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High-Rate Compaction of Aluminium Alloy Foams J.J. HARRIGAN, Y.C. HUNG, P.J. TAN, N.K. BOURNE, P.J. WITHERS, S.R. REID, University of Manchester, J.C.F. MILLETT, Cranfield University, A.M. MILNE, Fluid Gravity Engineering Ltd — The response of aluminium foams to impact can be categorised by the impact velocity. Tests are reported ranging from quasi-static to impact velocities greater than the speed of sound in the foam. The techniques used ranging from drop-hammer and pneumatic launcher tests, to plate impact at velocities greater than 1000 m s-1. The quasi-static compression behaviour was elastic, perfectly-plastic, locking. For static and dynamic compression at low impact velocities, post-impact examination of partially crushed specimens showed that deformation was through the cumulative multiplication of crush bands. If the impact velocity is less than the velocity of sound, but above a certain critical impact velocity, the plastic compression occurs in a shock-like manner and the specimens deform by progressive cell crushing. At higher impact velocities the compaction front is not preceded by an elastic wave. Laboratory X-ray microtomography has been employed to acquire tomographic datasets of aluminium foams before and after tests. The morphology of the underformed foam was input as the input dataset to an Eulerian code. Hydrocode simulations were then carried out on real microstructure. These simulations provide insight to mechanisms associated with the localization of deformation.

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