

Numerical Analysis And Verification Of Energy Harvesting Circuit For Regenerative Hybrid Electromagnetic Damper

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The regenerative hybrid electromagnetic damper (RHED) is a linear type electromagnetic damper that can effectively attenuate the vibration of the structure. A damping force of the RHED is generated by electromagnetic force, and electrical energy generated in RHED can be harvested. In order to effectively harvest the energy generated by the RHED, it is essential to develop an energy harvesting circuit. The energy harvesting circuit is basically composed of an AC/DC rectifier, a capacitance, a DC/DC converter, and energy harvesting circuits that require circuit optimization depending on the generator. In this study, the circuit applicable to RHED was optimized, such as selecting a DC/DC converter considering the electrical characteristics of the RHED. The power and circuit loss energy generated in RHED were analyzed by composing the numerical model of the RHED and the numerical model of the circuit. The numerical analysis showed that the buck converter can harvest more energy than the boost converter in the RHED circuit. An energy harvesting circuit was designed based on the results of numerical analysis and results of the numerical analysis were verified through experiments. It was proved that the buck converter showed better results through the shaking table test. Although the tendency of numerical analysis and the actual experiment was similar, there was a problem that the gap between the numerical analysis and experimental results had to be solved through future research.