Numerical Simulation of Button Head Bullet Effects on the Incident Wave of Split Hopkinson Press Bar

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ABSTRACT

In order to make the specimen deformed under a constant strain rate and the stress in the specimen kept homogeneous, the wave shaper technology was adopted to modify the incidence waves of the normal Split Hopkinson Press Bar. A method of changing the shape of the bullet was suggested to be applied on the SHPB. Bullets with different length and different curvature have been researched in this paper. And the affection of the button head bullet about incidence pulse was simulated with Lagrange method by ANSYS/LSDYNA. Based on the elastic wave propagate through the discontinuous section in the one-dimensional wave theory, combined with conservation of momentum theorem, derive the calculation formula of the incident wave caused by the button head bullet hitting the the incident bar, and the theoretical curve was be obtained by Finite-Difference Method. It is shown in the results that changing the curvature of the bullet has little impact with incidence waves, and the peak stress increase with the length of the bullet increase, when the peak stress reach a certain strength, increase the bullet length can make the stress peak value lasts longer. Due to the reason that the button head bullet was based on the elastic wave theory, the wave length and the max stress of the shaped wave would be controlled conveniently and avoid the shortcoming that the analogue specimens could not be recycling in the normal pulse shaper technology.