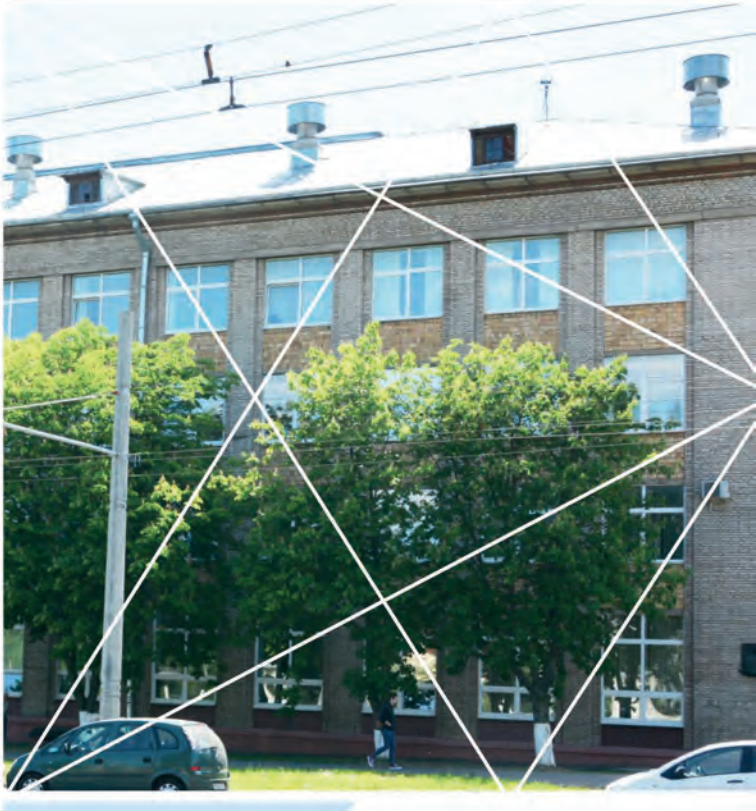
The Joint Institute of Mechanical Engineering of the National Academy of Sciences of Belarus

Leading scientific organization of Belarus in the field of mechanics and machine science



Advertising brochure

90 ГОД

UDC 621.0

"State Scientific Institution "The Joint Institute of Mechanical Engineering of the National Academy of Sciences of Belarus" advertising brochure contains information on history, achievements, main directions of activities of the Institute.

The information on the chief executives, structural divisions and scientific developments of the Institute is presented.

It is intended for a wide range of scientific and engineering workers, managers of enterprises and organizations of various forms of ownership interested in implementing joint projects, investing and mutually beneficial cooperation.

It can be distributed at exhibitions, fairs, presentations.

Dear colleagues and friends!

Current global and national economic situation requires the task of increasing the competitiveness of domestic engineering industry to be of a high priority, and needs the development of new commercially successful equipment and its expansion into the world market. Thus, mechanical engineering is given the title role. The leader in this sphere is the Joint Institute of Mechanical Engineering of the National Academy of Sciences of Belarus.

In 2017 our Institute celebrated its 60th anniversary. Over the years, not only the names of the Institute, its leaders have changed, but a number of scientific schools and directions have been created, and its heritage has been preserved and developed. The Institute continues and strengthens its traditions and its role as the leading scientific organization that provides development of science-based machines, materials and technologies for mechanical engineering, their testing and certification, and support for production. Machine science has always remained a key area of our activity. We are an interdisciplinary and interdepartmental center having the role of a cluster of machine science (research engineering core in automotive industry and high-tech equipment sector). In modern interpretation of the problems facing engineering industries, this is computer and technological mechanics, which is based on reliability, resource and quality of machinery and equipment. These are the main "parameters" of competitiveness. Perhaps that's why our partners are the leading mechanical engineering enterprises, and the Institute's employees are in the scientific and technical councils of 7 holdings.

The Institute is actively involved in scientific support of various technological branches and mechanical engineering productions. The main mechanisms for implementation of these tasks are subprogram "Automobile, Tractor and Combine Construction" of state scientific and technical program "Mechanical Engineering and Mechanical Engineering Technologies" for 2016–2020, which contains the industry development projects (new design and technological solutions of the issues of scientific support of mechanical engineering in development and production of new automotive equipment and its components); subprogram "Mechanics" of state scientific and technical program "Mechanics, Metallurgy, Diagnostics in Mechanical Engineering" for 2016–2020, – machine science (issues of dynamics, theory of calculation and design of machines and materials, investigation of their reliability and resource, establishment of new regularities and properties); innovative projects (development of our auto-fleet, development of municipal engineering, electric transport, new materials, technologies, equipment, etc.). In the new cycle of subprogram "Automobile, Tractor and Combine Construction" there are more than 20 new large projects involving engineering science (in fact – sectoral projects with BelAZ, MAZ, MTW, Mogilevliftmash, Belkommunmash): intercity and airfield buses, trucks with increased load capacity with environmental requirements; heavy dump trucks with new power transmissions and electric power plants on board, etc. They will be successful in the markets; this is confirmed by the volume of export of newly developed equipment by our developments.

Our main R&D goals are new automotive engineering (OJSC "BelAZ", OJSC "MAZ", OJSC "MTW", OJSC "MWTP", OJSC "Gomselmash", OJSC "Belkommunmash"), science-driven components with higher value added (OJSC "Ekran", OJSC "Izmeritel") including those for precision electronic engineering (OJSC "Planar"), technological equipment of OJSC "Mogilevliftmash", OJSC "Minsk Automatic Lines Plant named after P.M. Masherov" and many others.

On that basis we build the structure of the Institute trying to make it mobile – for the needs of industry, specific projects with maximum cover of the "specific" industries. Therefore, we chose the optimal "scheme" – scientific units are scientific and technical (R&D) centers. Nowadays there are eight of them, specificity is a direct interaction with enterprises. The Institute develops scientific schools in which it has a leading position. These are the theoretical bases of reliability and quality of technology, resource forecasting, engines and drives for transport, technological and space systems, surface engineering, engineering materials. Being a coordinator in these areas, the Institute solves a number of issues using extensive scientific and technical ties. Our partners are a number of academic organizations, primarily those of the Department of Physical-Engineering Sciences, universities, design bureaus, scientific and practical and scientific and technical centers of various branches and departments.

Dear colleagues! Please, see the advertising brochure "State Scientific Institution "The Joint Institute of Mechanical Engineering of the National Academy of Sciences of Belarus", which contains brief information about the history, achievements, main lines of activity, structural divisions and scientific developments of the Institute.

Sergey N. PODDUBKO,
Director General,
Ph. D. in Eng., Associate Professor

Leading scientific organization of Belarus in the field of mechanics and machine science.

