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# SELECTING THE METROLOGICAL DIMENSIONS OF THE PNEUMATIC TIRE RESOURCE IN MECHANICAL ENGINEERING CASE ANALYSIS

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**Аннотация:** Одним из важнейших элементов детали в машиностроении является пневматическая шинная часть, поскольку она служит для гашения ударных сил, поступающих на колеса машины. Одним из основных факторов обеспечения точности шинной детали является обеспечение в ней метрологических размеров на основе требований стандарта, а также освещены сведения о научных работах, проводимых по этой теме.

**Ключевые слова:** Машина, пневматика, шина, элемент, протектор, шина, инструмент, техника, стоимость, ресурс, эксплуатация, агротехника.

**Abstract:** One of the most important elements of a part in mechanical engineering is a pneumatic tire part, since it serves to dampen shock forces acting on the wheels of the machine. One of the main factors for ensuring the accuracy of a tire part is the provision of metrological dimensions in it based on the requirements of the standard, as well as information on scientific work carried out on this topic.
***K*ey words:** Machine, pneumatics, tire, element, tread, tire, tool, technique, cost, resource, operation, agricultural technology.

Introduction: Nowadays, effective use of energy and resources in all areas of the world, development and implementation of technology and technical means that save them is the main factor of raising the economy. Globally, more than 1.6 billion hectares of land are expected to be raised annually due to repeated tillage of various agricultural crops, using a large number of agricultural techniques. Fuel, lubricants, labor and spare parts are used for their use. Therefore, reducing these costs and effectively using existing agricultural machine-tractor units remains one of the important tasks.

In order to effectively use machine-tractor units (MTA), a system of maintenance, repair and restoration of their parts has been introduced, in which great attention is paid to increasing the weight and quality of restoration of agricultural machinery. Reasons such as non-uniformity of operational indicators such as thoroughness, reliability and performance resource of all working parts that make up the MTA, high dustiness of the air, direct contact of the parts with the soil, difficulty of providing them with continuous and full service due to improper use of the parts of the parts in agricultural machinery, creates requirements to prevent the causes of failure.

One of the main reasons for the failure of MTA parts is the premature failure of the parts due to corrosion. Due to wear of parts, the power and performance of machines decreases, as a result, consumption of fuel, lubricants, spare parts and other expenses increases. When these indicators reach certain values, their recovery also wears off. The main part of repair costs is the cost of spare parts. The main means of reducing the consumption of spare parts is the prevention of the effective use of worn parts. That is why the volume of restoration of

machine parts in the world is increasing year by year.

In accordance with this, today the scientists of this field in all countries, and in particular in our country, strengthen the resource-saving methods and new scientific and technical bases of agricultural machines, increase the efficiency of operational and agrotechnical indicators, use the tractor at full capacity, preserve working resources during the warranty period, during operation Targeted scientific research is being carried out on problems such as ensuring the accuracy of walking parts.

Currently, the agricultural machinery of our Republic is being equipped with high-performance foreign machine-tractor aggregates (MTA) and tools. In this field, the technical equipment manufactured by agricultural machinery companies such as “Sase”, “New Holland” and “Class” is widely used. At this point, it should be noted that the operational and agrotechnical requirements during the period of use of agricultural machinery produced abroad, especially in cotton cultivation, are being fulfilled a priori, that is, without scientific justification. Preliminary observations show that this approach to work leads to wear of the tire tread, increased slippage, increased fuel consumption, reduced tire life, etc. Such a situation is one of the important issues to develop reliable recommendations based on the results of experiments on increasing the performance resource of the tire part of the running system of agricultural tractor units.

Thus, one of the important tasks is to increase the operational resource of the pneumatic tire of the wheel by justifying the metrological parameters of the pneumatic tire in order to ensure the serviceability of the tire part during the period of use of the tractor’s walking system.

