FE SIMULATION OF SANDWICH PANELS WITH FUNCTIONALLY GRADED CORE - PART II: HIGH VELOCITY IMPACT

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KEYWORDS: Functionally Graded Core, Contact, High Velocity impact, Sandwich Panel, Penetration.

Simulation of sandwich panels with functionally graded core under low velocity impact have been investigated in part I of these studies. Fewer studies have been conducted on the high velocity impact behavior of sandwich panels. In this work, the models of projectile and target are same as those used in our pervious study. However, in high velocity impact complete penetration happens and therefore the mechanical properties of sandwich panel should define as inelastic (mat-plastic kinematics). Since, experimental data for tangent modulus and failure strain core and face sheets of sandwich panels are not available then the effect of different unknown parameters on the overall response of the sandwich panel should be investigated.

In this paper, variation of projectile velocity through thickness of sandwich panels for two cases of symmetrically about the mid-plane core and/or asymmetrically is investigated. Fig. 1 and Fig. 2 show the velocity history for symmetrical and asymmetrical core, respectively. Failure strain for every layer is assumed to be 0.1 and the ratio of Young's modulus to tangent modulus was equal to 150. In this way, by having the Young's modulus for each layer, it is possible to calculate the value of tangent modulus.

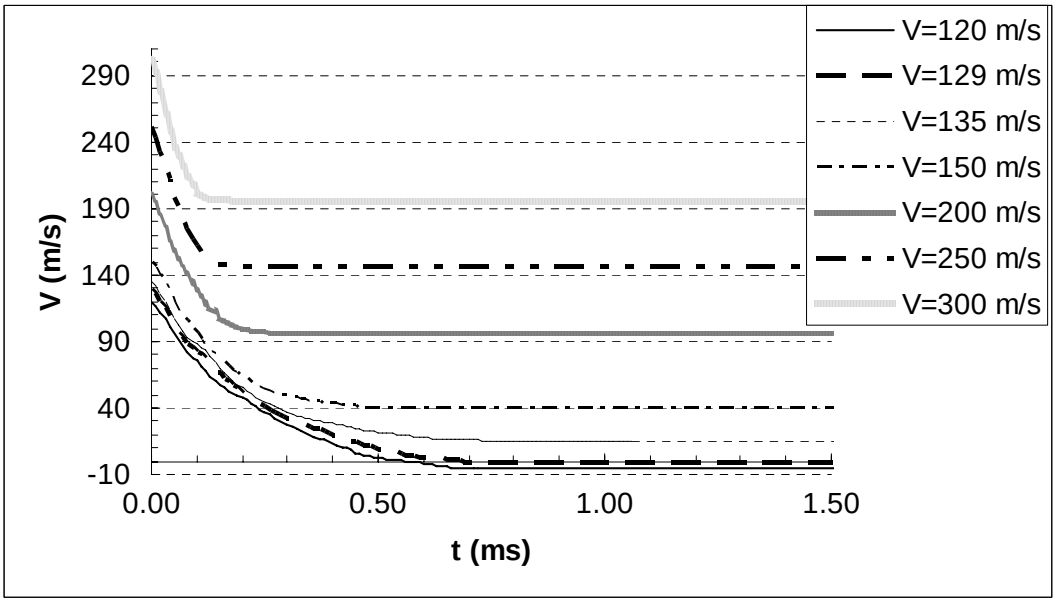

Fig.1: Velocity history diagram for symmetrical core

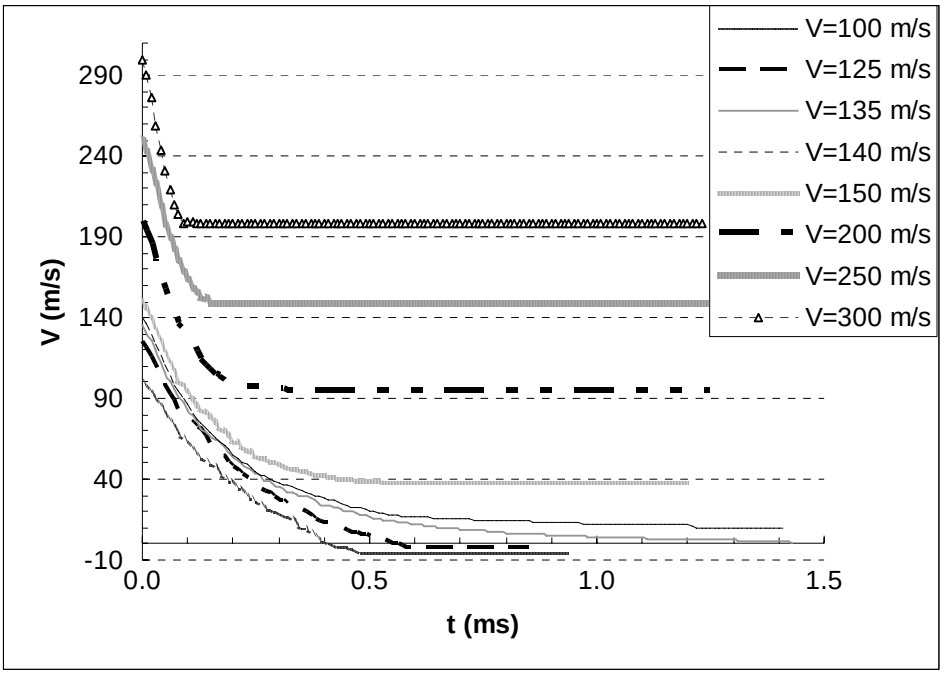

Fig.2: Velocity history diagram for asymmetrical core

The ballistic velocity, the lowest velocity of projectile that will result in complete penetration, was 135m/s and 129m/s for asymmetric and symmetric cores, respectively. This behavior can be contributed to the fact that the core in the asymmetrical condition is stiffer than the one in symmetrical condition. Furthermore, the residual velocity is defined as the exiting velocity of the projectile from bottom face of the panel. Considering this, Fig. 3 shows the residual versus initial kinetic energy for both cases.

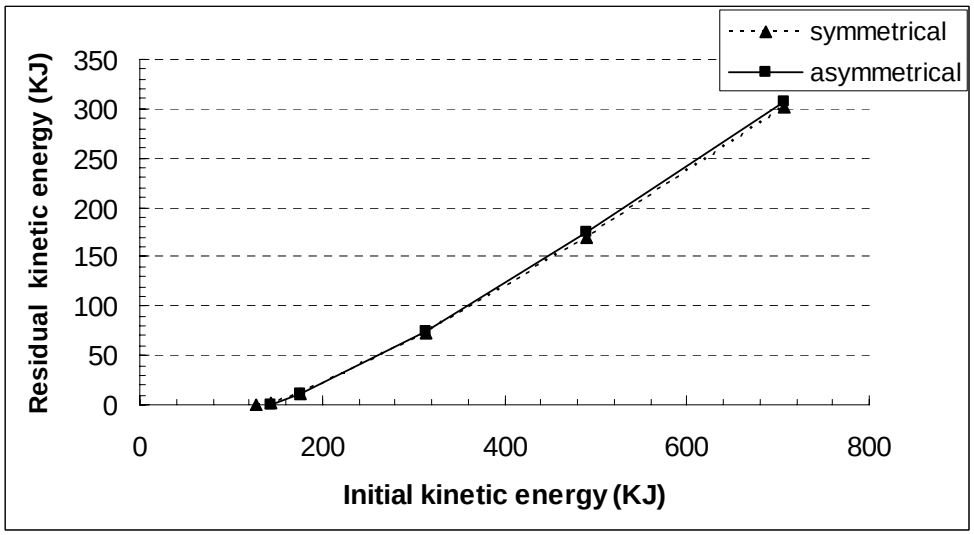

Fig.3: Plots of residual versus initial kinetic energy

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