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The use of the dynamic vibration absorber for energy harvesting

Leo Acho Zuppa, Jan Awrejcewicz, Nataliya Losyeva, Volodymyr Puzyrov, Nina Savchenko

Abstract: Vibration energy is abundantly present in many natural and artificial systems and can be assembled by various mechanisms, mainly using piezoelectric and electromagnetic means. In the present article, the electromechanical system with two degrees of freedom is considered. To the main mass, whose vibrations are to be reduced, an additional element (dynamical vibration absorber or DVA) is attached. The DVA consists of a spring, damping and piezoelectric elements for energy harvesting. The goal is to reduce the vibration of the main structure and at the same time collect energy from the vibration of the connected vibration absorber. Two configurations are studied: with linear and nonlinear coupling. For the first one the condition is obtained in closed form for the optimal dimensionless frequency ratio. For the second case the method of averaging is applied which allows to analyze the influence of nonlinear component on system's dynamics.

[1] Leo Acho Zuppa, Professor: Universitat Politecnica de Catalunya, EDIFICI TR5 DESPATX 357 C. COLOM, 11 08222 TERRASSA SPAIN, Spain (ES), leonardo.acho@upc.edu.

[2] Jan Awrejcewicz, Professor: Lodz University of Technology, 1/15 Stefanowski Str., 90-924 Łódź, Poland, Poland (PL), jan.awrejcewicz@p.lodz.pl.

[3] Nataliya Losyeva, Professor: Vasyl Stus Donetsk National University, 600-richia 21, Vinnitsia, Ucraine, Ukraine (UA), natalie.loseva@gmail.com.

[4] Volodymyr Puzyrov, Professor: Vasyl Stus Donetsk National University, 600-richia 21, Vinnitsia, Ucraine, Ukraine (UA), v.puzyryov@donnu.edu.ua, the author presented this contribution at the conference in the special session "Innovative strategies for vibration control and mitigation" organized by G. Failla and R. Santoro.

[5] Nina Savchenko, Associate Professor: Zhukovsky National Aerospace University ”KhAI”, 17, Chkalova str., Kharkiv, Ukraine, Ukraine (UA), nina_savchenko@hotmail.com.