

Dynamic Analysis of I Cross Beam Section Dissimilar Plate Joined by TIG Welding

M.S.M. Sani^{1, a)}, N.A. Nazri^{2, b)}, M.N Abdul Rani^{3, c)} and M.A. Yunus^{3, d)}

¹*Automotive Engineering Centre (AEC), Universiti Malaysia Pahang,
26600 Pekan, Pahang, Malaysia.*

²*Advanced Structural Integrity and Vibration Research (ASIVR), Faculty of Mechanical Engineering,
Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia*

³*Structural Dynamics Analysis and Validation (SDAV), Faculty of Mechanical Engineering,
Universiti Teknologi MARA (UiTM), 40450 Shah Alam, Selangor Malaysia.*

^{a)}Corresponding author: mshahrir@ump.edu.my

^{b)}mechyafina@gmail.com

^{c)}mnarani@salam.uitm.edu.my

^{d)}mayunus@salam.uitm.edu.my

Abstract. In this paper, finite element (FE) joint modelling technique for prediction of dynamic properties of sheet metal joined by tungsten inert gas (TIG) will be presented. I cross section dissimilar flat plate with different series of aluminium alloy; AA7075 and AA6061 joined by TIG are used. In order to find the most optimum set of TIG welding dissimilar plate, the finite element model with three types of joint modelling were engaged in this study; bar element (CBAR), beam element and spot weld element connector (CWELD). Experimental modal analysis (EMA) was carried out by impact hammer excitation on the dissimilar plates that welding by TIG method. Modal properties of FE model with joints were compared and validated with model testing. CWELD element was chosen to represent weld model for TIG joints due to its accurate prediction of mode shapes and contains an updating parameter for weld modelling compare to other weld modelling. Model updating was performed to improve correlation between EMA and FEA and before proceeds to updating, sensitivity analysis was done to select the most sensitive updating parameter. After perform model updating, average percentage of error of the natural frequencies for CWELD model is improved significantly.