ALUMINIUM USING AN INVERSE METHOD AND BLAST LOADING

M.A. Louar[1,2], B. Belkassem[2], H. Ousji[1,2], L. Pyl[1], J. Vantomme[2]

[1]Department of Mechanics of Materials and Constructions, Vrije Universiteit Brussel (VUB), Pleinlaan 2, B-1050 Brussels, Belgium;
[2]Department of Civil and Materials Engineering, Royal Military Academy (RMA), Av. De la Renaissance 30, B-1000, Brussels, Belgium

ABSTRACT

The dynamic behavior of structures under blast wave loading is increasingly studied due to the rising risks of intentional and accidental explosions and the development of new protective technologies and methods. To ensure the efficiency of these protective measures, the identification of the material behavior under blast loading is of utmost importance. This paper investigates the feasibility of the identification of the strain rate hardening of aluminum using an inverse method and blast loads. The results of a series of tests on aluminum plates loaded by means of an Explosive Driven Shock Tube are reported. A numerical study is performed to develop a model that is, both, in concordance with the experimental measurements and suitable for loop implementation. The 3D high-speed full-field measurements and finite element simulations are used to accurately assess the dynamic response of the plates. The identification is based on the Levenberg-Marquardt formulation for damped least-squares solution. The approach is virtually validated and its sensitivity to noise is provided using virtual measurements from finite element calculations. Then, experimental data are used for the identification. The results obtained are in good agreement with the values from literature.