Finite element normal mode analysis of resistance welding jointed of dissimilar plate hat structure

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Abstract. Structural joints offer connection between structural element (beam, plate, solid etc.) in order to build a whole assembled structure. The complex behaviour of connecting elements plays a valuable role in characteristics of dynamic such as natural frequencies and mode shapes. In automotive structures, the trustworthiness arrangement of the structure extremely depends on joints. In this paper, top hat structure is modelled and designed with spot welding joint using dissimilar materials which is mild steel 1010 and stainless steel 304, using finite element software. Different types of connector elements such as rigid body element (RBE2), welding joint element (CWELD), and bar element (CBAR) are applied to represent real connection between two dissimilar plates. Normal mode analysis is simulated with different types of joining element in order to determine modal properties. Natural frequencies using RBE2, CBAR and CWELD are compared to equivalent rigid body method. Connection that gives the lowest percentage error among these three will be selected as the most reliable joining for resistance spot weld. From the analysis, it is shown that CWELD is better compared to others in term of weld joining among dissimilar plate materials. It is expected that joint modelling of finite element plays significant role in structural dynamics.