OPTIMIZATION OF CHARACTERISTICS IN RESISTANCE SPOT WELDING FOR DISSIMILAR MATERIALS UTILIZING ADVANCED HYBRID TAGUCHI METHOD COUPLED CoCoSo, EDAS And WASPAS METHOD

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ABSTRACT

Resistance spot welding is the most significant joining technique utilized in various industries, like automotive, boilers, vessels, etc., that are commonly subjected to variable tensile-shear forces due to the unsuitable use of the input spot welding variables, which mainly cause the welded joints failure during the service life of the welded assembly. So, in order to avoid such failures, the welding quality of some materials like aluminum must be improved taking into consideration the performance and weight saving of the welded structure. Thus, the need for optimizing the used welding parameters becomes essential for predicting a good welded joint. Accordingly, this study aims at investigating the influence of the spot-welding variables, including the squeeze time, welding time, and current on the tensile-shear force of the similar and dissimilar lap joints for aluminum and steel sheets. It was concluded that the use of Taguchi design can improve the welded joints strength through designing the experiments according to the used levels of the input parameters in order to obtain their optimal values that give the optimum tensile-shear force as the response. Experimentation is planned as per Taguchi's L9 orthogonal array. Assumptions of ANOVA are discussed and carefully examined using analysis of residuals. The various recent type of Hybrid Taguchi methods i.e. CoCoSo, WASPAS and EDAS based Taguchi methods are applied to investigate the output responses of resistance spot welding operation. The results revealed that the welding time and current are main affecting parameter of tensile-shear strength and nugget diameter. Finally, experimental confirmation was carried out to identify the effectiveness of this proposed method. Minitab 19 offer both mean analysis as well as S/N Ratio base DOF by making suitable orthogonal array.

Keywords— ANOVA; COCOSO; EDAS; Minitab; Orthogonal array; Resistance spot welding; Taguchi design method; WASPAS.