Proposals for cooperation

of Electrical transport and diesel locomotives construction department of NTU "KhPI"

Department of Electrical transport and diesel locomotives construction

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Specialities on which Department is preparing bachelors and magister's degrees:

- Electrical transport
- Locomotives and locomotives establishment

Subject of scientific work of the department:

- The magnetically levitated trains;
- Traction electric drive of rolling stock;
- Tilting trains with electromechanical drive mechanism;
- Storage of energy for railways.

The most significant results of the department in the scientific activities:

Participation in projects and development are conducted in the following areas:
- Electromotive dynamics of railways and its interaction with the track;
- Electromechanical energy conversion in the perspective rail transport;
- Resource- and energy-saving technology for railways.

Executed state budget themes
- Development of scientific bases of creation electromechanical drive mechanism for tilting wagons of high-speed rail transport of Ukraine;
- Development of scientific foundations of a test stand with energy storage for high-speed trains;
- Development of practical provisions creating suburban high-speed trains with tilting body and energy storage
- Development of practical provisions creation of rational energy storage, their parameters for suburban trains electrified railways

The most significant results of the department in the scientific activities:

Completed of self-financing themes
- The development of technical specifications for the automated system prediction of hourly, daily, monthly consumption of electricity for the needs of railways
- Development of software and algorithmic complex design traction synchronous motor excited by permanent magnets
- Development of software and algorithmic complex design engines with transverse field

Last SCOPUS publication:
Simulation of combined body tilt system of high-speed railway rolling stock.
Yeritsyan Bagish, Liubarskyi Borys, Iakunin Dmytro

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Proposals for joint research: Definition of parameters and evaluation of working properties onboard inertial electromechanical energy storage devices that operate in the acceleration and deceleration modes of commuter trains

Objective: To establish regularities of influence of parameters on the performance properties of the on-board inertial electromechanical energy storage, as well as evaluation of their functioning as part of the traction electric drive during acceleration and deceleration modes of commuter trains.

Expected results: the Substantiation of rational application of a magnetic sector type of system is oriented elementary magnets magnetized in conjunction with ferromagnetic screen. Search analytical expressions machine permanent and electromagnetic parameters for specific schemes armature coils.

Introduction of energy efficiency drive works as part of the scheme of the traction electric drive, which indicate ways to improve the quality of the test technology.

Create a conceptual design of an electric commuter trains with on-board inertial energy storage, which allows you to extend the limits of regenerative braking, eliminating its dependence on the processes occurring in the contact network, and to use reclaimed under braking energy to electric acceleration.

Scientific novelty: the use of energy storage on the perspective suburban electric train allows to extend the limits of regenerative braking, eliminating its dependence on the processes occurring in the contact network, and to use reclaimed under braking energy to electric acceleration after stopping it.

Practical significance: scientific an expediency substantiation of the use of electro-mechanical inertial energy storage as part of the traction electric drive vehicles.

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Proposals for joint research: The selection and evaluation of perspective electromechanical energy conversion systems of electromotive rolling stock

Objective: choice of different types of perspective electromechanical energy conversion, determination of optimal regimes and define the boundaries of rational use for each of electromotive

Expected results: For electromechanical transducers of linear and rotary types the development of generalized mathematical model, based on the Lagrange equation for solving electromechanical system considering nonlinearity of the magnetic system and gear character of the surface of the rotor and stator. Creation of simulation models for electric traction drives based on synchronous motors with permanent magnets, reactive inductor motors (valve) and reactive inductor motors of the axial magnetic flux, electromechanical energy converters and identification vector that defines their working properties. Determining the efficiency of traction drives. Development of mathematical models and algorithmic complex to determine the curves of train movement, that based on the calculating of traction problem feature is the best implementation, the criterion of efficiency, modes of electromechanical transducer, recording their thermal condition and rational control algorithm.

Scientific novelty: Determination of rational types of electromechanical energy converters on the proposed model of movement with different maximum speeds for suburban, inter-regional and high speed trains. For a comparative analysis of the efficiency of the traction drive types considered first introduced generalized evaluation criterion - "integrated efficiency", consisting of medium and maximum drive efficiency.

Practical significance: the creation of methods of selecting the type of electromechanical energy converter for modern electromotive stock; the development of software and algorithmic complex to determine the rational type electromechanical transducer through integrated efficiency criterion for the path with the given profile and schedule movement.

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Proposals for joint research: Gearless traction drive, based on reactive inductor motor with axial flux for high-speed electric rolling stock

Objective: To design a gearless traction drive, based on reactive inductor motor with axial flux for high-speed electric rolling stock in terms of establishing a link between its parameters and performance properties.

Expected results: creating gearless traction drive, based on reactive inductor motor with axial magnetic flux. Development of a mathematical model to determine the electromagnetic torque of the motor.
Development of a generalized simulation model of traction drive model combining semiconductor converter in conjunction with the drive system and the inductor model reactive engine with axial magnetic flux. Development of the methodology for assessing the energy performance of the studied traction drive.
Development of conceptual design of high-speed trains, which traction drive is synthesized by the results of research and determined its properties and performance indexes.

Scientific novelty: the traction electric drive concept for high-speed rolling stock, which is based on the use of gearless traction drive with the frame hanging reactive inductor motor with axial flux.
Practical significance: the justification of the possibility of creating a gearless traction drive, based on reactive inductor motor with axial flux. Development of software and algorithmic complex for the synthesis of gearless traction electric drive, based on reactive inductor motor with axial flux.

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Proposals for joint research: Tilting system for high-speed trains with electromagnetic actuator and a controlled air suspension

Objective: synthesis of combined tilting system for high-speed trains, consisting of electrical and pneumatic parts

Expected results: development of combined electromechanical and pneumatic tilt system, which allowed to establish the optimal parameters of the linear motor and requirements for selecting components semiconductor converter (types of keys and diodes) parameters and types of pneumatic springs.
Proposal to use tilting body combined system consisting of linear motor and adjustable pneumatic suspension of the second degree. Tilting body at an angle of 5° to will provide an electromechanical drive that has more speed, at high angles conducted by joint action of the electromechanical and pneumatic drives.

Scientific novelty: the first time the use of the combined system of body tilting high-speed train, consisting of the electromechanical linear drive motors and controlled pneumatic suspension.

Practical significance: recommendations on the optimal tilt angles for high-speed trains on perspective areas of railway; establishing the optimal values of the geometric parameters of linear motors drive; definition of the main dependencies energy performance of the tilting drive; setting requirements to select components of a semiconductor converter.