The Joint Institute of Mechanical Engineering of the National Academy of Sciences of Belarus

August 17, 1957 is considered to be the day of establishment of the Joint Institute of Mechanical Engineering of the NAS of Belarus when by the Decree of the Council of Ministers of the BSSR the Institute of Machine Study of the Academy of Sciences of the BSSR was founded.

ACTIVITIES OF THE INSTITUTE

Fundamental and applied scientific research

- machine science, mechanics, reliability and safety of machines and technical systems;
- theory of design, modeling, testing, industrial design;
- mechatronic systems of machines and mechanisms;
- new composite, polymeric, metal, nano- and microstructured materials;
- friction and wear in machines, control of the structure and properties of the surface.

Scientific and technological activities

scientific support, management and coordination of works on the creation of export-oriented motor-and-tractor and combine machinery:

- automobiles, road trains, buses, including those with electromechanical and hybrid power units;
- high-energy-efficient tractors and combines;
- dump trucks with the carrying capacity of 95–500 tons;
- multi-axle wheeled tractors, logging, road-building, municipal engineering machines, city electric transport;
- creation of new materials, coatings, tools, technological equipment.

Other activities

- bench, road tests;
- certification of land transport vehicles, machinery and equipment;
- certification of management systems;
- training of highly qualified scientific personnel;
- patent research;
- issue of the international scientific and technical journal “Mechanics of Machines, Mechanisms and Materials”;
- issue of collection of scientific papers “Topical Issues of Mechanical Engineering”.

Contacts

State Scientific Institution
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of Mechanical Engineering
of the National Academy
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The Joint Institute of Mechanical Engineering of the NAS of Belarus was awarded a Gold Medal of V.I. Blinnikov "For the contribution to the inventive and patent business".

There are three centers of collective use at the Institute: Republican Computer Center of Mechanical Engineering; Center for Structural Research and Tribo-Mechanical Testing of Materials and Mechanical Engineering Products; an industrial laboratory for research, design and testing of electric vehicles and electric drive basic components, as well as Republican Proving Ground for Mobile Machines Testing, and an industrial laboratory for research and testing of automotive components and mobile machines and "ACADEMSERT" Certification Authority.

ГОСУДАРСТВЕННЫЙ КОМИТЕТ ПО НАУКЕ И ТЕХНОЛОГИЯМ РЕСПУБЛИКИ БЕЛАРУСЬ
НАЦИОНАЛЬНАЯ АКАДЕМИЯ НАУК БЕЛАРУСИ

СВИДЕТЕЛЬСТВО
об аккредитации научной организации

15 августа 2016 г. № 50

Настоящее свидетельство выдано Государственному научному учреждению «Объединенный институт машиностроения Национальной академии наук Беларуси» (220072, г. Минск, ул. Академическая, 12) в том, что научная организация прошла аккредитацию в Государственном комитете по науке и технологиям Республики Беларусь и Национальной академии наук Беларуси.

Основание: заключение комиссии по аккредитации научных организаций о возможности аккредитации юридического лица в качестве научной организации от «30» июня 2016 г. № 247.

Действительно до «14» августа 2021 г.

Председатель Государственного комитета по науке и технологиям Республики Беларусь — А. Г. Шумилин

Президент Национальной академии наук Беларуси — В. Г. Гусаков

State Scientific Institution "The Joint Institute of Mechanical Engineering of the National Academy of Sciences of Belarus" provides the activities of the National Technical Committees on Standardization:
TC BY7 "Wheeled vehicles";
TC BY11 "Tractors and machinery for agricultural work and forestry";
TC BY33 "Reliability in engineering".

At the Institute, the International Center for Surface Engineering was established.
The Council for the Defense of Dissertations D 01.15.01 works at the Institute.

The Institute provides training of highly qualified scientists through postgraduate education in the following specialties:
01.02.06 – dynamics, strength of machines, instruments and equipment;
01.04.07 – condensed matter physics;
05.02.02 – machine science, drive systems and machine components;
05.02.08 – mechanical engineering technology;
05.05.03 – wheeled and tracked vehicles.

Higher doctorate in the following specialties:
01.02.06 – dynamics, strength of machines, instruments and equipment;
05.02.02 – machine science, drive systems and machine components;
05.02.08 – technology of mechanical engineering;
05.05.03 – wheeled and tracked vehicles;
05.13.12 – systems of design automation.

History of the Institute

GORANSKY
Georgi Konstantinovich,

Director (1957–1963),
Corresponding Member
of the NAS of Belarus,
Ph. D. in Eng., Prof.

BERESTNEV
Oleg Vasilyevich,

Director (1978–2002),
Corresponding Member
of the NAS of Belarus,
D. Sc. in Eng., Prof.

TREIER
Valfrid Nikolaevich,

Director (1963–1966),
Corresponding Member
of the NAS of Belarus,
D. Sc. in Eng., Prof.

KRASNEVSKY
Leonid Grigoryevich,

Director (2002–2006),
Corresponding Member
of the NAS of Belarus,
D. Sc. in Eng., Prof.

SCHASTLIVENKO
Fedor Yefremovich,

Director (1966–1973),
Ph. D. in Eng.

VYSOTSKY
Mikhail Stepanovich,

Director General (2006–2012),
Academician of the NAS
of Belarus, D. Sc. in Eng.,
Prof.

TSITOVICH
Igor Sergeyevich,

Director (1973–1978),
Corresponding Member
of the NAS of Belarus,
D. Sc. in Eng., Prof.

DYUZHEV
Andrei Anisimovich,

Director General (2012–2014),
Ph. D. in Eng.

At present, 11 citizens of the Republic of Belarus are awarded the title “Hero of Belarus”.

VYSOTSKY MIKHAIL STEPANOVICH (FEBRUARY 10, 1928 – FEBRUARY 25, 2013)

A scientist and designer in the field of mechanical engineering, academician of the NAS of Belarus, D. Sc. in Eng., Prof.
Mikhail S. Vysotsky was awarded the title “Hero of Belarus” by the Decree of the President of the Republic of Belarus of March 1, 2006 №135 for significant merits to the state and society, personal contribution to the formation and development of the national motor vehicle industry, the Belarusian scientific school of mechanics and integrated design of mobile machines.

MARIEV PAVEL LUKYANOVICH (BORN JUNE 14,1938)

A scientist and promoter of production in the field of quarry equipment, D. Sc. in Eng.
Pavel L. Mariev was awarded his Hero of Belarus title by the Decree of the President of the Republic of Belarus of June 29, 2001 № 360 for selfless work and exceptional efforts in the development of domestic automobile construction.

