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Simulating Rectified Motion of a Piston in a Housing Subjected to Vibrational Acceleration JONTHAN CLAUSEN, JOHN TORCZYNSKI, LOUIS ROMERO, TIMOTHY O'HERN, Sandia National Laboratories — We employ ALE finite element simulations to investigate the behavior of a piston in a housing subjected to vertical vibrations. The housing is filled with a viscous liquid to damp the piston motion and has bellows at both ends to represent air bubbles present in real systems. The piston has a roughly cylindrical hole along its axis, and a post attached to the housing penetrates partway into this hole. Protrusions from the hole and the post form a gap with a length that varies as the piston moves and forces liquid through this gap. Under certain conditions, nonlinearities in the system can drive the piston to move downward and compress the spring that holds it up against gravity. This behavior is investigated using ALE finite element simulations, and these results are compared with theoretical predictions. Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.

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