Vibration analysis of resistance spot welding joint for dissimilar plate structure (mild steel 1010 and stainless steel 304

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Abstract: Resistance spot welding (RSW) is a proficient joining method commonly used for sheet metal joining and become one of the oldest spot welding processes use in industry especially in the automotive. RSW involves the application of heat and pressure without neglecting time taken when joining two or more metal sheets at a localized area which is claimed as the most efficient welding process in metal fabrication. The purpose of this project is to perform model updating of RSW plate structure between mild steel 1010 and stainless steel 304. In order to do the updating, normal mode finite element analysis (FEA) and experimental modal analysis (EMA) have been carried out. Result shows that the discrepancies of natural frequency between FEA and EMA are below than 10 %. Sensitivity model updating is evaluated in order to make sure which parameters are influences in this structural dynamic modification. Young's modulus and density both materials are indicate significant parameters to do model updating. As a conclusion, after perform model updating, total average error of dissimilar RSW plate is improved significantly.

Keywords: Resistance spot welding, normal mode analysis, model updating, modal testing

1. **Introduction**

Welding is the process of joining metals with the presence of heat, with or without the application of pressure and filler metal [1]. A typical automotive structure could contain thousands of spot weld joints that contribute significantly to the vehicle's structural stiffness and dynamic characteristics [2]. RSW has excellent paybacks such as low cost, high speed and suitability for automation which makes it an attractive choice for auto-body assemblies, truck cabins, rail vehicles and home appliances [3]. Joining of dissimilar materials is of risky as the process necessitates a proper matches concerning the chemical, physical, and mechanical