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Slosh dynamics and rebound suppression of a partially filled sphere TAYLOR KILLIAN, Brigham Young University Dept. Mathematics, ROBERT KLAUS, TADD TRUSCOTT, Brigham Young University Dept. Mechanical Engineering — We introduce a study on the slosh dynamics of a partially filled elastic sphere. Currently the physical design of fluid-filled containers utilizes clever construction and machinery to mitigate sloshing motions. There are numerous cases that have been observed but we focus on the impact of a sphere under free fall with an initially undisturbed free surface. The study focuses on measurement and simulation of the force distribution between the fluid and the sphere through the use of high-speed imaging and finite element analysis. Using the cavity shape data, a potential flow numerical model is developed that predicts the unsteady forces. Our hypothesis is that the sphere's movements can be counteracted or cancelled by the exchange of energy between the sphere and the fluid. Forces are modulated by the formation of a parabolic cavity in the fluid, formed after the first impact. The second impact results in a collapse of this cavity forming a powerful jet which effectively dampens the motion of the sphere.

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