# THE MAIN TRENDS IN THE DEVELOPMENT OF ROAD AND MUNICIPAL MACHINERY AND EQUIPMENT

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Analysis of trends in scientific and technological progress and achievements in industrial construction technologies allows us to identify the main directions in the development of road and commercial vehicles. They are due to the general trends in the development of mechanical engineering, the successes of basic research, and the achievements of computerization. The current state of mechanical engineering is determined by the development of the microprocessor, robotics, and biotechnological directions. The use of microprocessor technology in mechanical engineering led to the emergence of computers with artificial intelligence [1]. Such computers allow the input and output of information in the form of images and sounds, as well as performing self-programming operations. The robotization of production is based on the implementation of mechanical engineering achievements, microprocessor technology, and computers in automats and robots. This leads to the intellectualization of robots and provides the possibility of their effective use in construction. The main directions of development of civil, road, and municipal construction are determined by the development of technology of road and airfield construction and consist of seven main directions.

The first direction includes the problems of improving the quality, reliability, competitiveness, and environmental characteristics of machines. Their indicators are implemented in each generation of road and commercial vehicles and at a higher level. The main task of this direction is to increase the indicators of reliability, durability, durability, maintainability, and implementation of technical service measures. All this is most economically and completely solved at the design and production stage. To create highly efficient automated multi-purpose machines, the requirements for reliability and longer service life are increasing. With newly designed commercial vehicles, the maintenance effort is significantly lower. For this, devices with an extended service interval, centralized lubrication, and on-board computer control with high-performance filters and a modular design are used, which provide easy access to nodes with a group arrangement of frequently serviced items.

To increase the competitiveness of the machines, the aesthetic design of the machines, service, maintenance, and spare parts supply is improved. New machines should surpass the best of the existing ones in terms of technical and economic indicators and have patent purity. The second direction characterizes the problems of electronics related to the widespread automation and robotization of commercial

vehicles based on the achievements of microprocessor technology and the use of computers. Automated devices will be created that will ensure the intensification of labor transport processes, positioning of working bodies, and facilitating the work of operators on control units, optimal modes of operation, and remote control of machines. Computer systems of satellite navigation and control of the operation and technical operation of municipal equipment will be implemented. The third direction involves solving the problems of further improving the efficiency of the working bodies of ground care machines for a significant increase in production and technological qualities of the machine based on the use of science, technology, and proven practices. It contains two main teachings on improving working bodies: based on traditional methods of environmental impact and based on the use of new resource-saving physical effects [2,3]. The first way is to solve a series of tasks shortly. First of all, it requires the creation of road and commercial vehicles with large unit power (400-1500 kW). An equally important task is the creation of small devices with a capacity of 5-30 kW through increasingly distributed, cramped, and diverse work. Working groups with a wide range of possible applications are formed.

The second way, the creation of community machines whose work processes are based on new physical effects, includes long-term problem-solving. The development of methods of intensifying work processes when moving tools in the medium by reducing frictional forces through the use of sliding materials, thermal effects, electro-physical methods, and devices for hydraulic and gas-air lubrication of working surfaces is gaining importance. The development of structures related to the use of gas and hydrodynamic achievements to intensify the destruction, compression, and movement of materials of various types is promising. To obtain fundamentally new machines, new physical effects are used. The fourth direction concerns the problem of improving the drive systems and power plants of commercial vehicles to further reduce energy costs and increase environmental friendliness. Hydrofication in combination with the electronics of machines ensures a significant increase in productivity and a reduction of metal consumption. The use of a volumetric hydraulic drive and in particular with drive pumps from a gas turbine engine; a hydro-mechanical transmission with gear shifting under load and the possibility of frequent reverse driving; highly efficient filters and additional hydraulic equipment open up far-reaching perspectives.

The fifth direction is achieved by solving problems related to the intensification of design based on the advancement of machine systems for various purposes, the widespread use of machine systems for various purposes, the widespread use of modular construction methods, and unification methods of resource-saving technologies and the creation of mechanized tool systems. Based on a modular design, optimal structures of road vehicle systems for different climatic conditions are created, series of standard sizes, uniform structurally and dimensionally similar machines, wide

specialization, and cooperation of production is ensured. The increasing volume of road construction in remote areas that are difficult to access requires the development of special machines based on the use of resource-saving technologies, the principle of combining several conventional blows in one operation, and the reuse of residual materials.

The sixth direction defines one of the important trends in the development of mechanical engineering as a system for manufacturing new road equipment and includes the problems of using computer-aided design tools and methods, automated systems for research and manufacture of machines to reduce time, cost, quality of design and drafting work and speed up the search for new solutions. This direction is associated with the development of technological construction operations based on the use of flexible automated construction industries. The seventh direction concerns the solution of important tasks to increase the efficiency of the use of road equipment by improving the structure of training and retraining of personnel in the conditions of economic reform of the national economy and production of electronics. The performance of machines with a traditional, non-automated control system largely depends on the skill of the operator. By using an automatic control system, you can provide more than 90% of the machine's potential productivity, regardless of the operator's training level. Automation of machine control requires a new way of organizing a training system for employees of different levels (engineers, operators, and setters) to create and operate machines with integrated microprocessor equipment.

The analysis of the main directions of development of road and municipal machines shows that a significant reserve for improving the efficiency of the use of the road and municipal machines is the introduction of robotization of the working processes of machines. In addition, it should be noted that the introduction of resource-saving technologies, in addition to increasing the versatility of machines, is also a very important direction in the development of road and commercial vehicles.

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