



## DETECTION OF WEAK SPOT IN BACK PLATE BY USING SINGLE ELECTRODE SPOT WELDING MACHINE

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### ABSTRACT

This work is focusing on finding a suitable method for detection of the weak spot of back plate due to single electrode spot welding. Now a day, in automotive and other manufacturing process, the resistance spot welding technique became a successful joining method for different types of work. Here, we have used two types of sensors: temperature sensor and current sensor for detecting the weak spot. The system is expected to measure the correct welding current and temperature at spot welding for each set current. If the observed value of current and temperature is outside the specified range then there is more possibility for weak spot. This sensor system reads the value of current and temperature while welding and compares it with specified value. The measurement is displayed on the LCD display. If the observed value is outside the specified value then buzzer will get activated. These results are observed on computer with the help of Bluetooth wireless communication.

**Keywords:** weak spot welding, back plate, single electrode spot welding, current sensor, temperature sensor, wireless communication.

### 1. INTRODUCTION

The spot welding technique is one the oldest technique which is being used by the industry. The weld formed by the combination of three processes which are heat, pressure and the time [1-3]. Here, the welding section will be done after detecting the position of the back plate and dust cover is in right position or not? This is a proactive work. The name spot welding implies that the resistance of the part is welded by the localization of the heat in particular area [1-3]. The main factors which decide the amount of current to be flowed in the work piece is by the material thickness, nature of the material and too the cross sectional area of the welding electrodes [1-3].

The selection of the sensor is a difficult criteria in the creation of any system which will make a great difference in the entire lifetime in the time of processing and too there will be its on consequences related to the product quality [4-10]. For the detection of the weak spot in the back plate we are using Current sensor and Temperature sensor.

In the Resistance welding it can be carried out by the flow of current through the electrode tips and two different pieces of metal to join together. The flow of electrical current produces heat in joint due to the resistance of the base metal which results in perfect weld.

In this spot welding machine the main function of back plate is to hold the braking system together so it can function properly. In every drum braking system, each wheel consisting of two curved brake shoes which are mounted on stationary baking plate These brake shoes have shape like letter C covered with friction material from outside. They are connected to one of the side of the brake plate. This assembly is mounted inside a cast iron drum which rotates along with the wheels. The function of springs is to keep the brake shoes in their place. So, when brakes are not active the brake shoes will not contact drum.

### 2. HARDWARE DESIGN MODEL

In this system, it is necessary to give power supply to individual components.

#### a) Hardware description

##### At mega 328

The microcontroller of Atmel family is of 8 bit AVR. The microcontroller will work between 1.8-5.5 volts. The microcontroller achieves 1 MIPS per mega Hertz.

##### Buzzer

The beeper is basically an audio signal device. The use of the buzzer in our prototype is that whenever weak spot found in the back plate buzzer will get activated.

##### Bluetooth protocol (HC-12)

Bluetooth module can be configured only by AT commands. The slave module cannot initiate the connection to other Bluetooth device, but can accept connection. Master Module can initiate connection to other device.

##### LCD

LCD is a very helpful device in order to provide a user interface and also for debugging. LCD is a major component in which it is used in most of the electronic projects.

##### Current transformer

The current transformer is a device which produces an alternating current in secondary winding in proportion with the current which is being measured in primary winding. In current transformer the high voltage current is reduced to lower measurable value of current. So the current flowing through the actual AC transmission



line can be safely measured with this converted current value.

### Temperature sensor

A thermistor does not actually “read” anything, instead the resistance of a thermistor changes with temperature. The change in resistance depends on the type of material used in the thermistor.

### b) Software description

#### Lab VIEW

It is used for the visual programming language. By this software, we can display the value of current and temperature on computer with the help of NI-VISA.

VISA- Virtual Instrument software Architecture is called VISA. This standard for configuration program and troubleshoot for the instrumentation systems that contains GPIB,PXI, Serial Ethernet and USB interface. VISA is a tool that provides programming interface for hardware and development system like LabVIEW, LabWindows also for measurement of Microsoft visual studio. VISA I/O standard can be executed by national instruments known as NI-VISA.

