

PRELIMINARY DESIGN OF A PIEZOELECTRIC ENERGY DEVICE FOR ENERGY RECOVERY IN TRANSPORT VEHICLES

Claudio D. Gatti^a, Mariano Febbo[†] Sebastián P. Machado^{a,*}

^a Grupo de Análisis de Sistemas Mecánicos, Centro de Investigaciones en Mecánica Teórica y Aplicada, Universidad Tecnológica Nacional, Facultad Regional Bahía Blanca, 11 de Abril 461, 8000 Bahía Blanca, Buenos Aires, Argentina, smachado@frbb.utn.edu.ar, <http://www.frbb.utn.edu.ar>

[†] Instituto de Física del Sur (CONICET) y Departamento de Física, Universidad Nacional del Sur, Avda. Alem 1253, 8000 Bahía Blanca, Buenos Aires, Argentina, mfebbo@uns.edu.ar; <http://www.uns.edu.ar>

ABSTRACT

In a conventional transport vehicle, only between 10 and 16% of the fuel is used to move it through the road. The rest is wasted energy in the brakes, transmission, engine, accessories, rolling resistance, aerodynamic drag and idle. From all these losses, the greater is the one that comes from the engine (approximately 63% thereof), which is largely wasted as vibration. This paper focuses on the analysis of this available energy which appears between the engine and the chassis of a road diesel vehicle obtained from acceleration measurements performed on it. As a result of the analysis, it can be determined that there is a lot of energy available to be retrieved, in the form of vibrational energy. This vibrational energy is characterized by a large number of frequencies which are excited at each engine speed. Then, by a suitable design of a multimodal electromechanical piezoelectric device is possible to recover an important percentage of this energy and convert it to electrical energy ready to be used. Computer simulations of the preliminary design of the device developed will be performed in order to evaluate the voltage generated according to the operating conditions of a transport vehicle in an average operating condition.