



Politechnika Śląska w Gliwicach
Wydział Mechaniczny Technologiczny
Instytut Podstaw Konstrukcji Maszyn

Rozprawa doktorska

**Metoda optymalizacji energochłonności pojazdu z napędem
hybrydowym z wykorzystaniem zarządzania energią w pojeździe**

mgr inż. Mateusz Tyczka

Promotor:

dr hab. inż. Wojciech Skarka, prof. Pol. Śl.

- Gliwice 2019 -

Energy consumption optimization method for a hybrid electric vehicle using the vehicle's energy management

PhD dissertation - Summary

Author: Mateusz Tyczka MSc, Eng.

Supervisor: Prof. Wojciech Skarka, PhD, DSc Eng.

Silesian University of Technology, Faculty of Mechanical Engineering

The aim of this PhD thesis was to gain knowledge about energy management in Hybrid Electric Vehicles, in order to reduce their energy consumption and the cost of their exploitation. The aim has been realized by proposing a new energy management method in *HEV*. The proposed method is a hierarchic combination of three existing methods. The proposed method is hierarchical. The output of the main method has been used as the input for the next algorithm. The method has been described in details, and the choice of the component algorithms has been justified. The research has been conducted in a numeric way, using a model created in MATLAB software. In order to adjust the method's parameters, the author has created a method for creating artificial velocity profiles, which has helped to create profiles of particular and desired characteristics, so that they could reflect different situations on the road, such as driving on a highway or driving in a dense city traffic. This has allowed the author to include various driving conditions, both for the adjustment of the parameters and for the verification of the proposed method itself.

The verification has been based on random velocity profiles. It consisted of comparing the results obtained with the proposed method and the results obtained with a simple strategy based on rules. In addition, after the verification, additional simulations for modified method has been conducted, in order to draw more detailed conclusions. The proposed method did not meet the expectations regarding the reduction of energy consumption in *HEV* in comparison with the simple strategy based on rules. Nonetheless, the thesis of the dissertation has been proved, because the results obtained with the modified methods show that a reduction of energy consumption is possible, with the use of more detailed algorithms. The results have been discussed, conclusions have been drawn and future research directions have been suggested.

Keywords: hybrid electric vehicle, energy consumption optimization, electric vehicle