### 3. IMPLEMENTATION AND SYSTEM DESCRIPTION

This work was conducted into two parts of testing. The first part was carried out using current transformer to measure the amount of current flowing to through the system and the second part was carried out using temperature sensor to measure temperature of system.

In temperature testing (Figure-1), we have connected our temperature sensor module with spot welding machine. In this machine, temperature sensor is connected near to the electrode temperature sensor senses the temperature at the welding spot one by one.



Figure-1. Temperature measurement using thermistor.

The measured value will be displayed on the LCD display on the module (Figure-2). If the temperature of the electrode goes above the specified limit then weak spot may occur. Alarm get activated when measure temperature crosses the specified value.

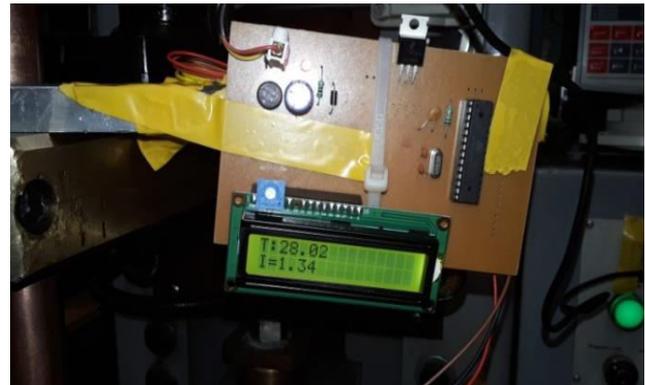


Figure-2. Display for temperature measurement.

In the current testing (Figure-3), we have placed the current transformer (CT) around the electrode as shown in figure. While welding, the current passes through the electrode and equivalent current is produced in CT and readings will be shown on the LCD display. Readings were noted down from the system.



Figure-3. Current measurement using current transformer.

### 4. RESULTS AND DISCUSSIONS

Table-1. Current measurement values.

Plate	spot1	spot2	spot3	spot4	spot5	spot6	spot7	spot8	spot9	spot10
1	40.23	45.30	41.25	47.51	41.12	51.22	46.43	48.51	40.34	50.13
2	50.21	55.23	52.57	58.67	59.89	50.54	48.32	50.41	45.92	42.35
3	17.78	24.25	35.39	66.44	37.98	48.17	29.18	21.19	65.12	40.10
4	57.48	61.67	58.90	46.56	54.23	55.45	56.18	63.26	68.89	69.78
5	65.68	61.56	54.89	48.23	62.34	63.23	57.17	51.26	62.67	66.65
6	48.76	47.45	53.78	58.12	57.56	60.12	65.16	67.24	67.56	62.12
7	65.87	89.73	73.67	51.90	76.67	88.90	70.15	69.36	71.34	75.23
8	60.90	62.29	58.56	56.89	52.67	60.89	64.14	67.34	68.23	69.45
9	51.56	54.67	59.45	58.78	48.78	49.78	60.13	62.23	63.12	58.56
10	55.29	56.98	58.34	55.67	63.98	65.67	50.12	67.29	64.56	67.78
11	48.98	55.38	67.23	60.56	68.23	74.56	70.16	66.27	55.57	66.89
12	57.87	64.34	56.12	67.45	62.45	73.45	50.16	55.26	66.59	65.55
13	23.18	53.56	75.45	66.34	89.12	82.34	90.17	66.25	30.38	45.44
14	66.28	42.98	67.00	68.23	51.37	52.23	40.18	53.24	58.28	53.33
15	55.43	41.87	70.89	69.12	60.38	42.13	60.19	52.23	75.34	62.22



