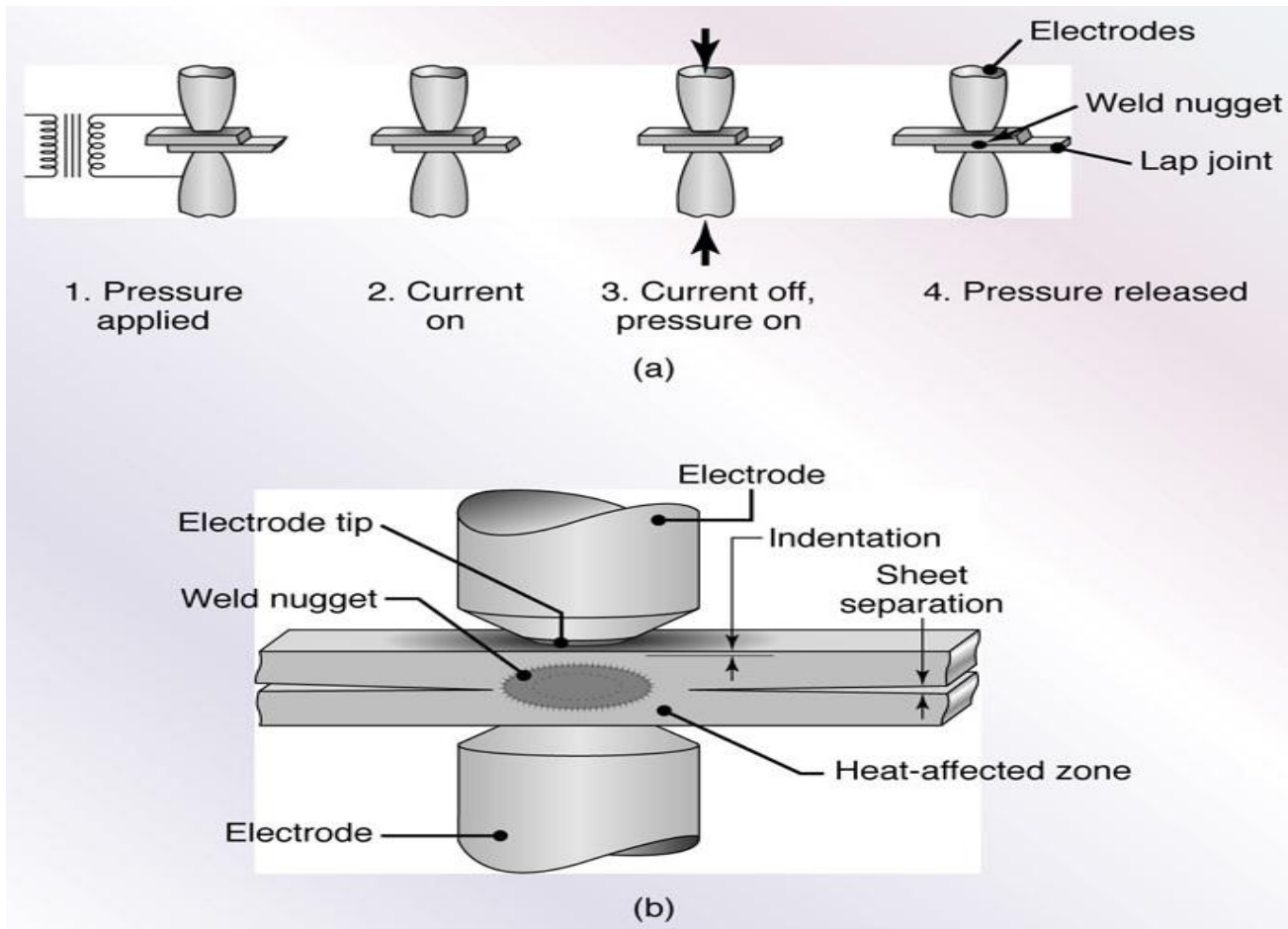


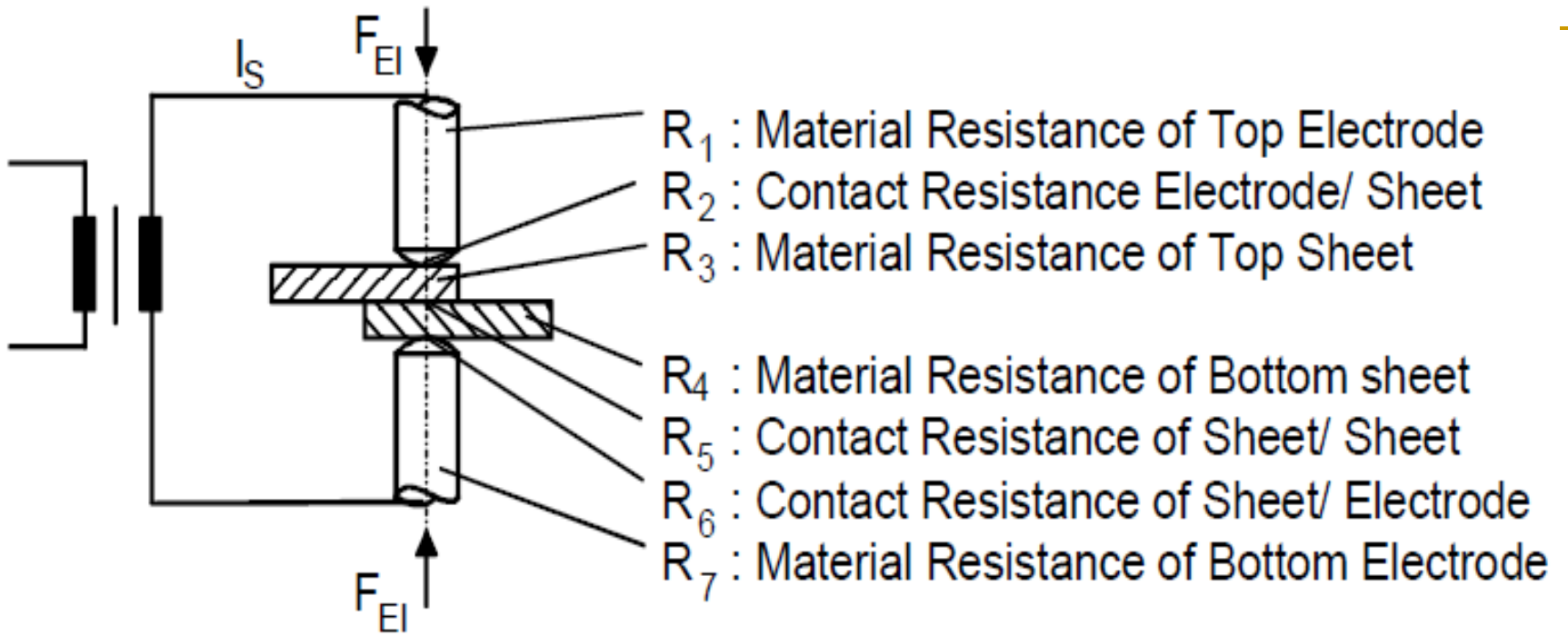
Foot Operated Spot Welding m/c [1]



Pneumatic Spot Welding m/c [2]

How does Spot Welding Work? [12]

