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Development of Tack Welding fixture: an Overview

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ABSTRACT:In this paper a proposal in given on the appropriate fixtures needed during tack welding of front chassis for a wheel loader. The main load carrying member of any equipment is the chassis which consists of many sub-components that are joined by welding. To achieve high productivity while at the same time reduce unit cost and achieve interchangeability during assembly, it is important to have suitable setting arrangements during tack welding to improve the work holding of the components. This necessitates the development of fixture which helps in securing the job during tack welding.

KEYWORDS: Tack Welding, Copper Material (Pin & Plate) Battery Bracket.

I. INTRODUCTION

In this paper Tack welding is an important welding process that most welders will become quite familiar with their career. For anyone new to welding you might be asking yourself "What is Tack Welding?". Tack welds are essentially temporary welds that help to hold two metals in placeThe main purpose of the tack weld is to hold the two pieces of metal. Welding is a reliable and efficient metal joining process and widely used in construction, shipbuilding, steel bridges, and nuclear power, chemical and petrochemical industries, supporting frames for pressure vessels and piping due to the demand from the design point of view. Tack welds are small and temporary welds used to hold parts together before a final weld occurs. Tack welds help keep the right alignment and distance between the parts that are being fused together.It'ssafe to say tack welding is pretty important. Keep reading to find out more about how these welds are used in the welding industry, as well as more on how the process works. In many different welding processes, the materials and parts will be clamped to fixtures that will prevent movement and keep the alignment correct. Tack welds are convenient because they help eliminate the need to clamp these materials. Often, tack welds are used for low-volume production jobs that don't justify the need to purchase fixtures.Tack welds can also be removed if you find that the parts being welded are not properly aligned. You can redo tack welds and refine them fairly easily.

Due to the highly conductive properties of copper, the heat from small particles of weld spatter that hits the face of the welding square is quickly conducted away, thereby preventing bonding of the materials

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Base Plate With Mild Steel

Fig.1**Spatter observed in Nut & Bush of K4 frame Battery Bkt. Part More than 30% rework of battery bracket / day.**

Mild steel is a type of low carbon steel. Carbon steels are metals that contain a small percentage of carbon (max 2.1%) which enhances the properties of pure iron. The carbon content varies depending on the requirements for the steel. Low carbon steels contain carbon in the range of 0.05 to 0.25 percen**t**. There are different grades of mild steel. But they all have carbon content within the above-mentioned limits. Other elements are added to improve useful properties like corrosion resistance, wear resistance and tensile strength. Carbon content is uniformly increased by heat treatment steel. As carbon content increases, steel develops hardness but loses ductility. This means that the metal becomes brittle and may fracture instead of bending when applying an excess load.

The manufacturing processes for mild steel are similar to other carbon steels. Higher carbon steels just contain more carbon, resulting in different properties like high strength and hardness values compared to mild steel.

These processes have developed over time and are now much more cost-effective than before. In modern manufacturing, three steps are involved in manufacturing mild steel out of pure iron.

Chemical Properties:mild steel has lower carbon content than medium and high carbon steels. The carbon content is up to 0.25% in mild steel but some schools of thought consider a carbon steel as mild steel up to a carbon content of 0.45%.

The low carbon content makes this steel a highly machinable metal. It can be cut, machined, formed into intricate shapes without adding proportional stresses to the workpiece. It also facilitates better weldability.

Mildsteel is ideal for welding and metal fabrication. Low carbon mild steel is extremely versatile as a weldable metal -- carbon percentages cap out at around 0.25-0.30% -- and have few, if any, unnecessary alloying elements. Mild steel is less expensive than other metals and is easier to work with than other welding materials.The higher the carbon content, the more difficult the steel is to weld. Low carbon mild steel is the industry standard for room-temperature welding work.

From the above study we observe that during welding there is spatter accumulation inside the bush and nut of mild steel battery bracket Because of metal to metal contact during welding there was 30% rework of battery bracket / day. Needs to do rework of main stand for spatter accumulation inside bush.