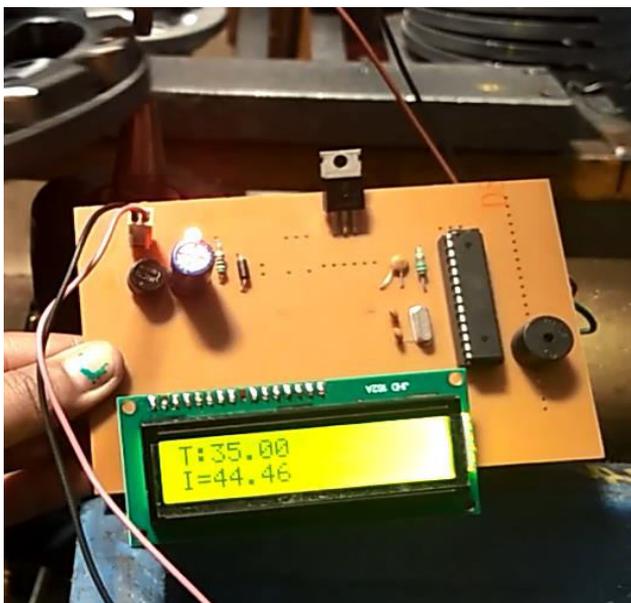
Table-1 indicates the moderate value of the current for spot welding which is in between 40 to 70 Amps. Readings marked by red colour are above moderate value and below moderate value. So we can conclude that, proper current at welding spot between 40 to 70 Amps will give better result.

**Table-2.**Temperature measurement values.

Plate	Spot1	Spot2	Spot3	Spot4	Spot5	Spot6	Spot7	Spot8	Spot9	Spot10
1	22.37	23.32	24.23	23.32	22.23	24.32	23.37	24.31	23.57	24.87
2	26.67	25.37	24.63	25.87	26.45	25.13	24.19	25.23	26.67	25.60
3	25.32	23.56	24.62	25.45	26.34	24.45	25.45	24.35	25.45	26.56
4	23.47	22.76	25.23	21.34	24.45	22.45	21.56	23.67	26.78	22.97
5	26.43	27.89	26.34	25.90	26.67	26.50	25.67	27.10	26.80	90.25
6	23.56	24.65	25.45	22.89	23.73	24.67	25.78	24.29	25.01	25.89
7	26.56	27.89	26.34	27.78	26.87	27.70	26.78	27.38	27.02	28.89
8	27.78	28.90	26.45	27.67	27.83	28.79	27.89	28.47	26.03	28.89
9	21.87	24.23	22.56	22.56	23.98	24.40	22.78	22.56	21.04	22.78
10	22.78	21.43	22.67	20.45	22.77	26.34	23.78	19.23	23.05	22.78
11	24.09	26.45	23.78	24.39	25.55	26.50	25.67	26.12	25.06	26.67
12	26.45	27.60	26.89	25.45	26.67	27.98	26.54	27.34	26.07	27.67
13	24.32	25.78	24.90	25.46	26.55	25.87	26.43	25.56	26.08	27.56
14	27.12	26.78	27.23	25.67	26.66	27.78	28.32	29.78	28.09	29.56
15	27.34	28.90	29.24	28.78	28.45	29.12	28.21	29.39	28.23	29.45

Table-2 indicates the moderate value of temperature for spot welding is in between 22 to 27 deg. Celsius. Readings marked by red color are above moderate value and below moderate value.

The reason behind weak spot welding will be higher value and lower value of temperature. So we can conclude that proper temperature at welding spot between 22 to 27 deg. Celsius will give better result.



**Figure-4.** Result for current and temperature measurement.

In Figure-4, the final result of Temperature and Current is shown on the LCD. These values will appear separately for each spot weld.

## 5. CONCLUSIONS

To determine the weak spot cause due to single electrode spot welding: current transformer and temperature sensors have been used. The device with fast response time and precision is successfully developed for detecting the weak spots in back plate by collecting values of current and temperature from different back plates by current transformer and temperature sensor testing. We have been able to find the differences in each welding spot for different back plates. We have been able to differentiate the strong weld spot and the weak weld spot. This results shows that the sensor system can be very much useful and gives more accurate value for weak spot detection with desirable precision and better accuracy to use as a device This method shows the potential use of current transformer and temperature sensor for weak spot detection in back plate. Development of this setup as a sensor system helps for the detection of weak spot for unskilled operator.

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