

Adam Stachura

Silesian University of Technology

Department of Applied Mechanics

## Subject: "Hybrid powertrain dynamics"

### Summary:

The purpose of the work was to analyze the dynamics of a prototype hybrid powertrain. The paper contains a review of existing market-based solutions and describes the genesis and development of the first gasoline electric vehicles. Based on preliminary assessment of market demand goals and objectives of the project were defined. In the first stage of the work computer models of the proposed drive and the simulation algorithms were created. The program was developed in Matlab \ Simulink. The program allows for calculation of fuel consumption in the sample driving cycles, vehicle suspension dynamic analysis and configuration of drive control algorithm. Simulations were carried out for the exemplary driving cycles obtained during experimental rides with use of GPS sensors. The program, thanks to its modular design, allowed an analysis of various configurations of the proposed drive. The results of the analysis helped to determine the expected parameters of future components of the drive. The paper also presents the potential use of supercapacitors, and thermoelectric materials in a hybrid powertrain architecture. In the next stage of work the prototype vehicle was created. The powertrain architecture is e4WD type with independent electric drive of rear axle. The choice of such a solution allowed to perform measurements of fuel consumption and the dynamics of powertrain in combustion drive mode, electric mode and hybrid mode. The study was conducted on a chassis dynamometer and test track. The results confirmed the correctness of computer simulations algorithms and design pipeline. The work is summarized by conclusions from the analysis of experimental results and computer simulations.