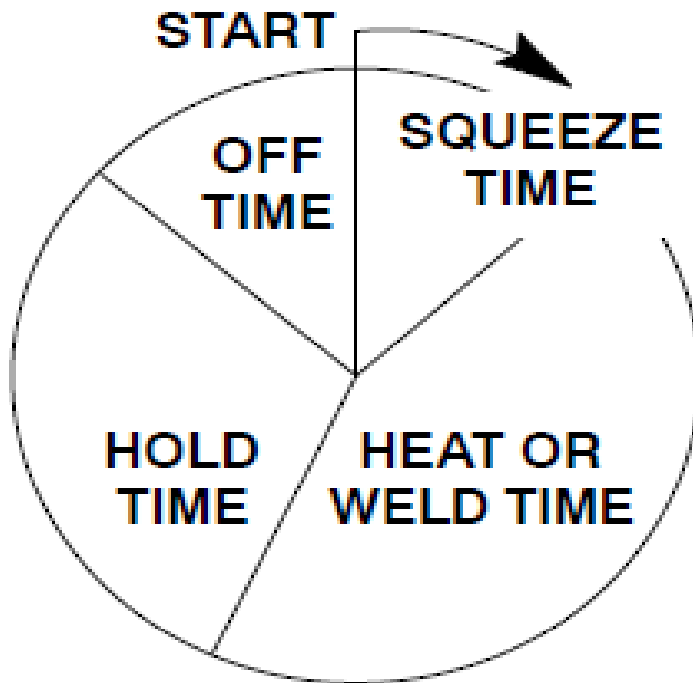




Resistance at Start of Welding	Steel	Aluminium
$R_1, R_7.$ $R_2, R_4, R_6.$ $R_3, R_5.$	Negligibly Small Small Large	Large Small

F_{EI} : Electrode Force
 I_S : Welding Current

Spot Welding Time Cycle^[3]



LITERATURE REVIEW

Research Papers:-

(1) Chase D. Cox, Brian T. Gibson, David R. DeLapp, Alvin M. Strauss and George E. Cook study A method for double-sided friction stir spot welding. ^[5]

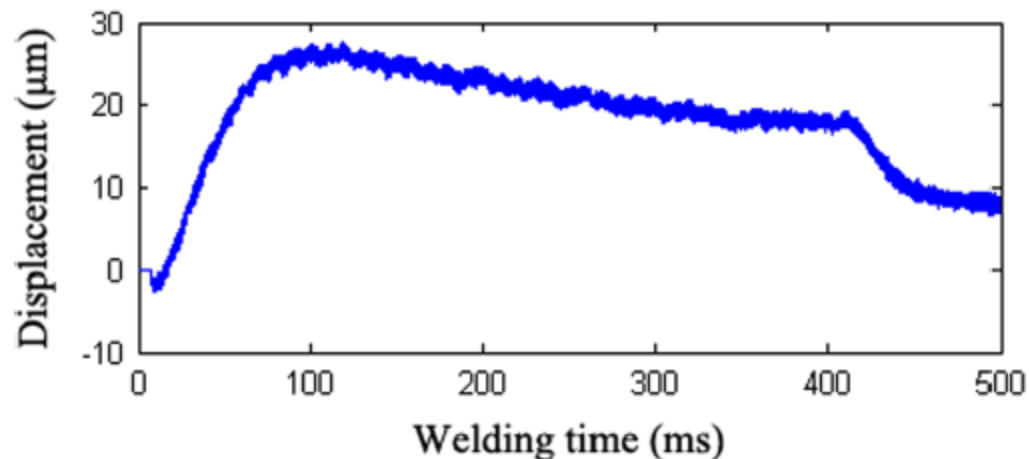
This paper present double-sided friction stir spot welding in rotating anvil made it possible to create quality spot welding the 2 mm thick plate. For the thicker plate, increasing the dwell time resulted in an increase in the strength of the spot weld. In this process capable of creating solid-state spot welds in thin metal plate typical for automotive manufacturing applications.

(2) Jae Hyung Kim, Yongjoon Cho and Yong Hoon Jang study Estimation of the weldability of single-sided resistance spot welding. ^[6]

This paper present weldability of the single-sided spot welding specimen is estimated through the tensile strength test. A certain level of tensile strength can be obtained at the range of welding variables for the optimal nugget sizes, which supports the reliability of the single-sided RSW. thickness of 0.7 mm and tensile strength of 270 MPa. The other was a high strength, low-alloy steel called SPRC with a thickness of 1.2 mm and tensile strength of 340 MPa.

