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Title: Assessment of collapse diagrams of rigid polyurethane foams under dynamic loading conditions

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Abstract: This paper investigates the collapse diagrams (energy-absorption and efficiency diagrams) under dynamic compression tests (drop tests) with an impact loading speed of 3.09 m/s. Experimental tests were carried out at room temperature on seven different types of closed cell rigid polyurethane foams with densities of 40, 80, 100, 120, 140, 145 and 300 kg/m(3) respectively. Based on the measured load-displacement curves, authors plotted the variation of peak stress, energy-absorption and efficiency attributes with respect to density for each type of foam, highlighting the optimum foam density (100 kg/m(3)). The influence of density and loading direction (in-plane and out-of-plane) on the main mechanical properties are also discussed. Following the investigations it was observed that both efficiency and energy absorption diagrams shows similar results, leading to the conclusion that both methods are reliable. Considering the test setup, a finite element analysis model was developed that aimed to replicate the experimental procedures. Simulations were performed in the commercial software Abaqus/Explicit using the implemented Elastic/Crushable foam constitutive model and using the static and dynamic test data for calibration. The energy-absorption and efficiency diagrams obtained from simulations were compared with the experimental data. (C) 2016 Politechnika Wroclawska. Published by Elsevier Sp. z o.o. All rights reserved.

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