State Scientific, Scientific and Technical Programs (R&D programs)

The Institute is the head executing organization of the government R&D program "Mechanics, Metallurgy, Diagnostics in Mechanical Engineering" for 2016–2020.

machine science, reliability and safety of machines and technical systems

mechatronic systems of machines and mechanisms

new materials, including those with nano- and microstructure, surface engineering

electromechanical and hybrid power units of transport systems

high-performance metallurgical processes and technologies of casting, heat treatment of engineering products

technical diagnostics of equipment and engineering products

State R&D program "Mechanics, Metallurgy, Diagnostics in Mechanical Engineering"

basic and applied research (calculations, theories, techniques, design, technical processes, tests)

R&D and development of new equipment

Subprogram "Automobile, Tractor and Combine Construction" of the government R&D program "Mechanical Engineering and Mechanical Engineering Technologies"

new designs of automobile, quarry, tractor, combine machinery, other machines and equipment

technologies for production of mobile equipment for various purposes

assimilation of new equipment production

import substitution and export

localization of automotive components production

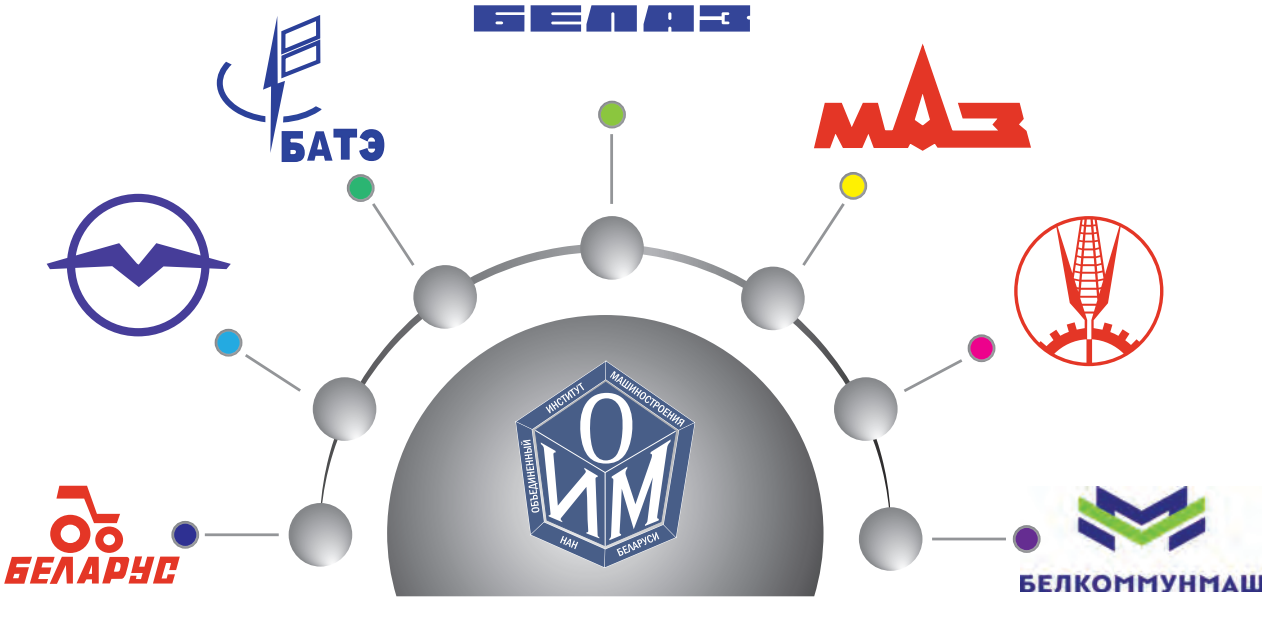
The Institute is the head executing organization of the subprogram “Creation of new generations of automobile, quarry, tractor, combine machinery, other machinery and equipment, components for them” (“Automobile, Tractor and Combine Construction”), which is part of the State R&D program “Mechanical engineering and mechanical engineering technologies” for the years 2016–2020.

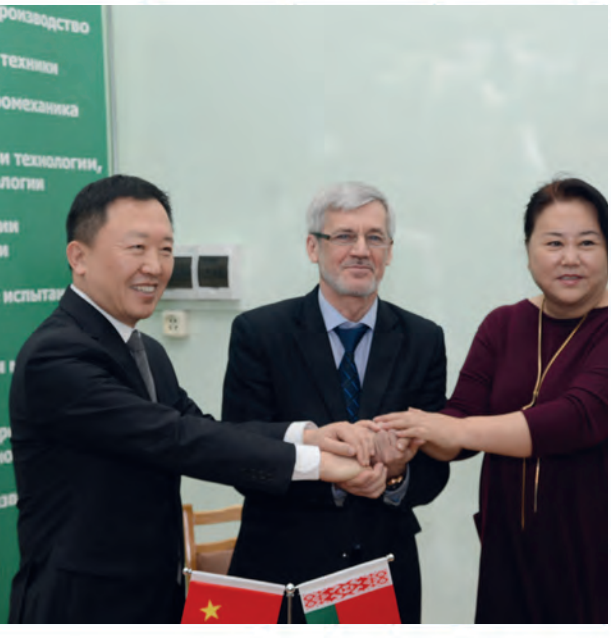
ORGANIZATIONS-PERFORMERS OF THE PROGRAMS

Cooperation with Engineering Holdings of Belarus. International Cooperation

The Institute cooperates with main Belarusian engineering holding companies within the framework of the implementation of state scientific, scientific and technical programs (R&D programs), as well as budgetary (extrabudgetary) contracts:

- OAO (OJSC) “MAZ” – the managing company of “BELAUTOMAZ” holding.
- OAO (OJSC) “BELAZ” – Management Company of Holding “BELAZ-HOLDING”.
- OAO (OJSC) “BATE” – managing company of the Holding “Automotive components”.
- OAO (OJSC) “MINSK MOTOR PLANT” Holding Managing Company.
- MTW-HOLDING.
- OAO (OJSC) “Gomselmash” – Management Company of “Gomselmash” Holding.
- OAO (OJSC) “Holding Managing Company “Belkommunmash”.





International scientific and technical cooperation includes joint research, exchange of scientific results and production experience, joint training of qualified personnel. The scope of international cooperation covers a wide range of issues from fundamental research to solving practical problems. There are many forms of cooperation: meetings with representatives of scientific organizations of the countries of near and far abroad; scientific official trips of the Institute's employees, release of the international scientific and technical journal "Mechanics of Machines, Mechanisms and Materials", management of international scientific, scientific and practical events on the basis of the Institute.

Russian Federation

People's Republic of China

Republic of Korea

Republic of Poland

Republic of Kazakhstan

Czech Republic

Ukraine

Georgia

Germany

Spain

UNIDO

International Federation for the Promotion of Mechanism and Machine Science

Subscription index of the Journal
00338

Informational resources

Website of the Institute www.oim.by

THE INSTITUTE IS THE FOUNDER of the international scientific and technical journal "Mechanics of Machines, Mechanisms and Materials" and a collection of scientific papers "Topical Issues of Mechanical Engineering".