(3) Hongjie Zhang , FujunWang, TaoXi, JianZhao, LijingWang, WeiguoGao study a novel quality evaluation method for resistance spot welding based on the electrode displacement signal and the Chernoff faces technique. ^[7]

This paper present to develop a visual and reliable weld quality assessment method for resistant spot welding, the electrode displacement signal was measured and analyzed. Some statistical features closely related to the weld quality were extracted.



Patents:-

(1) Spot Welding Machine^[8]

Inventor:- Nakamura, Yoshio Kanagawa (JP)

Registration Date:- 21 January 1998

Patent Number:- EP0819496A2

The present invention generally relates to a spot welding machine, and in particular, it relates to a spot welding machine of the type that employs a foot step- ping force (hereafter sometimes "foot force", "stepping w force" or "stepping load") relatively small in magnitude to produce a welding spot pressing force (hereafter sometimes "weld pressing force", "pressing force" or "pressing load") of a favorable large magnitude, allowing a welding such as for processing a bottom side of a is work relatively large in height dimension.

(2) Monitoring Device for Spot Welding Machines^[9]

Inventor:- Nathan O. Clark

Registration Date:- 20 February 1945

Patent Number:- US2370009

This invention relates to welding apparatus and more particularly to an improved monitoring method and apparatus for continuously and instantly indicating the quality of each spot weld being made by an electric spot welding machine.

(3) Condenser Spot Welding Machine^[10]

Inventor:- Sergei Nikolaevich Mescheryak

Registration Date:- 22 February 1972

Patent Number:- US3644699

A condenser spot-welding machine, comprising: a rectifier unit to charge an operating capacitor bank; two gates one of which ensures the discharge of the capacitor bank, the other one connecting the capacitor bank for charging; a control unit wherein serving as the input is a voltage level setter connected in parallel with operating capacitor bank, the output being an actuating unit acting on said gates, while said voltage level setter in the control unit consists of at least two voltage dividers to whose outputs there are coupled shaping capacitors alternately connected to the control unit circuits shaping the control pulses.

(4) Spot Welding System and Method for Sensing Welding Conditions in Real Time^[11]

Inventor:- Kinichi Matsuyama

Registration Date:- 14 January 2003

Patent Number:- US6506997

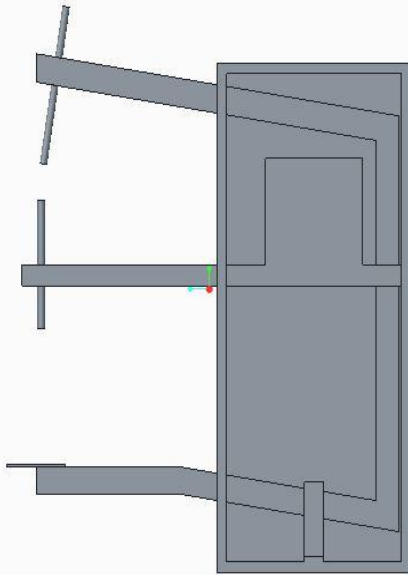
Methods and apparatus are provided for monitoring resistance spot Welding process conditions in real time by using Welding data in an energy balance model in integral form to estimate the mean Weld temperature and to predict process conditions such as occurrence of splash, and Weld diameter. Using predicted Welding process conditions, Welding parameters are modified in real time to prevent splash and produce sound welds.

TROUBLESHOOTING

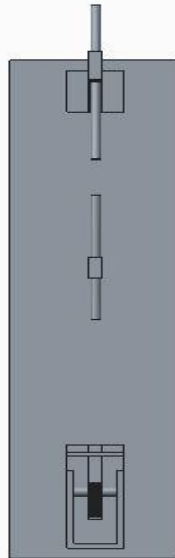
Trouble	Remedy [3]
Tips overheating	Weld time too long. Reduce weld time.
Tips arcing on material.	Not enough tong pressure. Increase tong pressure.
Molten material being expelled out during welding operation.	Incorrect tip alignment. Dress tips so that they align and are flat on the material.
Inconsistent weld nugget.	Inconsistent weld time. Install a weld timer, if applicable.
Hole in middle of weld.	Contact area of tips is too large. Change to a smaller tip diameter or dress tips back to original diameter.
Poor weld or no weld at tips.	Remove coating from material for intimate contact between pieces. Remove oxides and chemical compounds including galvanized coating.

