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### DESIGN AND FABRICATION OF SPOT WELDING MACHINE

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**Abstract:** Economy, reduced weight & cost, high productive output, use of unskilled manpower, and a high degree of possible precision are some of the outcomes of Spot Welding Machine for many mass produced goods such as electronic appliances, steel furniture, utensils & vehicles. All sheet metal work ranging from a car hood to an airplane body, sheet work can be performed effortlessly using the spot welding machine. This welding method is also called as Resistance Spot Welding (RSW) due to its working based on resistance of materials and the conduction of current through the electrodes. This paper highlights the main components and the vastness applications of the Spot Welding Machine.

**Keywords:** Resistance Spot Welding, Indentation, Weld Nugget, Squeeze time, Weld Time, Cooling Time, Off Time.

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## INTRODUCTION

In Resistance Spot Welding, the weld is made by a combination of heat, pressure, and time. As the name resistance welding implies, it is the resistance of the material to be welded to current flow that causes a localized heating in the part. The pressure exerted by the tongs and electrode tips, through which the current flows, holds the parts to be welded in intimate contact before, during, and after the welding current time cycle. The required amount of time current flows in the joint is determined by material thickness and type, the amount of current flowing, and the cross-sectional area of the welding tip contact surface.

Resistance welding is accomplished when current is caused to flow through electrode tips and the separate pieces of metal to be joined.

Force is applied before, during, and after the application of current to prevent arcing at the work piece. Melting occurs at the faying surfaces during welding.

The resistance of the base metal to electrical current flow causes localized heating in the joint, and the weld is made.

The thickness of the sheets that can be weld depends on the transformer rating and the amount of current flowing through the overlapped sheets. In our setup, Mild Steel sheets of upto 2.5mm can be weld using a transformer having rating 10KVA.

The RSW works on the following principle:

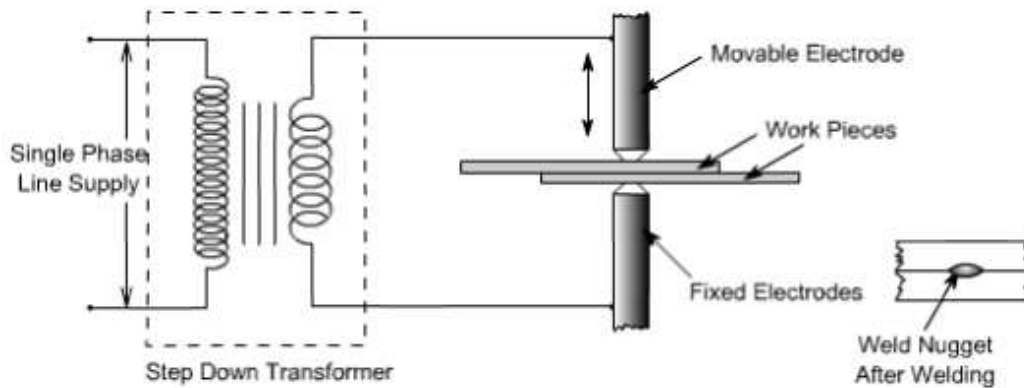


Fig 1. working principle of resistance spot welding

## WELD CYCLE

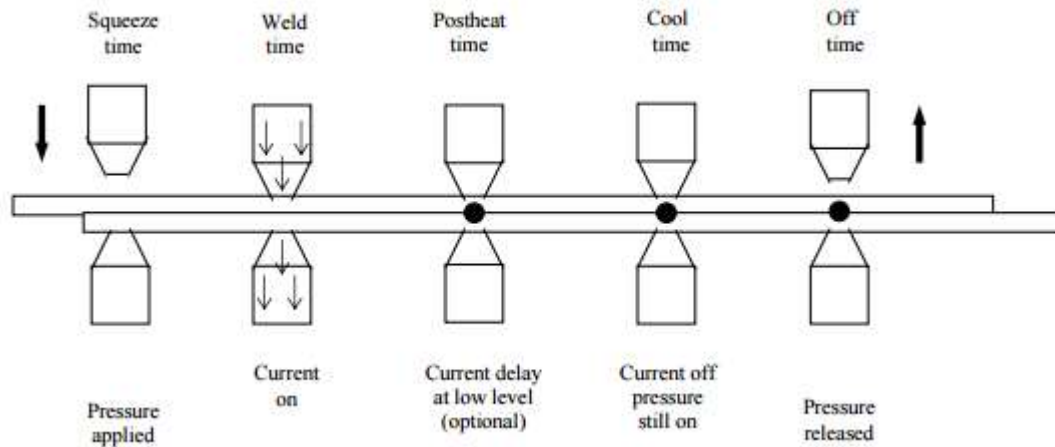


Fig 2. Weld cycle

### Squeeze Time

It is the time period during which the two electrodes are kept intact with the sheets while current is made to flow through the circuit. (Measured in cycles)

### Weld Time

Time allotted for the current to pass through the circuit and develop the short circuit to develop the heat required for nugget generation.

### Cool Time

The time after the weld is generated when the electrodes are kept intact but no current is made to flow through the electrodes.

## 1. HEAT GENERATION

RSW works on the principle of generation of heat due to the resistance developed at the junction of the material. Different materials having different resistances develop different amount of heat. For welding process, some materials require high amount of heat while some require lesser heat.

The amount of heat generated at the junction depends on the formula:

$$H = I^2 \cdot R \cdot T$$

Where: H= amount of heat generated

I = amount of current flowing (amperes)

R = resistance of the material

T = time period for which current flows (in cycles)

## 2. TRANSFORMER & ELECTRODE SPECIFICATIONS

Transformer Type	: Step Down Transformer
Current Input	: 220 Volts, 50Hz, Single Phase
KVA Rating of transformer	: 10KVA
Turn Ratio	: 11
Transformer coil diameter	: 0.9mm (primary), 1.29mm (secondary)
Transformer Output	: 8000amperes, 20volts

## ELECTRODES USED

Electrode Type	: Truncated Cone Type Electrodes
Electrode Material	: Copper
Electrode Tip Diameter	: 2mm

The Tongs used in the setup to hold the electrodes are made of Brass having a diameter of 12mm.

## 3. ACTUAL SETUP





#### 4. CONCLUSION

Thus, the Spot Welding Machine fabricated using a transformer having 10 KVA rating could generate enough temperature to melt a Mild Steel sheet of 2mm thickness. The electrodes used were Truncated Type electrodes which produce minimal deformation at the point of junction of electrodes and sheets.

It is a two way Spot Welding Machine which is different from conventional spot welding machine in the way that it can perform welding functions at two spots simultaneously without having to move the worksheet which is a time efficient manner to perform welding on metal sheets. To perform the welding operation, rocker arm assembly has been used to make or break the contact of the electrodes with the workpiece.

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