The periodicals are published in Russian and English.
The periodicals of the Institute are included in the system of Russian Science Citation Index.

The Ministry of Information of the Republic of Belarus has registered the international scientific and technical journal "MECHANICS OF MACHINES, MECHANISMS AND MATERIALS" as a mass medium (Certificate on state registration of mass media in the State Register of Mass Media No. 255 of 10.04.2009).

It is included by the Higher Attestation Commission of the Republic of Belarus in the List of Scientific Publications for the publication of the results of dissertation research in scientific areas:
- technical sciences (mechanical engineering, mechanics);
- physics and mathematics (mechanics).

The journal is published since 2007 with a frequency of four times a year.

TOPICAL SECTIONS OF THE JOURNAL

- General problems of mechanics, theoretical mechanics, theory of mechanisms and machines
- Mechanics of deformable solids
- Mechanics of liquids and gases
- Mechanics of mobile machines
- Computer mechanics
- Special sections of mechanics (mechanics of composites, structural mechanics, biomechanics, geomechanics, technological mechanics, nanomechanics, etc.)

Website of the Journal www.mmmm.by
ISSN 1995-0470 (printed version)
ISSN 2518-1475 (online)

Collection of scientific papers “Topical Issues of Mechanical Engineering” is included by the Higher Attestation Commission of the Republic of Belarus in the List of scientific publications for publication of the results of dissertation research in the scientific areas:

- Technical sciences (engineering science, mechanical engineering).

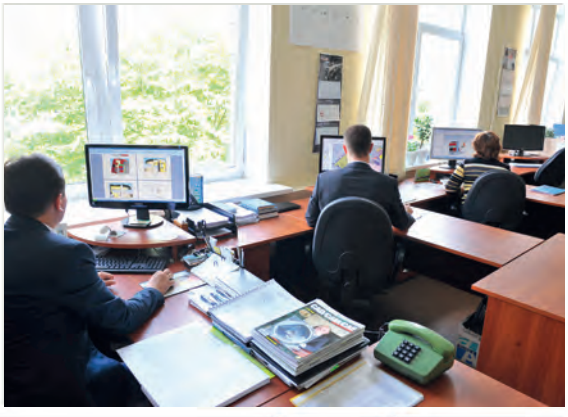
The collection is published in 2012 with a frequency of once a year.

TOPICAL SECTIONS OF THE COLLECTION

- General issues of machine science
- Mechanics of mobile machines and mechanisms
- Reliability, dynamics, strength of machines and structures
- Technological mechanics
- Experimental mechanics, diagnostics, testing

THE INSTITUTE IS ORGANIZER of republican and international scientific, scientific and technical, scientific and practical forums:

- Belarusian Congress on Theoretical and Applied Mechanics “Mechanics”
- International Scientific and Technical Conference “Innovations in Mechanical Engineering”.



Scientific Centers of the Institute

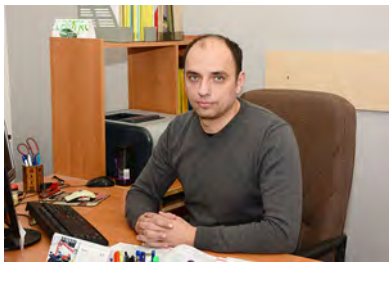
The total number of researchers is 164, including 14 Doctors of Science (D. Sc.), 26 Candidates of Science (Ph. D.), 6 Professors, 15 Associate Professors and two Corresponding Members of the NAS of Belarus.

Republican Computer Center of Mechanical Engineering

Chief
Alexey V. SHMELYOV,
Ph. D. in Eng.

R&D Center “Mechanical Engineering Technologies and Processing Equipment”

Chief
Vladimir L. BASINYUK,
D. Sc. in Eng., Associate Professor



R&D Center “Electromechanical and Hybrid Power Units of Mobile Machines”

Chief
Alexander V. BELEVICH

R&D Center “Onboard Control Systems of Mobile Machines”

Chief
Vladimir V. SAVCHENKO,
Ph. D. in Eng.

R&D Center “Mining Machinery”

Chief
Nikolai N. ISHIN,
D. Sc. in Eng., Associate Professor

R&D Center “Agricultural Engineering”

Chief
Dmitriy A. DUBOVIK,
D. Sc. in Eng., Associate Professor

R&D Center “Republican Proving Ground for Mobile Machines Testing”

Branch Manager
Sergey A. KOT

R&D Center “Certification of Mobile Machines”

Chief
Vladimir Ya. PAVLOVSKY,
Ph. D. in Eng.

Republican Computer Center of Mechanical Engineering

Modern integrated digital technologies for engineering products design

Industrial design

- design-research;
- design-engineering;
- ergonomic design;
- reverse engineering;
- scale modeling and prototyping (3D-printing, 3D-scanning and virtual reality technologies);
- promotional materials;
- company style development.

Design engineering

- complex product design;
- research and development;
- development, editing and correction of 3D models of any complexity;
- release of design documentation;
- development of accompanying design and technological documentation;
- development of operational and repair documentation;
- author's support of manufacturing and testing of products.

Computer simulation, calculations and optimization

- calculation and investigation of kinematics and dynamics of multicomponent mechanical systems using numerical methods and simulation tools;
- calculation and investigation of mechanical systems and components on the basis of the finite element method (strength, noise and vibration, hydro-gas dynamics, modal and harmonic analysis);
- resource estimation (high and low cycle fatigue, wear);
- one- and multi-criteria optimization;
- parametric and topological optimization of parts and structures.

Virtual testing

- development, verification and validation of computational models and methods for virtual testing of machines and components performed on the basis of numerical methods of calculations;
- virtual tests conducting to assess the compliance of the indicators: stability, maneuverability, controllability and running smoothness, as well as active and passive safety of vehicles and their structures to the requirements of regulatory documents (STB, GOST, UNECE, ISO, ROP/FOPS rules);

Contacts

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Republican Computer Center
of Mechanical Engineering
was established by the Decree of the Council
of Ministers of the Republic of Belarus
dated June 2, 2005 № 587.

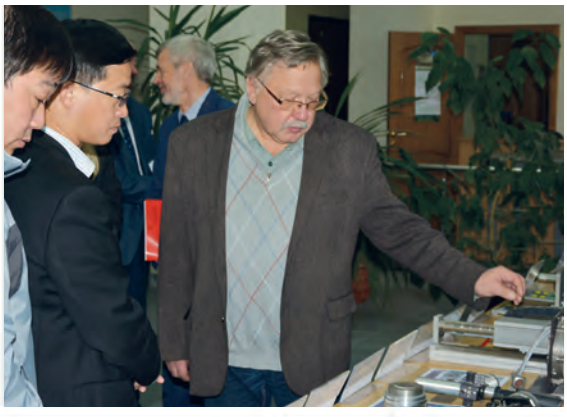
- carrying out of studies to determine the parameters of material models necessary for a reliable description of the properties of machine parts and structures in virtual tests;
- development, research and improvement of test schemes, equipment and devices used.

