

MAIN DIRECTIONS OF SCIENTIFIC AND EDUCATIONAL ACTIVITIES OF MADI (FOR THE 90TH ANNIVERSARY OF THE UNIVERSITY)

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Abstract: *The article, dedicated to the 90th anniversary of the Moscow Automobile and Road State Technical University (MADI) presents the history of the formation and development of the University, the main directions of scientific and educational activities during this period. structural features of the University, its links with production and other universities in Russia and abroad. It is noted that MADI is a basic organization for the CIS countries and a methodological center in Russia.*

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Among the technical universities of the Russian Federation, Moscow automobile and road state technical University (MADI) holds a special place due to the role that cars and roads have played in the development of modern society.

Established on December 13, 1930 at the beginning of the country's motorization, the University has become a recognized scientific and educational center, whose activities include a wide range of educational and research services in the interests of the automobile and road complex, designed to ensure the effective and safe operation of transport and transport infrastructure.



Fig. 1. General view of MADI

Currently, MADI unites more than 250 higher educational institutions in Russia as part of the Educational and Methodological Association for transport and transport-technological complexes and is a coordinating methodological center that determines the direction of improvement content of methodology and practice of teaching disciplines related to the development of motor transport and road management.

Over the years, MADI established scientific schools, the founders of which were outstanding Russian scientists: academicians E. A. Chudakov and S. B. Stechkin, corresponding member of the Academy of Sciences of the USSR N. R. Briling, corresponding member of the Russian Academy of Sciences V. N. Lukanin, Yu. M. Lakhtin (winner of the USSR State prize), A. N. Ostrovtssev (winner of the USSR State prize), S. V. Shestopoyerov (three times winner of the USSR State prize), N. N. Ivanov (twice winner of the USSR State prize), V. A. Kiselyev (winner of the state prize of the USSR) and many others.

The 58 Chairs of the University employ leading scientists in the field of motor transport, road management, airfield and bridge construction, road engineering, special purpose engineering, Economics, computer science, organization and management of motor transport and road construction, road traffic safety, telematics, ITS and automated control systems.

The first graduation of specialists in MADI took place in 1931. Currently, the University annually graduates 1.5 thousand highly qualified specialists (26 specializations), in 9 bachelor's and 6 master's directions. 30 programs of postgraduate education, 6 programs of additional education, professional retraining and advanced training were developed and implemented in accordance with the existing licenses. The University implements programs of second higher education and programs for obtaining additional qualifications (4 programs).

MADI's construction specialties are accredited by the British Institute of Civil Engineers (London, UK) for the master's level, and automotive specialties are accredited by the Association of Engineering Education of Russia. MADI has implemented additional education programs: Master of business administration (MBA) and Translator in professional communication.

The research team of the University has contributed to improving the efficiency, reliability and environmental friendliness of domestic cars and engines, increasing inter-repair runs, reducing the complexity of their maintenance and repair. A major contribution was made to the creation of a scientific organization of road transport and traffic safety. A large range of works was performed to improve the design, construction, repair and maintenance of roads, to introduce computer-aided design, to develop the theory of reliability in calculating road pavements, to improve the quality of structural and road-building materials, to improve testing methods and evaluation of transport and operational indicators of roads and airfields, to develop and implement means of transport telematics, intelligent information systems in transport and construction. Fundamental work has been carried out on the most important state scientific and technical programs in the field of transport, transport infrastructure and engineering education.

Important scientific and technical developments of MADI that received support in the USSR, Russia and abroad:

- In the sixties of the last century, a creative team headed by Yuriy M. Yakovlev created the world's first unique dynamic loading unit for evaluating the strength of high-performance road pavements, which received international recognition. At the 13th International Road Congress in Tokyo in 1967, the USSR delegation presented the main provisions of the new method, which was the beginning of its widespread introduction into the practice of road organizations in many countries. Based on the works of Yuriy M. Yakovlev a number of modified dynamic loading units have been created, which are the main tool for performing road surface diagnostics. Many companies in the United States and Europe have started producing such installations.

- The creative team of the Chair of "Theoretical mechanics" (A. A. Khachatyaurov, V. L. Afanasyev, V. I. Koltsov, V. B. Borisevich, etc.) created a unique device that allows you to assess the evenness of the road surface at speeds up to 80 km/h.

- In the early 60s of the last century, V. N. Ivanov developed a mobile laboratory that allows to study the influence of road conditions on the mode of movement of cars.

- In the mid-60s, E. M. Lobanov created a mobile laboratory to assess the psychophysiological state of drivers while driving.