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II. DEFECT ANALYSIS

PROJECTION WELDING DEFECT DISTRIBUTION			
DEFECT PHENOMENON TYPE	AVG. QTY / MONTH	% CONTRIBUTION	CUM %
Spatter inside Bush	200	70%	70%
Bush Burn	40	14%	84%
Tack Missing	28	10%	94%
DDS	5	4%	98%
Bush Missing	2	2%	100%
Total	285	100%	

Fig.2 Analysis Table

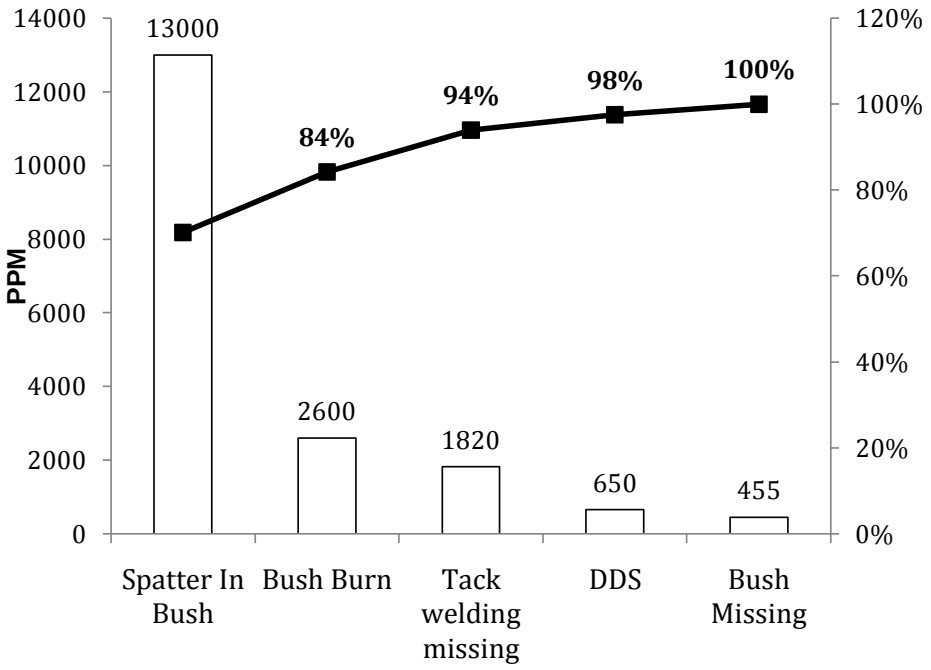

Fig.3 Defect Phenomenon

From the above table and the graph analysis We observed that defect in mild steel. High inhouse rejection at sub-assembly cell. Spatter observed in nut and bush of K4 battery bracket frame. Part more than 30% rework of battery bracket per day.