STRUCTURAL MODELLING

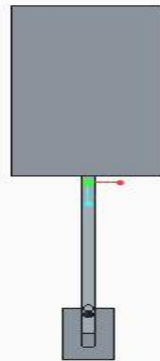
Assembly Drawing of Spot Welding



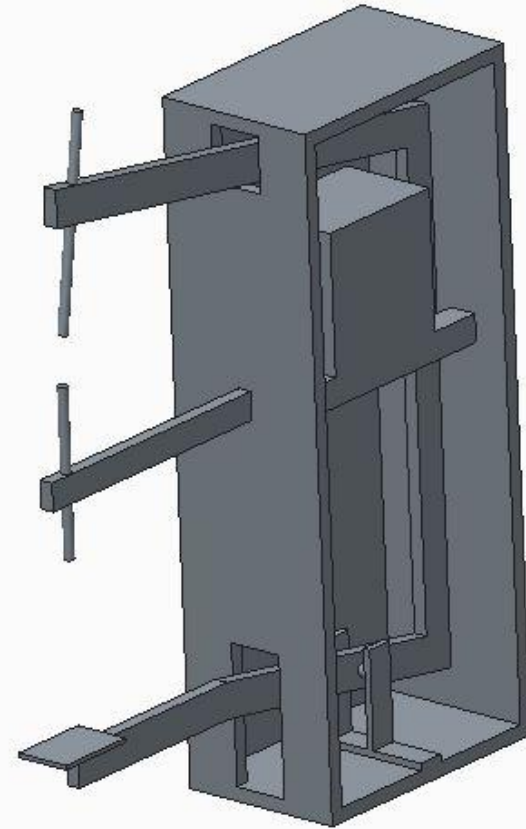
S.V.



F.V.



T.V.



Assembly

COMPONENTS



Transformer:-

Transformer is the main heart of spot welding machine. Its function is to convert high incoming voltage to low outgoing voltage for conversion of low current to high current. Because, Total power, $P=V*I$ is constant. For the purpose of welding we require very high current instead of high voltage, so, we are using transformer.

Specification:-

440V, 10KVA, 3Phase



Limit Switch:-

It is used for start and stop the welding process.



Electronic Timer:-

It is used for set up welding time by seconds or cycles.

Input volt-440V



Rotary Switch:-

It regulates the flow of current.

Input current-24A



Gunmetal Holder:-

It is used for hold the Brass Rod.



Brass Rod:-

It is the stand for Copper Electrode.
Brass Rod Dia.-15mm



Copper Electrode:- we are using 8 Gauge Copper wire for the purpose of electrode.



Spring:-

It is used for the convert force from foot pedal to sheet metal.



Power Cord:- Power cord is the main supply.



Specification:-

- I/P Voltage: 440V
- I/P Current: 10KVA
- Phase:3
- Frequency:50 Hzs
- Capacity of welding thickness: 2 to 6mm

Fig. Preparation Model Of Spot Welding M/C

RESULT & DISCUSSION

Sheet thickness(mm)	Electrode Force (KN)	Weld current -I (Amp.)	Weld Time (cycle)	Hold Time (cycle)	Electrode Dia. (mm)
2.00 + 2.00	5.00	11200	23	4	8
2.22 + 2.22	5.30	11500	26	4	8
2.50 + 2.50	5.60	11800	30	5	8
2.80 + 2.80	6.00	12200	34	6	8
3.00 + 3.00	6.15	12350	36	6	8
3.15 + 3.15	6.30	12500	38	6	8