Simulation and optimization of control systems

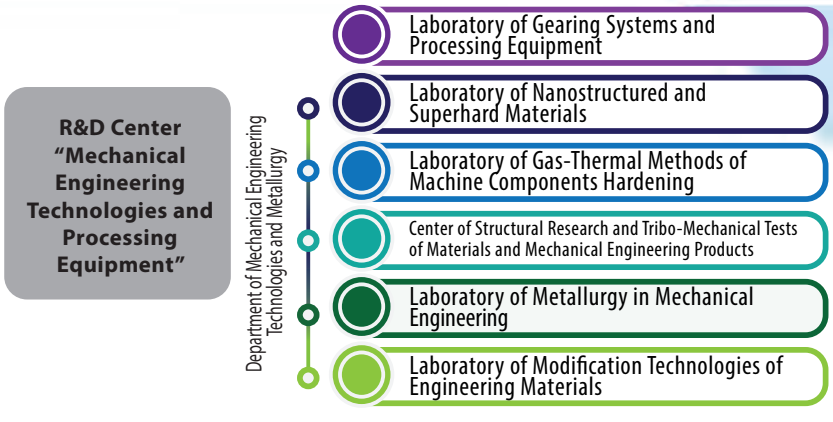
- development of models and techniques for systems and control objects simulation using numerical methods of multi- and interdisciplinary calculations;
- multi-level modeling and analysis of control algorithms for the machine and its individual systems;
- verification, validation and optimization of control algorithms;
- solving of the problems of multidisciplinary system SIL-modeling including: mechanical, hydraulic, pneumatic, electrical, electronic and other systems;
- study of systems and control objects using HIL-technologies.

Full-scale testing

- development of stands and bench equipment for parts and machine designs testing;
- development of programs-techniques of full-scale research, resource accelerated (road and bench) tests of engineering products;
- support of tests;
- processing and analysis of test results;
- verification and validation of computational models and methodologies based on the results of full-scale tests;
- development of recommendations for improvement of engineering products based on test results.



R&D Center “Mechanical Engineering Technologies and Processing Equipment”



LABORATORY OF GEARING SYSTEMS AND PROCESSING EQUIPMENT

Vladimir L. BASINYUK, Director of R&D Center “Mechanical Engineering Technologies and Processing Equipment” – Head of the Laboratory, D. Sc. in Eng., Associate Professor
+375 (17) 284 29 10; vladbas@mail.ru

Directions of scientific research:

- creation of software-controlled drives of mechatronic systems based on brushless high torque rotary and linear motors on permanent magnets and geared motors operating in normal and extreme conditions, including open space;
- development and implementation of “turnkey” technologies for automated means for the formation of functionally oriented composite materials and multilayer multifunctional coatings using cladding techniques with a flexible tool;
- development and research of methods and technical solutions in the field of noise and vibration reduction.

LABORATORY OF METALLURGY IN MECHANICAL ENGINEERING

Sergey G. SANDOMIRSKY, Head of the Laboratory, D. Sc. in Eng., Associate Professor
+375 (17) 284 23 51; +375 (44) 709 98 58; sand@iaph.bas-net.by

Directions of scientific research:

- development of chemical-thermal hardening technologies applied to specific equipment that provide the required quality of power transmission parts for automotive equipment;
- calculation of the service life of the gears of the transmissions (allows us to determine the microhardness and its distribution over the thickness of the hardened layer providing the required durability);
- calculating the hardenability of structural steels (allows calculating the hardenability of the core and the cemented layers of steel,

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vladbas@mail.ru

depending on the content of alloying calculation of the regime parameters of carburization providing a predetermined carbon distribution, on the basis of modeling the processes of carbon diffusion in steel, taking into account the mass transfer coefficients, the magnitude and accuracy of regulation of the furnace atmosphere carbon potential;

- magnetic structuroscopy in engineering and metallurgy;
- development of methods and devices for automated quality control:

– of heat treatment of products of mass production;
– of surface properties of mechanical engineering products after HFC hardening and other types of thermal-mechanical and chemical-thermal treatments;

- research and development of technological fundamentals:

– rings rolling of rings type parts;
– dynamic stabilization of friction discs and parts of other shapes.

LABORATORY OF MODIFICATION TECHNOLOGIES OF ENGINEERING MATERIALS

Alexander I. KOMAROV, Head of the Laboratory, Ph. D. in Eng.
+375 (17) 284 24 44; al_kom@tut.by

Directions of scientific research:

- research in the field of interfacial interactions in melts and composites, development of technologies for obtaining functional coatings, new materials and composites with improved physical and mechanical and tribotechnical properties, technological support of the resource of details and structural materials;
- research, development and experimental-technological work on technologies for volumetric and surface modification of structural materials, development of methods and means for producing ceramic coatings and metal matrix composites.

R&D Center “Mechanical Engineering Technologies and Processing Equipment”

LABORATORY OF NANOSTRUCTURED AND SUPERHARD MATERIALS

Viktor I. ZHORNIK, Deputy Head of the Department of Technologies of Mechanical Engineering and Metallurgy – Head of the Laboratory of Nanostructured and Superhard Materials, D. Sc. in Eng., Associate Professor
+375 (17) 284 25 18; zhornik@inmash.bas-net.by

Directions of scientific research:

- development of nanostructured antifriction materials modified with nanoscale additives, including nanodiamonds, for heavy-loaded and high-temperature friction units;
- nanostructured antifriction materials
  - lubricants
  - electrochemical chrome-diamond coatings on friction units elements;
- creation of superhard composite materials based on nano-, submicro- and micropowders of cubic boron nitride and diamond for blade and abrasive tools;
- development of methods for making cutting and ruling, including diamond-containing, tools with the use of electrocontact heating.

LABORATORY OF GAS-THERMAL METHODS OF MACHINE COMPONENTS HARDENING

Marat A. BELOTSERKOVSKIY, Head of the Laboratory of Gas-Thermal Methods of Machine Components Hardening, D. Sc. in Eng., Associate Professor
+375 (17) 284 28 63; mbelotser@gmail.com

Directions of scientific research:

Solving the problems of increasing the service characteristics of metal, polymer, composite coatings, formed by gas-thermal methods from powder and wire materials using rational methods to activate spraying processes, subsequent modification of sprayed layers, discovery of regularities in the formation of coatings, their structure, physical and mechanical properties and service properties corresponding to the operating conditions of most friction units of mobile machines and process equipment.

