INVESTIGATION OF CHAOTIC LOW FREQUENCY VIBRATIONS TRANSFORMATION EFFICIENCY OF HORIZONTAL PENDULUM BASE HARVESTER

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Powering of devices with low energy consumption became actual task in the eras when mechatronic equipment flooded industry and daily life. Remote located sensors typically powered using batteries or with permanent line, existing devices often can be powered from environment energy like vibration, wind or sunshine [1,2]. Generation or harvesting of electric energy as process is usually known, but harvesting of it from low-density sources has some specific problems. Energy generation for chaotic vibration source has even more problems, therefore special mechanical vibration element necessary.

Implementation of horizontal pendulum as mechanical part of the harvester allows retrieving energy from vibrating object due to excitation without prevailing frequency allows gaining energy from chaotic vibration of the bridge span. An effect of damping reduces amplitude and as result - the generated amount of energy (Fig. 1).

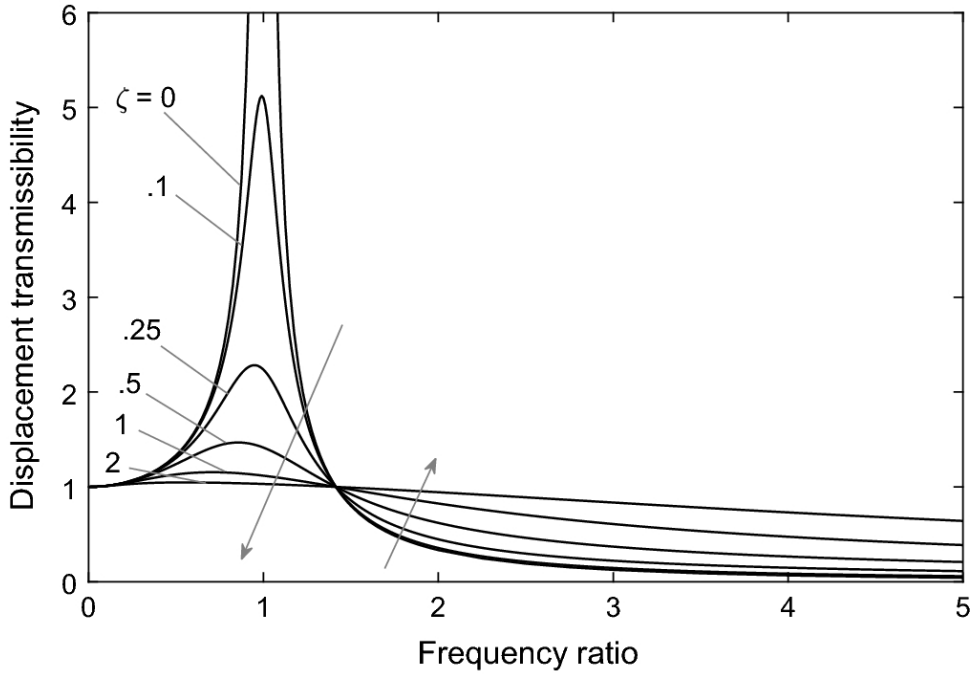

Fig. 1 Transmissibility in a one-degree-of-freedom system [3].

An efficiency equation is presented below and shows the ratio between the input energy (in current case energy of vibrations) and generated energy Eq. 1:

$$\text{Energy efficiency} = \frac{\text{Useful output energy}}{\text{Total input energy}} \tag{1}$$

The purpose of the research is to investigate the efficiency of the harvester prototype measuring the amount of energy needed for system to vibrate with desired frequency and comparing it with the energy output. Resultant graph will show the ratio and the efficiency of the created prototype will be evaluated comparing with other existing similar devices.

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