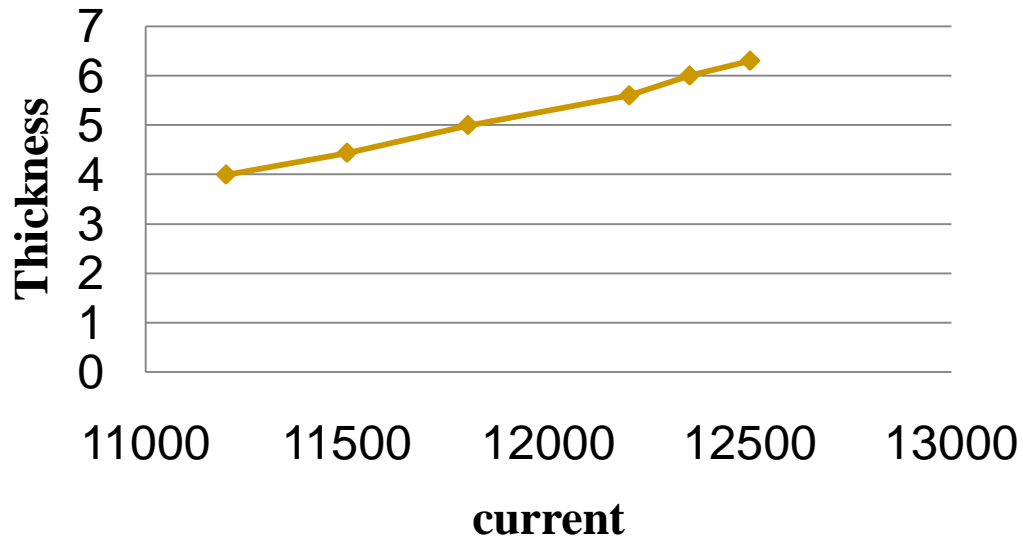


Fig. Current vs.Thickness Diagram

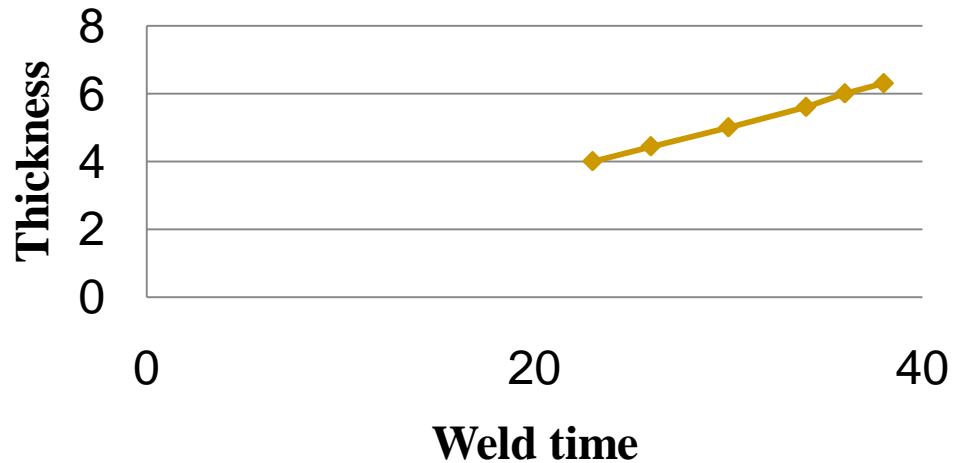


Fig. Weld time vs.Thickness Diagram

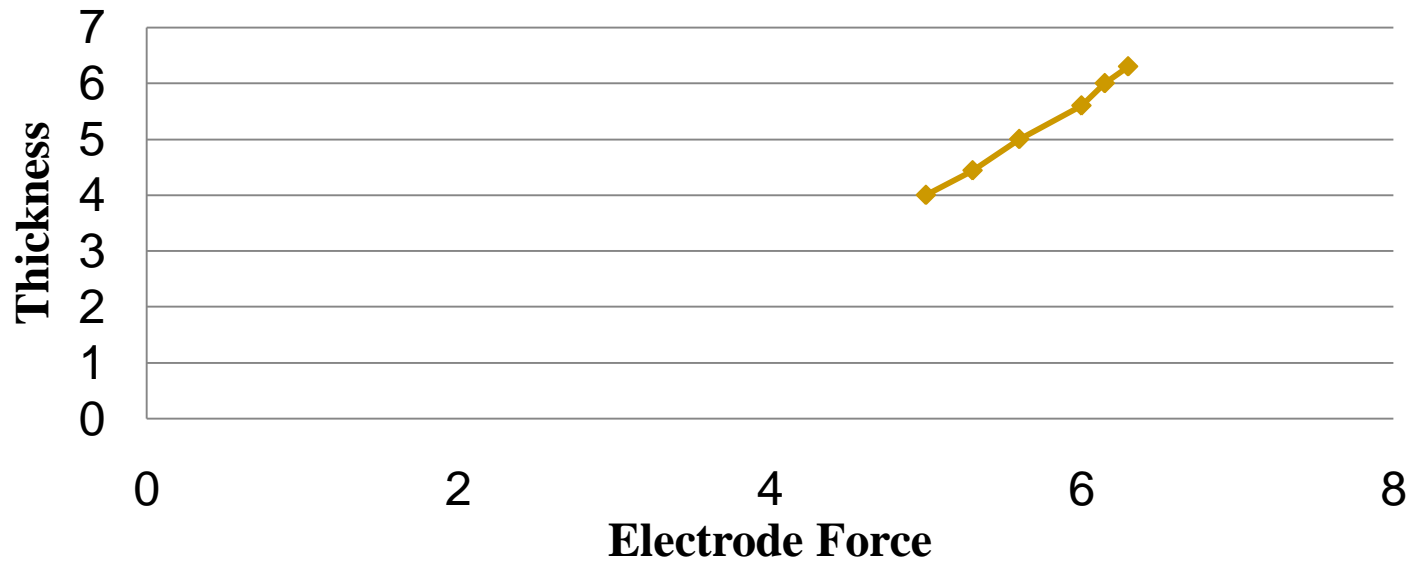


Fig. Electrode Force vs.Thickness Diagram

METHODOLOGY

PROBLEM IDENTIFICATION



LITERATURE REVIEW



FIND THE TROUBLESHOOTING PROBLEM



DESIGN & MODELLING



COLLECT THE COMPONENT



PREPARE A WORKING MODEL



RESULT & DISCUSSION



CONCLUSION



END

CONCLUSION

Spot Welding Machine which is available in market is very costly. We can make spot welding machine our self and we can use it for commercial purpose and domestic purpose also. By this spot welding machine can generate high amp current as per input power supplied.

REFERENCES

- [1] Introduction to Welding Technology by The Hashemite University.
- [2] Resistance Welding Data Book by P. R. Mallory & Co., Inc., Indianapolis 6, Indiana.
- [3] Hand book for resistance spot welding by Miller.
- [4] Resistance welding TALAT lecture4500 prepared by Lutz Dorn, Technische Universität, Berlin
- [5] Chase D. Cox, Brian T. Gibson, David R. DeLapp, Alvin M. Strauss and George E. Cook study A method for double-sided friction stir spot welding. Journal of Manufacturing Processes 16 (2014) 241–247
- [6] Jae Hyung Kim, Yongjoon Cho and Yong Hoon Jang study Estimation of the weldability of single-sided resistance spot welding. Journal of Manufacturing Systems 32 (2013) 505– 512
- [7] Hongjie Zhang , FujunWang, TaoXi, JianZhao, LijingWang, WeiguoGao study a novel quality evaluation method for resistance spot welding based on the electrode displacement signal and the Chernoff faces technique. Mechanical SystemsandSignalProcessing62-63(2015)431–443.

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- [8] Spot Welding Machine by Nakamura, Yoshio Kanagawa (JP).
 - [9] Monitoring Device for Spot Welding Machines by Nathan O. Clark.
 - [10] Condenser Spot Welding Machine by Sergei Nikolaevich Mescheryak.
 - [11] Spot Welding System and Method for Sensing Welding Conditions in Real Time by Kinichi Matsuyama.

Thank You