Contacts

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D. Sc. in Phys. and Math., Professor

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The center is accredited for compliance with the requirements of ISO/IEC 17025 as a testing center for testing the mechanical properties and research of materials structure and mechanical engineering products (certificate № BY/112 02.1.0.1670 dated from 03.05.2010, the period of validity is up to 05.03.2020).

The center conducts the analysis of structure, phase and defining of mechanical and tribological properties of construction materials (including at high temperatures) and hardened layers for heat-and-power, chemical, mechanical engineering, building and other equipment.

CENTER FOR STRUCTURAL RESEARCH AND TRIBO-MECHANICAL TESTING OF MATERIALS AND MECHANICAL ENGINEERING PRODUCTS, established on December 1, 2005.

Directions of scientific research

Investigation of phase and structural transformations in metal materials and coatings under the influence of thermal, chemical-thermal and other types of high-energy processing (including ion beams, microarc discharges, etc.). Establishment of dependencies between the parameters of the structural state and the mechanical, as well as tribotechnical properties of metals and alloys. Creation of scientific bases for improving the service properties of steels and alloys and developing technologies for hardening materials and coatings. Carrying out of examinations of the reasons of destruction and failure of machines and critical parts of mechanisms.

Tests types

- Static tension tests, including static tension tests under an elevated temperature, with temperature range up to 1100 °C.
- Compression tests. Load range: 0,6–300 kN. Accuracy ±1,0 %.
- Vickers hardness tests. Range HV: 8,0–2000.
- Microhardness testings (with indentation and scratching). Range HV: 8,0–2000.
- Evaluation of porosity and microstructure.
- Grain size tests.
- Evaluation of nonmetallic impurity rating.
- Evaluation of macro- and microstructure and carbide inhomogeneity.
- Determination of the phase composition of materials.
- Determination of the elemental composition of materials: qualitative and quantitative analysis of chemical (elemental) composition (from sodium Na to uranium U) of solid or liquid samples.

R&D Center “Electromechanical and Hybrid Power Units of Mobile Machines”

DIRECTIONS OF SCIENTIFIC RESEARCH

Electromechanical and hybrid power units of mobile machines

- selection and feasibility study of the structure of the power unit;
- simulation of operating modes of the power unit in typical operating modes;
- development of algorithms for system interaction and technical requirements for components of the power unit.

Electric drives

- design, calculation and modeling of physical processes of electrical machines;
- design, calculation, modeling of operating modes and creation of samples of inverters of electric drive control;
- development of algorithms and software for electric drive control systems.

Energy storage and converter equipment

- design, calculation, modeling of physical processes and creation of samples of accumulators of energy;
- design, calculation, modeling of physical processes and creation of samples of supercapacitor energy storage;
- development and creation of samples of electronic control systems for electrical energy storage units;
- development and creation of samples of controlled power electric energy converters.

Highly integrated electronic control systems

- development of design and circuit solutions for electronic modules of highly integrated control and diagnostic systems for mobile machines;
- simulation of algorithms and software development of microprocessor modules of highly integrated control and diagnostics systems for mobile machines.

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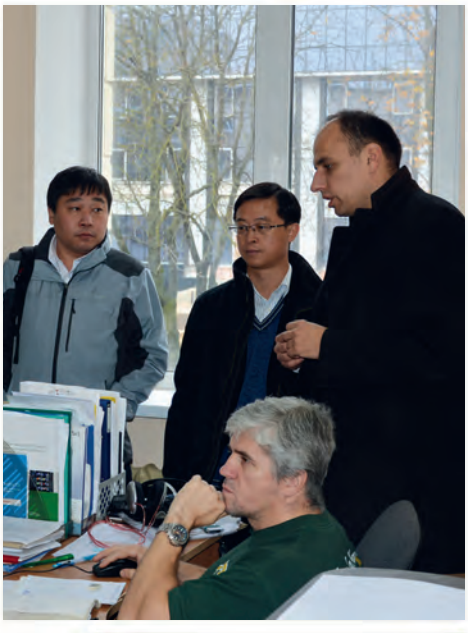

Test-bench equipment

- calculation and development of the design of test benches;
- development of electronic control systems for bench equipment;
- development of electronic systems for primary processing, accumulation and transmission of data on bench test results.

R&D Center “Onboard Control Systems of Mobile Machines”

DIRECTIONS OF SCIENTIFIC RESEARCH

- development, engineering of methods of analysis and synthesis, research of a new generation of electronic and mechatronic components, integrated onboard control systems and information and analytical complexes of prospective vehicles, including monitoring and servicing the “human – machine” transport systems according to their actual state;
- development of circuit solutions, basic algorithms and software for on-board switching units of new generation vehicles, with support for LIN and CAN protocols;
- development of an information and analytical system for locating a vehicle and informing about an emergency using high-precision navigation systems and dynamics of changes in the driver’s functional state;
- study of the processes of interaction of vehicles using V2V, V2I and V2P (P2V) protocols and development of applied algorithms;
- development of methods and algorithms for active safety systems of new generation vehicles using the methodology of driver assistant systems for dynamic stabilization of a vehicle and its trajectory movement;
- development of methods and algorithms for information protection in critical information flows on board a vehicle and in interaction with external systems;
- analysis and synthesis of algorithms for interaction of vehicles with intelligent transport systems;
- justification and development of the concept of cross-modal interaction in “human-machine” systems;
- development of scientific foundations and creation of electrohydraulic control systems using precise and energy-saving drives of actuators;

