INTRODUCTION

Significant energy resources exhaustion, environmental problems, and growing societal concern drew attention to research on electric vehicles all around the world. Cars with internal combustion engines are a significant source of air pollution due to greenhouse gas emissions, have complex construction, and are expensive to maintain. With a much smaller impact on the environment, electric vehicles can be the main type of vehicle in the future. Moreover, recent improvements in technology have significantly increased the energy efficiency and controllability of electric land vehicles.

In electric vehicles, angular velocity and electromagnetic torque are regulated by the control system. In the past few years, the Permanent Magnet Synchronous Motor based drivetrains are of growing interest due to their higher power density and great mass-dimensional characteristics. Although PMSM is more efficient than other types of electric vehicle traction motors, further efficiency improving via implementation of loss-minimization control algorithms will allow to reduce the battery size and increase vehicle power reserve.

Thesis actuality. Since energy efficiency is crucial for electric vehicles, optimal energy-efficient control is one of the most relevant tasks. The greater energy efficiency, the bigger single charge range and the lower battery capacity needed.

The relation with science programs, themes, and plans. The master thesis is performed in the department of automation of electromechanical systems and electric drives of National Technical University of Ukraine «Igor Sikorsky Kyiv Polytechnic Institute».

Research goals and tasks. The goal is to develop a loss minimization control algorithm of a permanent magnet synchronous motor, which can be used in electric vehicle applications.

Tasks of the thesis:

1. Analysis of existing drivetrain solutions of electric vehicles, overview of their main elements and parts.

2. Electric vehicle traction motor and battery pack calculation
3. Calculation of parameters of electric vehicle drivetrain elements
4. Development of loss minimization control algorithm of permanent magnet synchronous motor for electric vehicle applications.
5. Mathematical simulation of the obtained electromechanical system.

Research object. Electromechanical processes in electric vehicle drivetrain

Research subject. The electromechanical system based on a permanent magnet synchronous motor for electric vehicle applications.

The scientific novelty of obtained results. The algorithm for designing an electric vehicle drivetrain based on a permanent magnet synchronous motor with loss minimization is developed.

Practical application of obtained results. Obtained results can be used for the calculation and selection of drivetrain elements during vehicle modernization or design.

Scientific publications. Part of the results are published in the article:

1. Pavlo Soroka, Ivan Shapoval, “Parameters calculation of traction motor and battery pack for electric vehicle application” // International scientific and technical journal of young scientists, graduate students, and students "Modern problems of electric power engineering and automation", – 2020.