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Copper Base Plate With Pins

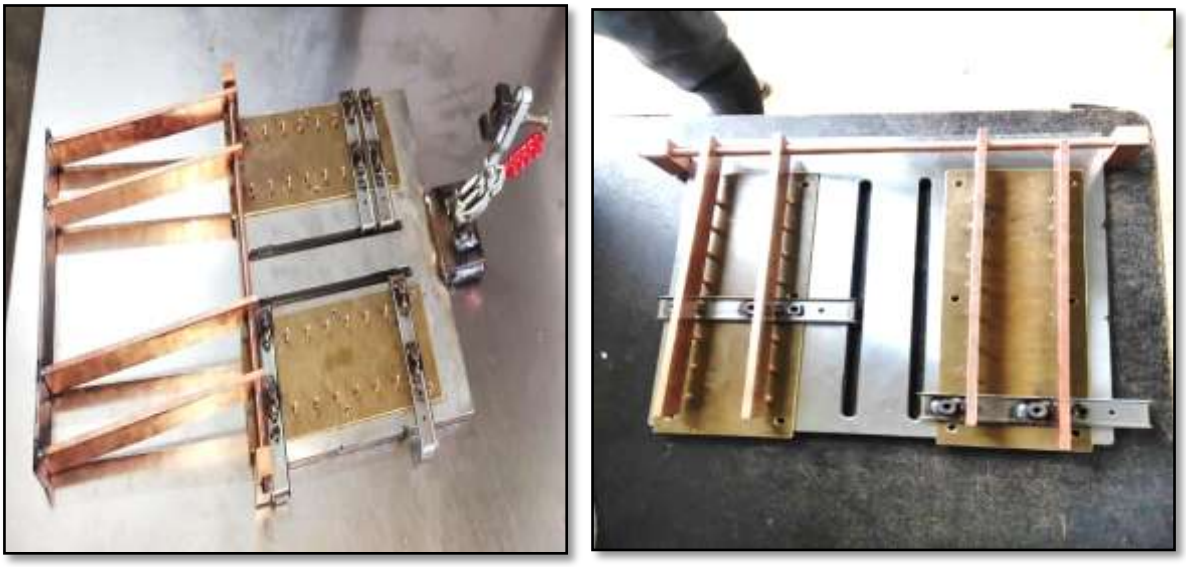

Fig.4**Tack welding fixture with Copper base plate with pins**

Copper has a face centred cubic crystal structure. It is yellowish red in physical appearance and when polished develops a bright metallic lustre. Copper is a tough, ductile and malleable material. These properties make copper extremelysuitable for tube forming, wire drawing,spinning and deep drawing. A new line of copper-plated magnetic welding squares from industrial magnetic include. (Boyne City, MI) resist corrosion and prevent weld spatter from sticking to their surface. Due to the highly conductive properties of copper, the heat from small particles of weld spatter that hits the face of the welding square is quickly conducted away, thereby preventing bonding of the materials. Properties of copper are Excellent heat conductivity,electrical conductivity, good corrosion, biofouling resistance, good machinability.Tough pitch copper contains stringers of copper oxide (<0.1% oxygen as Cu_2O) which does not impair the mechanical properties of wrought materialand it has high electrical conductivity. Oxygen-free and phosphorus deoxidised copper are more easily welded.

From the above study we observe that,during welding there is no spatteraccumulation inside the bush and nut of copper base plate. Because of no metal to metal contact during welding there was 0% rework of battery bracket / day.

Fig.5 Development of Tack Welding Fixture

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Experimental Validation

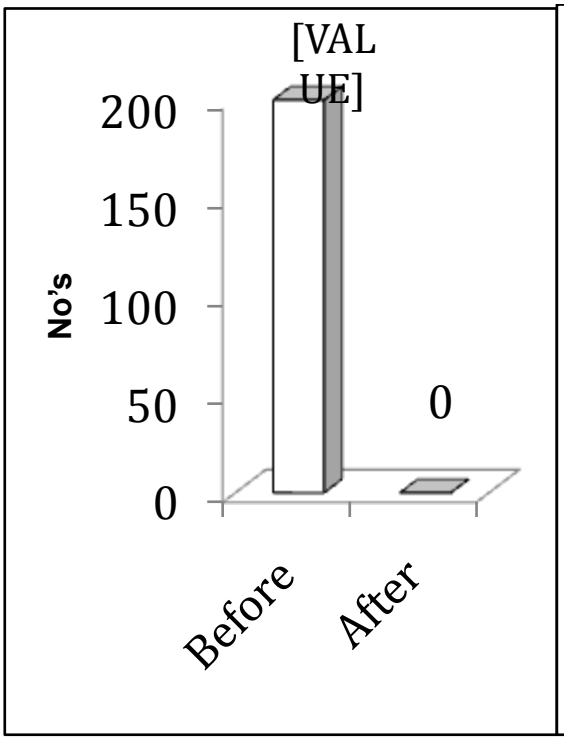

Fig.6 Spatter Removal Qty (No's)

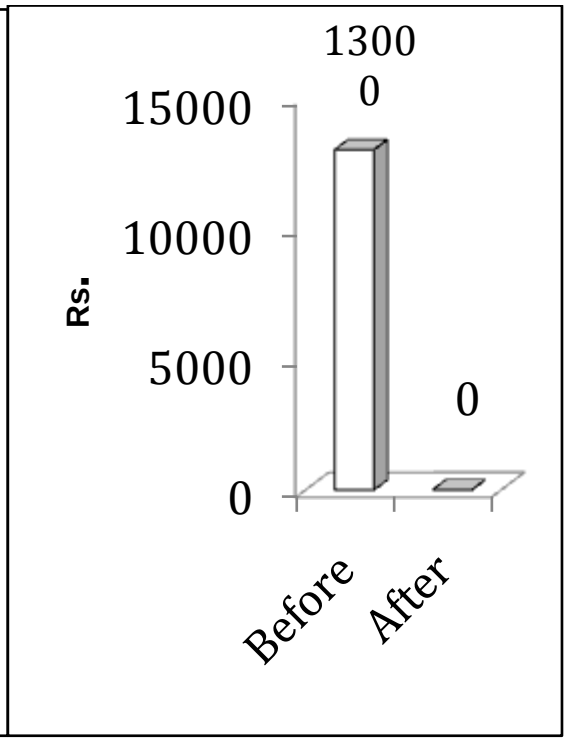

Fig.7 Rework Cost

III. CONCLUSION:

After long consideration we conclude that copper is suitable for welding operation.As copper is more resistive so rework operation is eliminated.As in whole process no metal to metal contact takes place, so quality is improved. Reduced 100% spatter accumulation inside bush and nut.

We got the expected results after repeated and accurate experimentrs.

IV. ACKNOWLEGDEMENT:

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