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Elimination of Spot Weld Missing at Partner LineStage Main Body 20

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ABSTRACT: Resistance spot welding is one of the primary welding techniques extensively utilized in the automotive and aviation industries. Some 2000-3000 spots are made in a single body of automobiles in the case of cabin spot welding 28 spots are created, which are numerically controlled nowadays. Resistance spot welding works on the principle of Joules's law of heating, where the heat generated is directly proportional to the square of the welding current. This welding technique is generally used to join the thin sheets of steel, titanium, aluminium, magnesium, etc. The welding of non-ferrous metals like aluminium and magnesium is quite tedious owing to their high thermal conductivities and the oxide formation on their surfaces. The technique presented here is for eliminating the missing of spots and elimination of quality complaint. The interlock system along with the Program Logic Unit de-clamps the clamp only when the actual value is equal to the set value.

KEYWORDS: Resistance spot welding, Joule's law, Interlock system, Program Logic Unit.

I. INTRODUCTION

Cabin spot welding using Program Logic Unit in Light Commercial Vehicle is a critical process in automotive manufacturing that ensures the structural integrity and safety of these vehicles. Spot welding involves joining metal sheets through the application of heat and pressure, creating strong and durable connections. In LCV, which are often subjected to demanding operational conditions, such as frequent loading and unloading, precise and reliable spot welding is essential to guaranteeing the vehicle's structural strength and longevity. The role of PLCs in the process is pivotal. PLCs serve as a central control system, automating and monitoring the spot welding process with precision and efficiency. PLCs are programmed to control various parameters of the welding operation, including current, voltage and electrode pressure, ensuring consistent weld quality across production batches. PLCs enable seamless integration with the other manufacturing processes, facilitating data exchange and synchronization.

II. RELATED WORK

Earlier spot welding was done manually using the spot welding gun. Program Logic Unit integration was not implemented, which caused 72% defect at the quality gate and in turn caused customer complaint. Missing of 12 roof spots due to operator negligence lead to rework of the cabin.

III. METHODOLOGY

The methodology described in the document revolves around the welding process involved. Both components, the clamp and the de-clamp, were subjected to testing. For using the tool, the design of the tool is to be made first. The cabin parts are assembled, as it passes down from MB10 stage and arrives at the MB20 stage. As it arrives at the

respective stage the conveyor is clamped through interlock mechanism. At this stage the welding electrodes are places on either side of the joint, creating the weld nugget where the weld must occur. Spot welding gun detects the formation of nuggets through the use of sensors. These sensors are integrated into the welding electrodes or gun itself. When a sufficient amount of heat is generated during the welding process, indicating the creation of spot nugget, the sensors detect changes in parameters such as electrical resistance, voltage or current. Once the nugget is created the sensors identify the formation and send a signal to the controller. The signal serves as a feedback to the controller indicating the welding process. The signal from the controller is then transmitted to the PLC through a wired communication interface. The PLC is programmed to interpret these signals as indication of successful spot welding. Upon receiving the signal the PLC processes the information and updates the control logic. The PLC communicates with the HMI about welding updates. As it receives the updates the actual count is updated every time when the process take place. When the actual value and set value is found equal the clamp is de-clamped. This resulted in elimination of defect at the quality gate. Which in- turn provided rejection of complaint from the customers.

IV. EXPERIMENTAL RESULTS

As the Program Logic Unit setup has done, the missing of spots have been eliminated and the clamp is de-clamped only when the actual value is found equal to the set value. This resulted in elimination of defect at quality gate and customer complaint.

