WELDING AND ITS TYPES

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ABSTRACT:- **The paper presents the type of welding and its uses in industries. Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by causing fusion, which is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal. In addition to melting the base metal, a filler material is often added to the joint to form a pool of molten material that cools to form a joint that can be as strong as the base material. Pressure may also be used in conjunction with heat, or by itself, to produce a weld.**

***Index Terms*—: shielded metal arc welding, tungsten inert gas welding, electroslag welding, spot welding.**

INTRODUCTION:

Welding is a fabrication or sculptural process that joins materials, usually metals or thermoplastics, by causing fusion, which is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal. In addition to melting the base metal, a filler material is often added to the joint to form a pool of molten material that cools to form a joint that can be as strong as the base material. Pressure may also be used in conjunction with heat, or by itself, to produce a weld.

Some of the best known welding methods include:

- Shielded metal arc welding
- Gas tungsten arc welding
- Gas metal arc welding
- Flux-cored arc welding
- Submerged arc welding
- Electroslag welding

Welding is of various types:-

1. Resistance welding
a. Spot welding
b. Seam welding
2. Electric arc welding
3. Gas welding
4. Projection welding
5. Stud welding
6. MIG (metal inert gas welding) welding

1. RESISTANCE WELDING

It is the process of joining metal pieces together by raising the temperature of the pieces to fusion point and applying a mechanical pressure to join them. In this, the pieces to be joined are held together and a strong electric current of high amperage and low voltage is passed through them. This current comes across a certain resistance in passing from one piece to other and it is this resistance offered to the flow of current which results in raising the temperature of the two pieces to fusion or melting point at their junction. The mechanical pressure applied at this moment completes the weld.

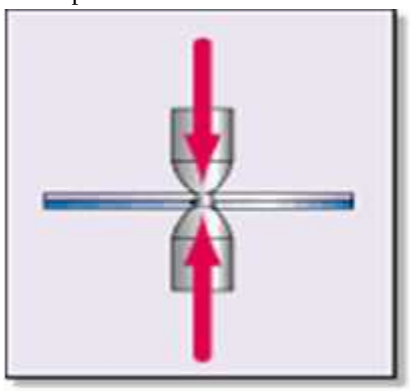

FIG. 3 SPOT WELDING

Resistance welding process depends upon correct application and proper control of the following factors:-

1. Welding current – Enough current is needed to bring the metal to its plastic state for welding.
2. Welding pressure- In this welding mechanical pressure is required to be applied at two stages- first to hold the metal pieces tightly between the electrodes, while the current flows through them, and secondly when the metal has been heated to its

plastic state, to forge or squeeze the metal pieces together to form the weld. The former is known as WELD PRESSURE and the latter FORGE PRESSURE

3. Heat is directly proportional to the square of current and time.

H=I2xRxT.

H = Heat,I2 = Current in amperes, R = Resistance of the work in 0hms,

T = Time the current flow in cycles (50 CYCLES IN ONE SECOND

4. Time of application- It can also be described as cycle time and is the sum total of the following time periods-

a. Weld time – It is the time period during which the current flows through the metal pieces to raise their temperature.

b. Squeeze time or forging time- It is the time period during which the forge pressure is applied to the metal pieces to squeeze them together to form the weld

Hold time- It is the time period during which the metal pieces are held together under forge pressure for a short while to enable the weld to solidify. It can therefore, be called cooling time also.

c. Off-time- After cooling of weld the electrode pressure is released and the metal pieces removed for the next operation cycle. The time period between this release of electrodes and the start of next welding cycle is called off-time.

7. Contact area of electrodes- The weld size depends on the contact area of the face of the electrodes. It can be varied by selecting suitable set of electrodes to provide the desired area of contact at their tips.

1 (a). RESISTANCE SPOT WELDING:The principle of spot welding- in which a transformer core is having primary and secondary winding. One end of the secondary winding is connected to the upper electrode carried in the movable copper or bronze arm A and the other end to the lower electrode mounted on the fixed arm B. In operation the metal sheets S1 and S2 are held and pressed between the electrodes and a strong current at low voltage is switched on. Due to the resistance offered by the sheet metal to the flow of this current the temperature at the contact surfaces rises to fusion point and the weld is completed under the contact pressure of the electrodes.

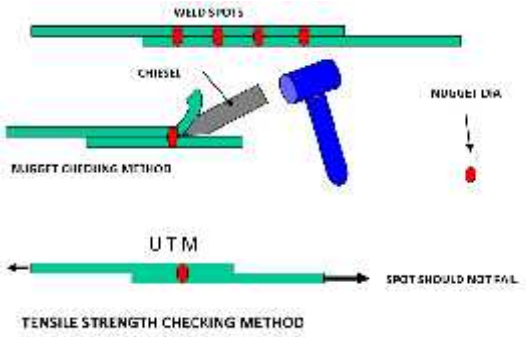

FIG.5 SPOT CHECKING METHOD

SPOT WELDING ELECTRODES &ELECTRODE HOLDER

The electrode holders should possess the following characteristics-

1. They should be good conductors of electricity.
2. They should be good conductors of heat.
3. They should possess high mechanical strength and hardness.