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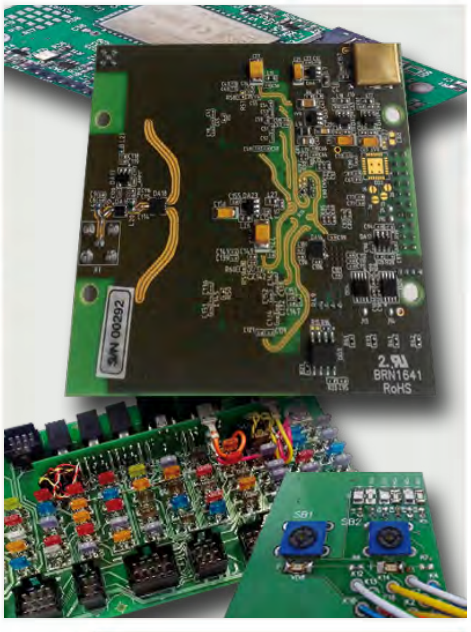
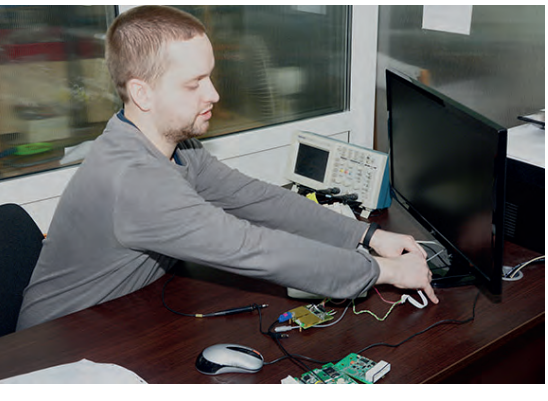
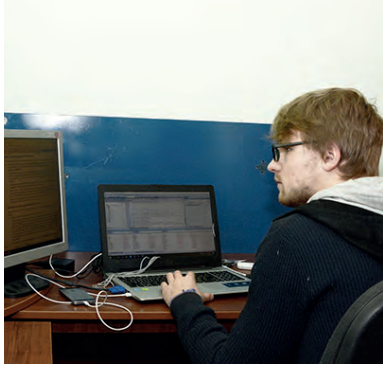
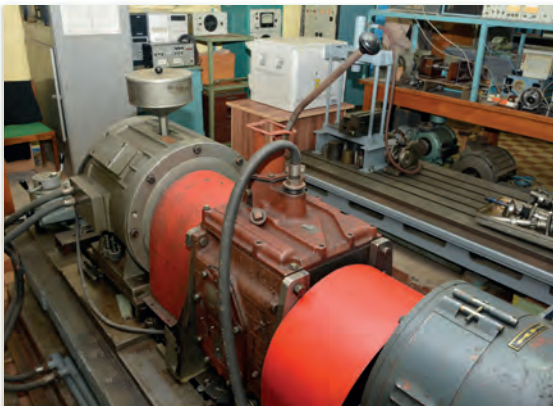


- development of electrohydraulic control systems and their components for mobile machines for industrial development;
- development of methods and creation of systems for diagnosis and correction of motor and cognitive functions of a person on the basis of the methodology of biological feedback, including those for solving issues of monitoring and improving important professional qualities of drivers.







R&D Center “Mining Machinery”

DIRECTIONS OF SCIENTIFIC RESEARCH

- mobile machines safety and reliability maintenance;
- synthesis and optimization of mechanical and mechanical-based hybrid systems of mobile machines with a complex structure;
- methods of kinematic, dynamic and resource calculation of mobile engineering;
- calculation of designing process of joints and assemblies of mobile engineering;
- development of methods of technical state and transmission systems;
- development of theoretical and experimental methods for predicting of construction resource in typical operational environment;
- development of theoretical and experimental monitoring methods of vibration processes and accumulation of damages in limiting parts of machine driving;
- development of methods and tools of accelerated tests of automotive components based on their technical condition;
- development of software for the given areas of activities;
- implementation of the developed products at domestic mechanical engineering enterprises;
- development of methods and tools based on software and hardware simulation to create and evaluate the quality of control algorithms, control systems elements of mobile machines, testing of elements of these systems;
- development of control algorithms and software for the hydromechanical transmission control systems of trucks, construction and mining machinery;

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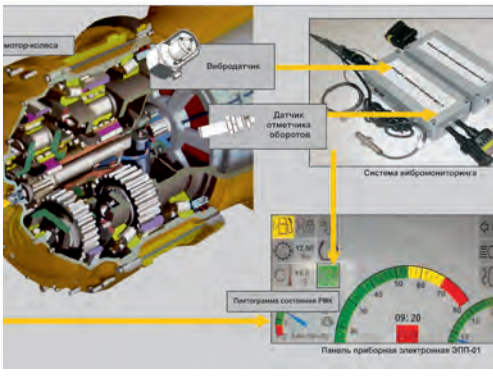
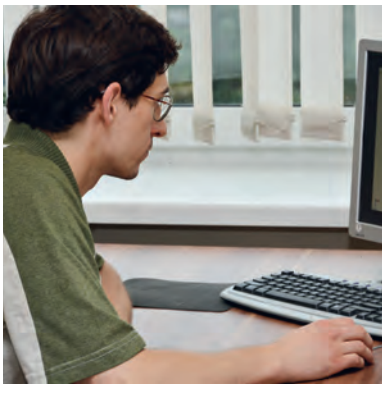


- dynamic and kinematic calculation of transmission, the synthesis of control systems schemes;
- development of methods and tools, virtual, benchmark, site tests of active safety systems, their components and control algorithms based on software, hardware and software modeling and information processing methods; synthesis of active safety systems schemes;
- creation of fundamental principles of scientific and innovative technologies of improving of strength of steel and components by control of chemical, structural and mechanical homogeneity of the border nanovolumes of structural material grains.



R&D Center “Agricultural Engineering”

DIRECTIONS OF SCIENTIFIC RESEARCH

- analysis of the tendencies in tractors and combine harvesters industries, substantiation of rational parameters of tractors and combine harvesters machinery of different purpose;
- development of methods for calculating and justifying the parameters of the main aggregates, systems and units, developing programs and techniques for bench and field testing of tractors and agricultural machinery;
- development of methods for determining reliability indicators for automotive, tractor and agricultural machinery, its components and parts for operational data, development of recommendations for improving its reliability;
- substantiation of reliability rate of agricultural machinery of various purposes by the criterion of competitiveness;
- development of technical regulatory legal acts in the field of agricultural machinery reliability, taking into account existing standards of GOST, ISO, IEC;
- analysis of kinematic schemes of steering gears of controlled wheels of mobile equipment, justification of the control formula for multi-axis machines;
- formulization of scientific foundations and development of the theory of an agricultural wheeled tractor with electric drives of power units;
- analysis and synthesis of differential mechanisms and onboard power distribution systems between driving axles and wheels, steering gears of steerable wheels, structural schemes of dual-flow hydrostatic-mechanical transmissions of mobile equipment;
- development of designs and methods for calculating the strength of composite parts for machinebuilding purposes;
- development of methods and tools for dynamic balancing of the oscillating working bodies of agricultural machines; increase of the efficiency of running systems of wheeled vehicles;
- development, support of tests, setting for production and serial production of attached and trailed forage harvesting equipment with recuperative drives of working bodies, regenerative drives of agricultural machines.

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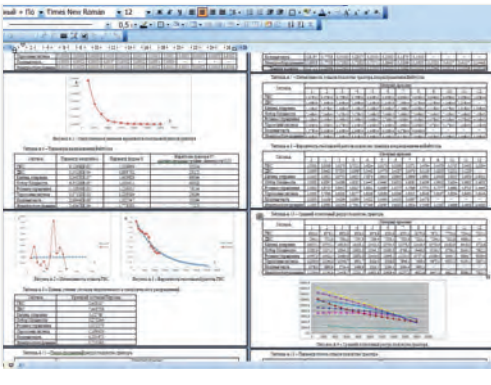

The joint laboratory “MTW-JIME of the National Academy of Sciences of Belarus” is included in R&D Center of OAO (OJSC) “MTW”, which provides activities in research and development work, scientific support of innovative projects, pilot testing and introduction into production of the results of R&D activities.

