APPLICATION OF ROBOTIC ARC WELDING TECHNOLOGY FOR MANUFACTURE OF TWO WHEELER FRAMES

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Triggered by the boom in the automotive industry and driven by the highly competitive environment in the Indian industry, several OEM's have chosen to introduce new technologies to improve their throughput and quality. One of the technologies that has received great attention in this regard is the Robotic arc welding that ensures uniform quality and very high production rates. This technology is becoming increasingly sought; as it suits the mass production requirements exceptionally well with high flexibility.

However adoption of this technology in the industrial environment is not so smooth as it appears to be, especially when the industry switches over from conventional manufacturing methods to modern methods. Several engineering issues are to be analyzed and appropriate measures are to be established for successful implementation of the technology besides basic rudimental steps like selection of the right equipment, welding process etc. Further, amongst other quality aspects that are required to be met, the control on dimensional tolerances is a critical requirement. The control of distortion produced during welding has been a subject of interest as the components are mostly made of thin walled tubes and sheet metal components that are vulnerable for distortion and considerable extent of welding is made in these components during assembly welding of the frames.

Recently Welding Research Institute had assisted two major two wheeler manufacturers for the successful implementation of robotic arc welding of the frames. A holistic approach was adopted for the successful implementation of the Robotic welding of two wheeler frames. The main objective of this present work was to evolve and implement all critical measures that would result in control of distortion in welding and other quality aspects besides achieving the required cycle time to synchronize with the line-mode mass production environment.

This comprised amongst other things, simulation of the complete welding process of the sub-assembly and main assembly for single and multi robot welding to evaluate the temperature regimes realized, deformation behavior of the total frame while using multiple heat sources, identification of the appropriate clamping locations and extent of clamping based on the above analysis for fixture engineering, optimization of the welding parameters to obtain the required penetration in the tube, optimization of weld sequence to obtain the required quality levels in terms of overall dimensions and residual stress in high stress regions and establishment of the above process during the actual production environment to suit different cycle time requirements in response to market driven demands. Besides, the quality of the components made by the vendors of the OEM were also considered and modified to successfully implement the robotic arc welding technology. The above technology has been successfully implemented in two OEM's in India.

This presentation highlights the various steps from concept to establishment of the robotic arc welding technology and the results achieved. This should provide valuable information to all those in the automotive and related industries who have plans to implement robotic welding in production of welded frames.