1`(b). RESISTANCE PROJECTION WELDING

This process is similar to spot welding but differs from the latter in that the spots at which the welding takes place are previously located by providing projections at the desired locations on the surface of one of the work pieces. Thus the surfaces of the work pieces are in contact with each other only at the projections. As the current is switched on the projections are melted and the work piece pressed together to complete the weld, by pressing the upper electrodes downwards

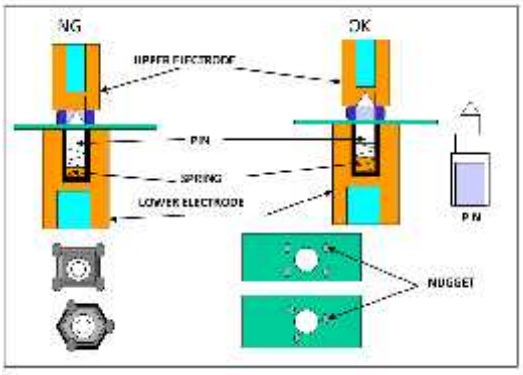

FIG 6. PROJECTION NUT WELDING

1(c). STUD WELDING:It is an arc welding process adopted specifically for welding of studs to structures and other surfaces for fastening other components to them .it is done with the help of a specially designed gun called stud welding gun. As soon as the gun trigger is pressed the current is switched on and a solenoid inside pulls the stud away from work piece by a predetermined distance. This creates an arc between the stud and the work and the stud end and base metal melts. It has a controller, 3 phase transformer, and automatic trigger.

DRAWBACK- If get unbalanced very difficult to balance.

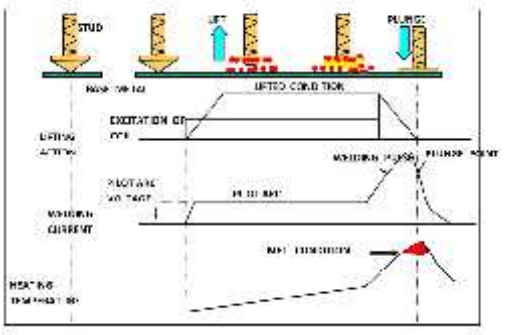

FIG 7. STUD WELDING (FLASH WELDING)

1(d). MULTI SPOT WELDING (MSW) - It is similar to spot welding but as the name suggests it is used for doing multiple spots at the same time. There are number of cylinders having magnetic slips in them which creates magnetic field.

1(e). PORTABLE SPOT WELDING (PSW)- It is a non integral type welding. It consists of a kick less and a coaxial cable. The nugget produced is of very high diameter. The cost production is less because it uses only 1 IT gun in place of 2.

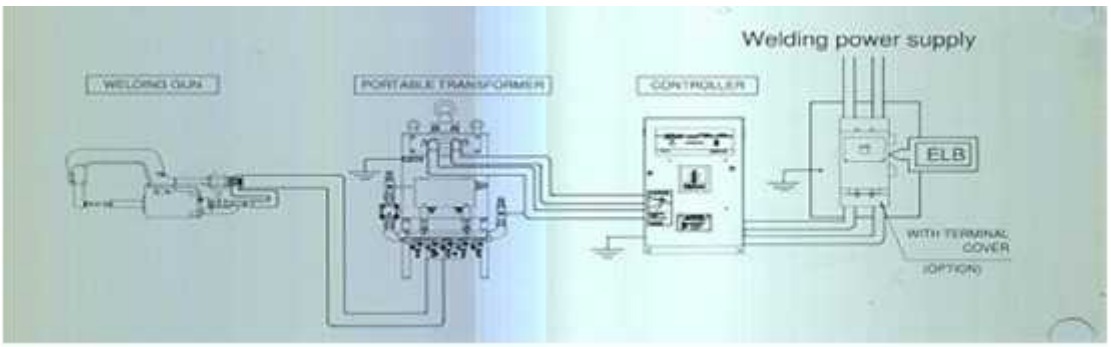

FIG. 10 PSW WELDING SYSTEM

2. GUN WELDING:The specific use of this method is in welding of irregular surfaces, such as fabrication of automobile bodies. The electrodes are actuated either hydraulically or pneumatically. The equipment consists of a transformer, flexible leads connecting the transformer to the welding gun, the welding gun unit comprises of two electrodes and a trigger switch.

3. METAL INERT GAS WELDING (MIG):MIG stands for metal inert gas welding. It involves welding of metals using consumable metal electrode in an inert gas atmosphere. The arc is struck between the electrodes and the work piece. The electrode is in the form of continuous wire which is fed into the arc, by an adjustable speed electric motor, at the same speed at which it is melted and deposited in the weld. The electrode holder also incorporates passage for supply of inert gas for shielding the electrode, molten weld metal, arc from atmospheric contamination. Usually D.C. with reverse polarity is used in MIG welding. Use of this enables a deeper penetration.

3(a). CO2 MIG WELDING: In this process the electrode used is either flux cored or magnetized flux coated. Co2 is used as a shielding gas. In either case the filler wire or electrode is fed the arc in the same way as in MIG welding.

4. TUNGSTEN INERT GAS (TIG) welding: it is a manual welding process that uses a nonconsumabletungsten electrode, an inert or semi-inert gas mixture, and a separate filler material. Especially useful for welding thin materials, this method is characterized by a stable arc and high quality welds, but it requires significant operator skill and can only be accomplished at relatively low speeds. GTAW can be used on nearly all weldable

metals, though it is most often applied to stainless steel and light metals. It is often used when quality welds are extremely important, such as in bicycle, aircraft and naval applications.

CONCLUSIONS: It is concluded that all type of welding have their respective significance in their respective fields and all the welding type are necessary for the metal joining but difference is that all will have their respective significance for different situations.

REFERENCES:

- www.wikipedia.com
- www.welding and its types.com