

Computational Approaches for Ballistic Impact Response of Stainless Steel 304

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Abstract : This paper presents a numerical study on determination of ballistic limit velocity (V_{50}) of stainless steel 304 (SS 304) used in manufacturing security screens. The simulated ballistic impact tests were conducted on clamped sheets with different thicknesses using ABAQUS/Explicit nonlinear finite element (FE) package. The ballistic limit velocity was determined using three approaches, namely: numerical tests based on material properties, FE calculated residual velocities and FE calculated residual energies. Johnson-Cook plasticity and failure criterion were utilized to simulate the dynamic behaviour of the SS 304 under various strain rates, while the well-known Lambert-Jonas equation was used for the data regression for the residual velocity and energy model. Good agreement between the investigated numerical methods was achieved. Additionally, the dependence of the ballistic limit velocity on the sheet thickness was observed. The proposed approaches present viable and cost-effective assessment methods of the ballistic performance of SS 304, which will support the development of robust security screen systems.

Keywords : ballistic velocity, stainless steel, numerical approaches, security screen

Conference Title : ICMAE 2020 : International Conference on Mechanical and Aerospace Engineering

Conference Location : Stockholm, Sweden

Conference Dates : July 16-17, 2020