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CLADDING ENGINEERING: IMPROVEMENT IN SURFACE PROPERTIES BY CLADDING MILD STEEL ON MILD STEEL PLATE WITH ELECTRIC ARC WELDING.

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Abstract: Surfacing is defined as the application by welding, brazing, or thermal spraying of a layer, or layers, of material to a surface to obtain desired properties or dimensions as oppose to making a joint. In the present day's surfacing industry, weld surfacing or overlaying is a well established and proven, convenient and economic alternative to the use of the solid alloy or cladded plate for improving the life of engineering components operating under wear and corrosion. Present work demonstrates advantages of cladding same mild steel on mild steel specimen by electric arc welding. Samples are prepared using standard arc welding technique. Then samples are tested for hardness along the lateral direction. All samples showed considerable increase in hardness of samples.

***Key Words*: Arc Welding, Cladding, Hardness, Mild Steel.**

I. INTRODUCTION

Industrial application of surfacing for industry is the need for today's fast growing industries for cost cutting and for the other economy factors, technical issues, productivity improvements and a quest for having newer materials with better properties. The cladding of low strength material for improving properties is the key for all the industries for the successful working of /on the material. The metals are cladded for improving Wear resistance, Corrosion resistance and many other applications for thermal working and other processes. The application of metal cladding is being used for making Tool, Utensils and Boilers

Improving the productivity and quality of weld surfacing operation requires a thorough understanding and proper control over the variables which affect dilution. Minimization of dilution is possible but not at the stake of bond integrity.

The Figure 1 Shows the percentage dilution:-

Percentage dilution = $[A_p / (A_p + A_r)] \times 100$

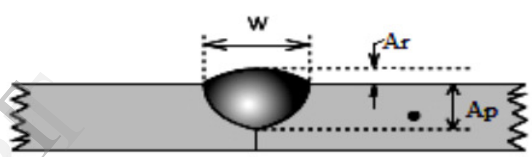

Figure 1: Dilution as shown in a weld bead

Where: Ap – Area of penetration,
Ar – Area of reinforcement and
W – Width of weld bead.

Arc welding is a type of welding that uses a welding power supply to create an electric arc between an electrode and the base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is usually protected by some type of shielding gas, vapor, or slag. Arc welding processes may be manual, semi-automatic, or fully automated. First developed in the early part of the 20th century, arc welding became commercially important in shipbuilding during the Second World War. Today it remains an important process for the fabrication of steel structures and vehicles.

II. EXPERIMENTAL WORK

Experimental part is divided in three parts

A. Preparing test specimen
B. Cladding test Specimen
C. Testing test specimen
   i. Hardness
   ii. Micro structure

2.1 Preparing test specimen

Standard test specimen is prepared. Top surface of the metal specimen is prepared to perform cladding process.

2.2 Cladding test specimen

Test specimens were cladded with suitable techniques. There are lot many techniques available in the market. Present work used electric arc welding to perform the cladding process. Electric arc is easily available process and relatively cheaper than other processes.

2.3 Testing Specimen

Two tests were performed to know the properties of surface after cladding.

i. Hardness
ii. Micro structure

III. RESULTS AND DISCUSSIONS

3.1 Testing for Hardness

Test specimens were tested for hardness of the surface.

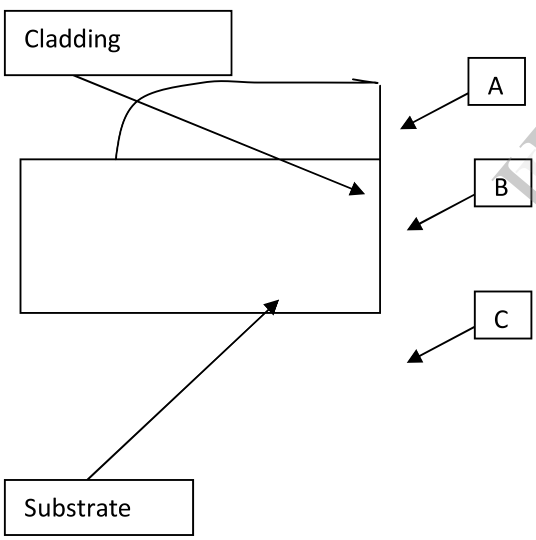

Figure 2: Schematic diagram of cut section of test specimen with cladding

It was found that harness of the sample increased with cladding top value of the harness achieved is 42. Magnitude if the hardness value is increased from 20 to 42.

Table 1: Harness of cut section

S.No.	Point	Hardness
1	A	20
2	B	27
3	C	42

Figure 2 shows the location of points in cut section of test specimen. Table 1 shows the hardness values at each point.

3.2 Testing for microstructure

Test specimen was tested for micro structure to check evenness of the structure. Figure 3 shows that the microstructure of the sample in cladding zone is even and smooth.

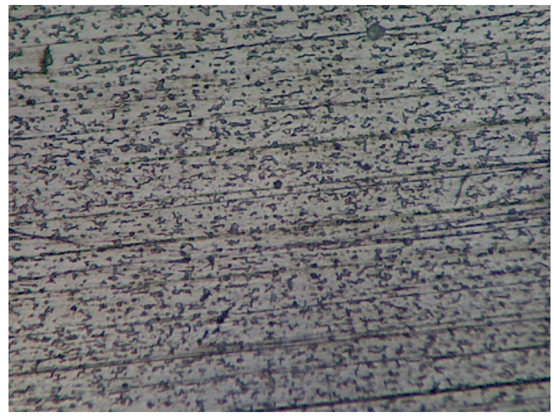

Figure 3: Microstructure of test specimen

IV. CONCLUSION

Test specimen tested for hardness showed lot of improvement in hardness of the surface. The micro structure shows a even behavior over the entire range of cladding section. This showed that cladding improves the surface properties of substrate a lot. This also shows that electric arc welding is also a suitable technique to produce a cladding on the samples.

V. FUTURE SCOPE

Present work tries to emphasis the importance of cladding to improve the properties of surface. It used only hardness as the criteria which plays most important role at surface. The other mechanical properties of surface can be evaluated to prove the hypothesis. More tests can be performed to check the surface evenness too.

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