R&D Center “Republican Proving Ground for Mobile Machines Testing”

DIRECTIONS OF SCIENTIFIC RESEARCH

Carrying out of certification tests of all categories of vehicles to obtain the certificates of conformity, the reports concerning the regulatory approval of vehicle type with regard to individual properties pursuant to the UN Rules and vehicles type approval to release on the territory of the Customs Union. The tests are carried out to be compliant with the requirements of the following international and national standards:

- UN Rules.
- STB, GOST and GOST R.
- Technical Regulations of the Customs Union 018/2011 “On safety of wheeled vehicles”.
- Technical Regulations of the Customs Union CU 010/2011 “On safety of machinery and equipment”.
- Technical Regulations of the Customs Union CU 007/2011 “On safety of products for children and adolescents”.
- Research and testing of experimental and production models of vehicles, systems, vehicles constructional elements and developing of recommendations to improve their performance properties in compliance with the current and future requirements.
- Verification of the requirements to individual vehicles prior to their release into circulation.
- Verification of the requirements to vehicles in service in case of changes in their engineering design.
- Assigning and application of the vehicle identification number (VIN).

ADDITIONAL SERVICES

- Test drive organizing and conducting.
- Club events and presentations.
- Organizing and conducting sports and training activities.

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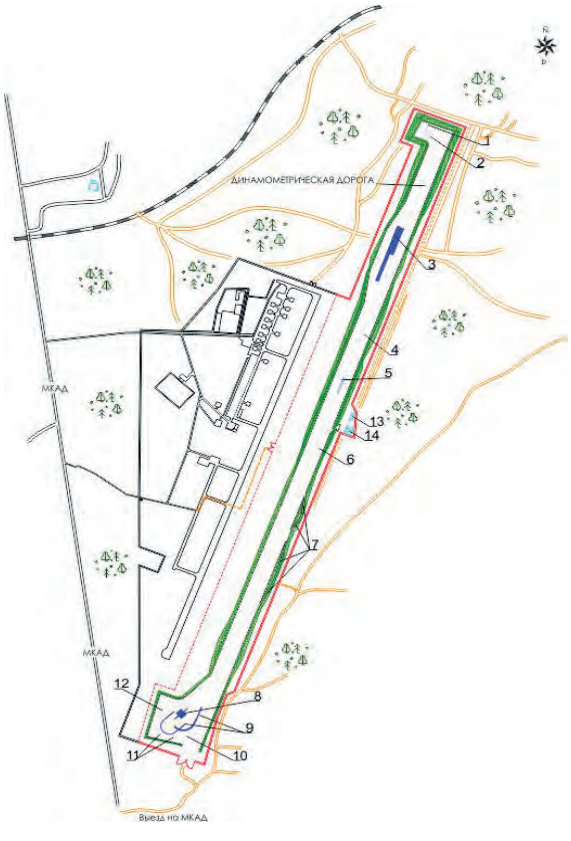
R&D Center “Republican Proving Ground for Mobile Machines Testing” is accredited by the National accreditation system of the Republic of Belarus in compliance with STB ISO IEC 17025, it is a Testing Center E 28/Q under 1958 Geneva accord, it was included in the Unified Registry of certification authorities and test laboratories (centers) of the Customs Union carrying out assessment of compliance of products with the Technical Regulations of the Customs Union.
The scope of accreditation includes 51 UN Rules, 113 National and Interstate Standards.



1 – field for geometric measurement and inspection of vehicle structure, light alarm illumination device, rear view mirrors, visibility from the driver’s seat;
2 – field for maneuvering tests (flexibility into the back passage);
3 – field with basalt coating for evaluation of braking performance;
4 – field for measurement of control speedometers maximum speed;
5 – field for stability and handleability tests;
6 – field for measurement of traction and dynamic properties and fuel consumption;
7 – lifts for parking brake system tests;
8 – field for audio measurement, audible signaling;
9 – fields for tests of handling and stability in critical driving conditions;
10 – field for tests of steering control of vehicles towing trailers;
11 – field for tests of four-wheel drive machines steering control;
12 – field for tests of mobile machines steering control;
13 – laboratory-household unit;
14 – building for machine preparation to tests.

R&D Center “Certification of Mobile Machines”

“ACADEM-SERT” INCLUDES

- Certification Authority of products and services, conforming to the requirements of the National accreditation systems of the Republic of Belarus and accredited for compliance with the requirements of GOST ISO/IEC 17065-2013. Authority for certification of products and services is included in the Unified Register of Certification Authorities and Testing Laboratories of the Customs Union.
- Certification Authority of management systems conforming to the requirements of the National accreditation systems of the Republic of Belarus and accredited for compliance with the requirements of GOST ISO/IEC 17021-2013.

ACCREDITATION AREA

- Technical Regulations of the Customs Union TR TC 007/2011 “On safety of products intended for children” (in the area of children’s bicycles and prams).
- Technical Regulations of the Customs Union TR TC 010/2011 “On safety of machinery and equipment”.
- Technical Regulations of the Customs Union TR TC 018/2011 “On safety of wheeled vehicles”.
- Technical Regulations of the Customs Union TR TC 031/2012 “On agricultural and forestry tractors and trailers thereto”.
- STB ISO 9001-2015 “Quality management systems. Requirements”.

CONFIRMATION OF COMPLIANCE RESULTS

- Certificate of conformity of the Customs Union.
- Approval of vehicle type (chassis).
- Declaration of conformity.
- Message type approval.
- Certificate of Conformity of the National System for Conformity Assessment.
- Certificate of compliance of the quality management system with the requirements of the STB.

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- TP TC 007/2011: strollers, bicycles for children.
- TP TC 010/2011: snowmobiles, snow aerial vehicles, garage equipment, machinery, agricultural, smallscale mechanization, mechanized tool, technological equipment, machines, tractors, lift trucks, quarrying machines and utility vehicles, adult bicycles, millers, cutters, saws, construction equipment and machinery.
- TP TC 018/2011: motorbikes, mopeds, motor scooters, motorcycles, tricycles, ATVs, cars, trucks, buses, trolleybuses, special vehicles, trailers, semi-trailers, vehicle components.
- TP TC 031/2012: agricultural and forestry tractors, tractor trailers, tractor components.

NATIONAL SYSTEM OF CONFORMITY ASSESSMENT

pipes, tubes, collets, locks, hand-guided tools, wrenches, hammers, sledge hammers, planers, chippers, chisels, jaws, clamps, drills, nails, buttons, fixing arrangements, rivets, keys, cotter pins, fittings, hydraulic pumps.

CONTENTS

THE JOINT INSTITUTE OF MECHANICAL ENGINEERING OF THE NAS OF BELARUS

Advertising brochure

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