- In the early 60s, Prof. O. V. Andreev developed a method for calculating the opening (span) of large bridge structures, which has received international recognition. And in Canada, this technique was published for official mandatory use.

- A graduate from MADI, Prof. G. Ya. Klyuchnikov, working in the Leningrad branch of the Institute "Aeroproject", participating in the expeditions of Soviet scientists to Antarctica, designed and built the first snow airfield in Antarctica, which provided landing of heavy cargo aircraft on a wheeled chassis without skis. His scientific supervisor was D.Sc., prof. G. I. Glushkov-head of the "Airfields" Chair of MADI.

The main directions of MADI's research over the past years were the following:

- scientific and methodological support of the educational process in the areas and specialties of the University, assessment of the quality of graduation and employment; environmental problems of the motor transport complex and road economy, saving of traditional fuel, development of energy installations using alternative fuels;

- ensuring traffic safety on roads and city streets;

- innovative technologies in the field of traffic management and safety based on transport telematics, global navigation systems and intelligent information systems;

- improving the design, construction and operation of roads and airfields, road bridges, road tunnels and other transport structures to improve traffic safety and their durability and reliability;

- innovative technologies for assessing the operational condition of transport facilities;

- development of technologies and equipment that improve the performance of motor vehicles;
- economics, management, logistics in motor transport and road sectors of economy of the country.

To implement the full cycle "from idea to prototype" and accelerate the implementation of research results, small enterprises, joint-stock companies and partnerships, engineering centers, centers for licensing and certification of transport equipment and materials have been created and successfully operate at the University. It has become a tradition to hold the annual spring exhibition of scientific achievements of MADI, which greatly contributes to the popularization of scientific activities and attracting orders for scientific research.

A team of MADI scientists developed the "Concept of transport policy in the field of improving traffic conditions in Moscow", "the Concept of development of motor transport in the Russian Federation", and "the Concept of the Russian safe car". They define goals, priorities, policies and mechanisms for their implementation in the field of road transport, road traffic safety, and transport services for the population of the Russian Federation.

MADI carries out systematic work to activate scientific research and involve the public in solving road traffic safety problems:

- a group of University scientists actively participates in the work of the State Commission on road traffic safety and The center for strategic research under the Government of the Russian Federation;

- MADI representatives are included in the working groups of the Federation Council and The State Duma on improving the regulatory framework and legislation in the field of transport and road safety;

- the University, represented by V. M. Prikhodko, a corresponding member of the Russian Academy of Sciences, and a group of MADI scientists are members of the working groups preparing issues on road safety and innovative development of the transport complex of the Russian Federation for the meetings of the Presidium of the State Council of the Russian Federation;

- the University is one of the main scientific performers of the Federal target program on road traffic safety (Decree of the Government of the Russian Federation No. 100 of February 20, 2006 "On the Federal target program" Improving road safety in 2006-2012 and in 2013-2020»);

- the University represents the Russian Federation at the Forum of European research institutes in the field of road safety (FERSI), an Advisory body to the Council of Ministers of transport of the EU.

MADI specialists have created a scientific school that has allowed them to develop basic principles and methods of traffic safety based on basic research, which form the basis for

reducing the number of road accidents on city streets and highways.

Based on fundamental research of fuel combustion processes, a new MADI-KAMAZ engine was developed and manufactured, powered by natural gas and allowing it to meet the prospective EURO-5 standards. Based on the results of successful operational tests, the management of JSC LiAZ decided to install these engines on buses of the LiAZ-5256 type.

A computational and design complex has been created and is being developed that allows simulating the operation of parts and assemblies of cars and engines made of composite materials, and calculating rubber-metal products and tires.

The "MONSTER" information and calculation system has been created, based on a constantly updated database of road bridges on the Russian Federal road network. The system allows you to use built-in programs to conduct strength and economic calculations that ensure effective spending on the repair and reconstruction of bridge structures. Presently this system is widely used in Israel.

To develop and implement innovative technologies in the Russian automobile and road complex, the University has established and is successfully developing research institutes:

1. Institute of energy-ecological problems of the motor transport complex.
2. Institute of mechanics and quality problems.
3. Institute of road transport problems.
4. Institute of road industry problems.
5. Institute of materials and structures.
6. Institute of natural sciences.

To implement the results of scientific research and implement innovative projects at the University, organizations created with the participation of the University, such as

MADI-PROJECT, which designs local measures to increase road capacity and safety of the Moscow road and street network;

MADI-PRAKTIK, which implements new technologies in road construction;

MADI-TEST, which works in the field of vehicle safety certification;

"Road research center", which promotes geoinformation technologies in the practice of road design and maintenance organizations responsible for the condition of roads;

MADI-logistics, which works in the field of practical implementation of logistics systems in motor transport;

for many years, the Problem laboratory of road traffic safety (PLOBD) has been successfully operating (scientific Director prof. V. V. Silyanov) and others.

