

The NEIUmatic Shake Table: A New Tool

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Shake tables are excellent tools for demonstrating and studying vibration-related phenomena, including earthquakes and mechanical resonance. In many cases, however, equipment developed in-house and at the entry level often has questionable reliability and frustrating limitations. A cooperative multiyear effort by the NEIU Earth Science and Physics Departments, including undergraduate researchers, has investigated how new technologies might result in a useful, reliable device with good precision and power on a modest budget. After exploring a range of options, including air cylinders and electric motors, in 2017 we settled on a combination of pneumatic power and electronic control. While previous shake tables developed by NEIU have been useful for classroom demonstrations, the newest unit has opened up numerous avenues in the quantitative exploration of vibration phenomena. It can subject 20kg loads to vibration rates from 1 to 15 Hz, with precise control of frequency and amplitude. In addition to periodic (cyclical) vibrations, it can also generate earthquake-like non-periodic motions. Several groups of students in Earth Science and Physics classrooms have used it to investigate how resonance affects objects of different sizes, the stability and robustness of various building models in simulated earthquakes, soil liquefaction, and vibration isolation and damping in building design. In addition to student research and classroom demos, this technology has been very promising for public outreach.