The world’s leading scientific centers and higher education institutions for improving the walking system of agricultural tractors, including the University of Hohenheim, University of Göttingen (Germany), Harvard University, Texas A & M University (USA), The Institute of agricultural engineering (Great Britain) , University Bologna, Institute for agricultural mechanization (Italy), Belarusian National Technical University (BNTU), Belarusian State Agrarian Technical University (BGATU), Russian State Agrarian University, K.A. Temiryazev Moscow Agricultural Academy, A.A. Kostichev Ryazan State University of Agrotechnology, Orenburg State Agrarian University (OGAU), Kazan State Agrarian University (KGU), N.I. Saratov State Agrarian University named after Vavilov, Stavropol Research Institute, Chelyabinsk State University of Agricultural Engineering and Tashkent State Technical University (TDTU), National Research University “Tashkent Institute of Irrigation and Agricultural Mechanization Engineers”, Research Institute of Agricultural Mechanization and Electrification, It is conducted by Andijan Institute of Agriculture and Agro-Technology, Andijan Institute of Mechanical Engineering and Namangan Engineering-Construction Institute.

In addition to these, in the above scientific centers, maintenance of precision and performance of high-powered agricultural machines, increasing the productivity of aggregates, production of tractor wheel tires at the level of operational, agrotechnical and metrological requirements, creation of double-tire tractor wheels that reduce the pressure on the soil, and the sliding between the wheel and the soil researches are being carried out to solve the scientific problems of reducing, improving the deformation state of the tire, reducing the deflection of the wheel tire tread pattern and increasing the performance resource.

The main part. Processes of improving the walking system of universal wheeled agricultural machine-tractor units Saidi Mkomwa (Italy), P. Peter (Germany), Rebecca Nelson (USA), M. L. Attanda (Nigeria), Dj. C. Taylor, V. N. Tkachov, A.I. Selivanov, I.S. Levitsky,

V.A. Skotnikov, V.I. Knoroza, V.N. Tarasova, N.A. Ulyanov, R. Hedekel, Ya.S. Ageykin, I.E. Ulman, E.M. Asmankin, V.A. Shakhov, I.G. Galiev, A.T. Lebedev, N.Sh. Shkaruba (Russian Federation) T.S. Khudayberdiev, M.T. Tashboltaev, S. Kadirov, Sh.A. Shoabidov, K.A. Sharipov, K.K. Nuriev, A.A. Akhmetov, K. Kasimov, I. Ashirbekov, M.A. Researched by Tokhtaboev (Uzbekistan) and others.

In their scientific work, the main attention was paid to issues such as the use of agricultural machine-tractor aggregates, repair and restoration of damaged parts.

However, in the scientific research of foreign and our republican scientists, problems that appear in the tractor running system and their reduction in machines (car-tractor units) that perform certain agrotechnical processes have not been taken into account. In the field of cotton, the process of working between rows has not been studied. The parameters and indicators (reliability, MTA efficiency and agrotechnical indicators) that determine the efficiency of the working resource of MTA are not theoretically based. The fact that the scientific and practical tasks of improving the tire part of the MTA walking system of agricultural machinery maintenance is insufficiently studied shows the relevance of research in this direction.

The tasks of the research were defined:

- Analysis of the wheel tires used in the improvement of the MTA walking system and their implementation, as well as the scientific and research work carried out on them;
- To create theoretical foundations for improving the accuracy of the walking system of agricultural machine-tractor units and to develop a method for determining the increase of the working resource of the wheel tire;
- Justification of indicators and resources in the “soil-mover-MTA” system;

-creating the theoretical basis for reducing the deflection and increasing the precision of the wheel pneumatic tire tread pattern;

- Justification of metrological parameters and indicators of optimally selected wheel pneumatic tires based on the requirements of operational and agrotechnical indicators;
- Development of recommendations on the selection of pneumatic tires based on the results of the conducted research;
- Assessment of the economic efficiency of the developed technological recommendations..

As the object of the study, the working processes of pneumatic tires of walking systems of “New Holland TD 110” and “MTZ-80X” tractors used in agriculture were taken.

The subject of the research is the theoretical and practical principles of increasing the efficiency of the MTA walking system in cotton farming, the laws of improving the metrological supply in the system, and the performance resource indicators of the tire.

