EVALUATING THE HIGH-VELOCITY IMPACT ON THE MULTI-LAYERED PANELUSING THE REGRESSION MODELLING

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Abstract - This paper presents the regression-based models for high velocity impact performance of multi-layered steel-aluminium panels under armour piercing projectile impact. Layer thickness and impact velocity are major factors affecting the performance of the multi-layered panels. The regression modelling aims to ease the process in determining the ballistic performances which are affected by these factors. Two types of laminated panels were constructed using finite element modelling for impact simulation at the velocity range of 400 m/s to 900 m/s; double-layered and triple-layered configuration. Ballistic performance of each configuration plate in terms of depth of penetration, end of penetration, energy absorption and stress distribution was quantified. Multiple linear regression approach was conducted to obtain the regression models for each ballistic performance. Linearity, normality and scatter of the residuals were investigated to ensure the goodness of data fitting. As a result, regression models for depth of penetration and energy absorption responses for steel layer gave coefficient of determination values, $R^2$0.94. This has indicated that layer thickness and impact velocity have significant effect on these responses. The models were then validated using finite element data. The validation results indicated that the model predictions were acceptable and hence, could be used to enhance multi-layered panel designs.

Keywords - Ballistic Impact; Multi-Layered Panel; Multiple-Linear Regression;