MADI Technopark is an educational and research center created and located at the

University's training ground (34 km of Leningradsky highway). The integration of applied science, education and business is successfully implemented on this territory of the. At the same time, effective use of the combined scientific, pedagogical and innovative potential of the University is achieved, and the gap between domestic science and business is bridged by establishing direct links between the creators of equipment and technologies with the domestic and global markets.

At the same time, the tasks of improving the quality of engineering education, ensuring its compliance with modern requirements of the labor market and technology, as well as strengthening the interaction of the scientific and educational sphere with employers and research customers, among which are: JSC "LONMADI" and JSC "KVINTMADI" (JVM Group); LLC "Terminal XXI"; LLC "Konturs SDM"; LLC "Sisteminvest"; LLC "Bosch service MADI"; LLC "MADI-Motor"; LLC "MADI L-Auto".

The main strategic partners of the University in the implementation of innovative educational programs are the following organizations and agencies – customers of specialists and scientific research: the Ministry of education and science of the Russian Federation; the Ministry of internal Affairs of the Russian Federation; the Ministry of transport of the Russian Federation; Ministry of industry and trade of the RF; Moscow city Government; Ministry of transport and communications of Moscow region; Scientific research institutes of the Russian Academy of Sciences; Academy of transport of the Russian Federation; scientific-research institutions working in the motor industry; International Association for Automobile and Road Engineering Education (IAAREE).

The University has an official public website on the INTERNET at: www.madi.ru. The number of requests to the site reaches 20 thousand or more per month. The scientific section of the site provides updated information about the main directions and topics of scientific research, scientific schools and the main results achieved.

The University constantly holds job fairs, where employers and senior students are invited. A database of graduates and students has been created and is constantly maintained, as well as information about employers and vacant jobs. Together with the Council of rectors of higher education institutions in Moscow and the Moscow region, the certification of regional and University structures to promote employment of graduates was carried out. An information portal that unites and coordinates work on employment and adaptation of graduates to the labor market conditions has been created. In order to establish contacts with prospective employers, the University is actively engaged in advertising activities through publications in the media, presentations of the University's achievements at exhibitions, congresses and conferences, through cooperation with leading employment agencies.

MADI has a "Russian-Swedish center for distance education on road traffic safety".

The University has developed and implemented a quality management system for training specialists with higher professional education (Certificate of compliance No. 10750). In MADI

for the first time in Russia in 1997, the Center for engineering pedagogy was established and successfully operates. It is accredited by the International Society for Engineering Pedagogy (IGIP). One of the tasks of the Center is to improve the pedagogical skills of teachers to the level that meets the requirements of the International Register. The Russian Monitoring Committee of the international society for engineering pedagogy RMC IGIP (RMC President – prof. V. M. Prikhodko, General Secretary – prof. A. N. Solovyov) operates on the basis of MADI. RMC IGIP coordinates the work of fourteen accredited centers for engineering pedagogy, established in various universities of the Russian Federation and contributing to the modernization of the system of training and advanced training of technical University teachers.

At the University, within the framework of the Institute for the development of higher professional education (IPR HPE), fundamental and applied research is being conducted to improve engineering education. The significance and effectiveness of this area of work is evidenced by the fact that prof. V. M. Prikhodko, Director of the Institute (prof. I. V. Fedorov) and scientific Director of the IPR VPO (prof. V.M. Zhurakovsky) were awarded the Russian President's award in the field of education for the development and implementation of scientific and methodological support for the improvement of engineering education and the creation of a system of training and advanced training of teachers of technical universities.

The University is a co-founder of the International Association for Automotive and Road Engineering Education (IAAREE), which includes more than 250 universities in Russia, Vietnam, Mongolia, the USA, China, and India (the President of IAAREE is Professor Valentin V. Silyanov).

For many years, the rector of MADI prof. Leonid L. Afanasyev was elected as a vice president of the International Automobile Federation (FIA). This has contributed to the successful development of MADI motor sports activity.

On 14th June 2018 MADI became the basic organization of the CIS countries which gave possibility to open the branches of MADI in countries of CIS.

The availability of experience, scientific and material base allows the University to carry out a large amount of work on training and advanced training of teachers of higher education institutions of the country in conjunction with the solution of a range of problems of training a new generation of specialists for the automobile and road complex of the country within the framework of an innovative project.

References

[1] www.madi.ru (consulted 10.01.2020)