Research methods. In the course of the research, systematic analysis, theoretical mechanics, material resistance, metrology bases, probability theory and mathematical statistics, as well as the methods presented in operational and agrotechnical requirements for agricultural machinery were used. Scientific research rules of classical mechanics, mathematical analysis and methods, experimental studies GOST 7463-2003, GOST 18322-78, GOST 1041082, GOST 11358-89, GOST 22374-77, GOST 2405-88, GOST 25641.1-94, GOST 26000-83 was implemented on the basis of state standards. Mathematical statistics rules and computer programs “Word”, “Excel” and “Statistika-10” were used to evaluate the obtained results.

The scientific novelty of the research is as follows:

-scientific solutions for improving the walking system of the universal agricultural tractor were developed;

- Based on the technical, technological, operational, agrotechnical, metrological and economic sources of management of the walking system, which ensure the improvement of the efficiency of this system;
- The movements in the tractor walking system are based on the load, deformation, bending speed and slippage of the tread pattern during the cultivation period;
- Mathematical expectation of failures, average resource, residual resource, performance and load-carrying capabilities that occurred simultaneously in the tractor running system, and their analytical links that provide the ability to calculate appropriate numerical values in different special cases;
- Based on the rational values of the optimal factors in the walking system, which is the main criterion of the proposed efficiency.

The practical results of the research are as follows:

In the walking system, which are the main values of the proposed operational and agrotechnical efficiency, the required effective metrological values were determined.

Reliability of research results. The reliability of the research results is based on the fact that the research was carried out using modern methods and equipment, the theoretical justification of the parameters of the tractor's walking system and operating modes was carried out based on the rules of theoretical mechanics and higher mathematics, the results of the experiments were treated with mathematical statistics and metrological methods and measurements, the results of theoretical and practical research mutual adequacy was explained by the positive results of the tests of the tractor walking system developed on the basis of the studies and its implementation in practice.

The scientific significance of the results of the research was based on the effectiveness of operational and agrotechnical indicators of the wheel pneumatic tire of the universal tractor walking system with the metrological size values of the tire model obtained on the basis of theoretical and experimental research.

The practical significance of the research is to reduce the pressure of the wheel tire on the soil, bending and sliding of the tread pattern, and to increase the performance resource according to the recommendations developed on the basis of operational and agrotechnical requirements in MTA.

Conclusion: Implementation of research results. The following works were carried out on the basis of the results obtained on the improvement of the metrological values of the wheel tires of the walking system of the agricultural machine-tractor aggregates:

Completing the walking system of universal wheeled tractors with new model tires, MTA "Bo`ston gold fiber", "Muzaffar Ko`qumboy", "Q As a result of its implementation in the ``Kumboy Golden Valley'' and 'Kokuboy Azamatlari' farms, it was possible to increase the load-carrying capacity of the tire by 1.3 times and the unit's productivity by 10-15%.

According to the approval of research results: discussions were held at 70 scientific and practical conferences, including 16 international, 34 republic scientific and practical conferences and scientific and technical seminars:

- Scientific seminar of the "Technological machinery and equipment" department of the Namangan Engineering-Construction Institute;
- Directory of the center of regional innovation activity and technology transfer of Namangan region;
- Scientific seminar of the "Metrology and Standardization" department of the Namangan Engineering-Construction Institute;
- Scientific and technical seminar of Namangan Institute of Engineering and Construction;
- Scientific seminar of the "Traktory" department of the Belarusian National Technical University (BNTU);
- Joint scientific seminar of the Belarusian State Agrarian University (BGATU) "Expluatatsii mashinno-traktornogo parka" and "Traktorov i avtomobiley" departments;

As a result of the conducted research, 70 scientific works were published, including 2 monographs, articles were published in "Scopus FSCC", "Impact Factor SJIF" magazines, and one textbook, 9 training manuals, teaching-methodical manuals, methodological instructions, technical work was done on the basis of topics related to diploma projects and master's theses for bachelors and masters.

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