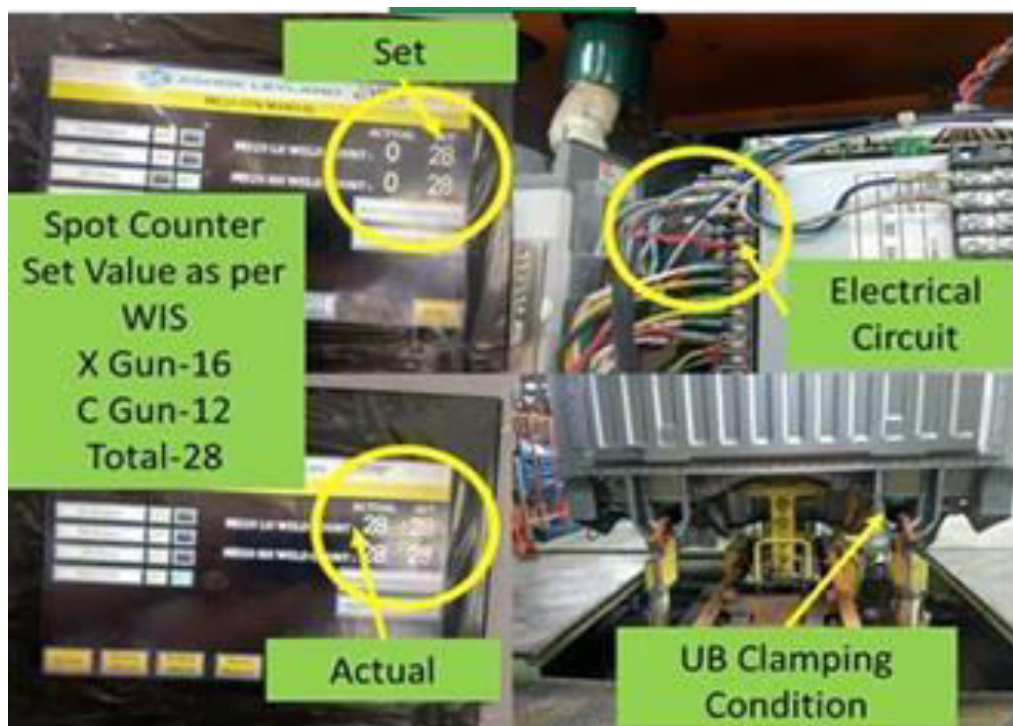


Fig: 1-Experimental Setup of Spot Welding Using PLC

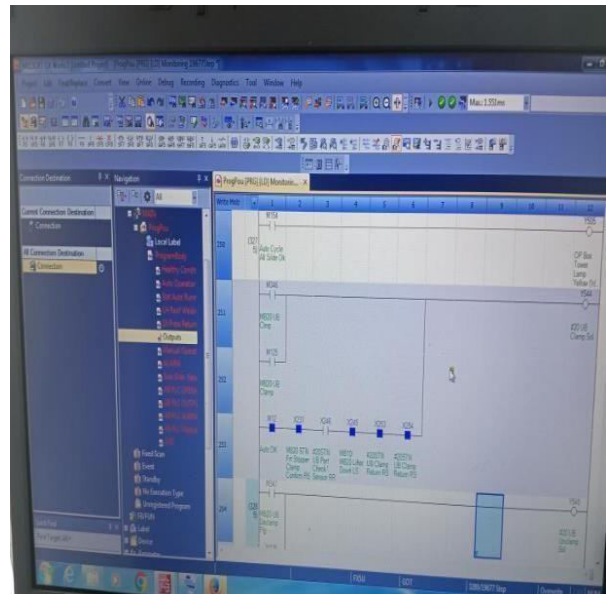
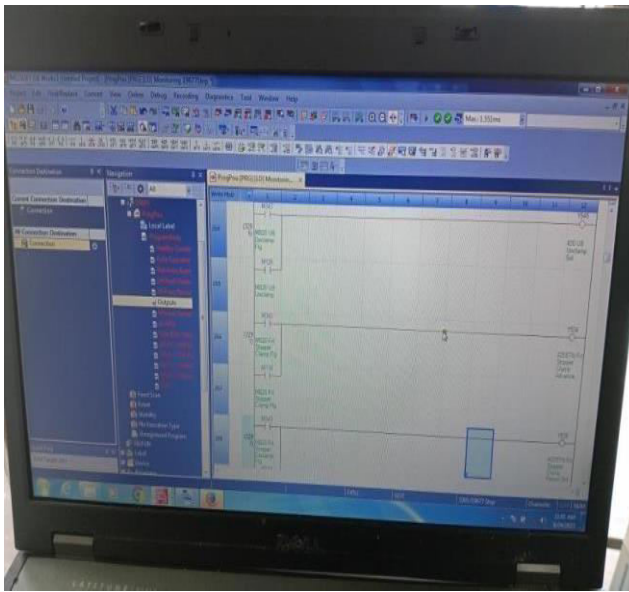


Fig: 2-Updated PLC Ladder Program

INFERENCE:- In MB20 stage roof spot missed and it leads the quality defect due to no POKA YOKE System and spot gun count not available in system.

INFERENCE:- Program modified and gun and Gun countout interlock introduced to avoid spot missing on roof

V.CONCLUSION

In summary, the problem statement focuses on the challenges encountered in the missing of spots at the MB20 stage. A comprehensive list of issues related to spot miss has been identified. It is imperative to address these complexities for the seamless operation of welding system. The "Four M's" framework, encompassing Man, Machine, Material, and Method, has been employed to analyse and resolve the root causes of these issues systematically. This approach allows for a holistic understanding of the challenges and facilitates effective problem-solving. The validation process highlighted the significance of quality control measures, as a substantial number of vehicles undergo inspection at the quality gate. The data revealed specific spot welding concerns, particularly in the Partner, emphasizing the need for continuous quality improvements. The proposed solution involves the implementation of auto clamp option enabled in logic and clamp opening operation interlinked with spot count. Which in turn will decrease the spot missing and increase the production count and reduce the rework for the spots missed due to human negligence thus, gains profit in such a way of excess production. Thus, thereby it validates its effectiveness. In conclusion, addressing elimination of quality complaint at line stage MB20 is a crucial challenge for maintaining product quality and customer satisfaction. By employing systematic analysis, implementing effective solutions, and conducting thorough validation, the organization can enhance the assembly process, reduce defects, and ensure the production of reliable and high-quality vehicles.

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