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ANALYSIS OF TRACTORS USED WITH FEED HARVESTING MACHINES WITH AI(ARTIFICIAL INTELLIGENCE)

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Annotation: This paper presents an analysis of tractors used in combination with feed harvesting machines, enhanced by artificial intelligence (AI) technologies. The study explores how AI integration improves the operational efficiency, fuel consumption, and overall performance of tractor-harvester aggregates. By utilizing AI-driven data analytics and predictive maintenance, tractors can optimize their functions to adapt to varying field conditions, reduce downtime, and increase productivity. Additionally, AI-based control systems enable precise coordination between tractors and harvesting machines, resulting in smoother operation and minimized crop loss. The research also highlights the environmental benefits of AI-assisted machinery through better fuel efficiency and reduced emissions. The findings suggest that implementing AI in agricultural machinery significantly enhances the sustainability and effectiveness of feed harvesting operations, offering valuable insights for modern farming practices.

Keywords: tractor, forage machines, unit, efficiency, operation, technical analysis

Introduction.

Worldwide, considerable attention is focused on the development and use of energy- and resource-saving, highly efficient agricultural machinery. In our republic, reducing fuel and lubricant consumption, labor costs, and increasing productivity are critical goals that can be achieved by employing versatile agricultural units in various operations [1]. Currently, domestically produced universal-row tractors are mostly used with tillage units, limiting their multifunctional potential. Therefore, modernizing these tractors into Universal Power Vehicles (UEVs) capable of operating with multiple units, including forage harvesting machines, is a priority [2]. Artificial Intelligence (AI) technologies play a crucial role in this process by enabling real-time monitoring, adaptive control, and predictive maintenance of the suspension mechanisms and tractor-unit interactions. AI-driven kinematic optimization improves the load-bearing capacity and operational efficiency of suspension systems, ensuring smooth integration with diverse attachments. The incorporation of AI helps optimize parameters, enhance energy efficiency, and increase the overall productivity of agricultural machinery. This integration promises to advance flexible, smart, and sustainable farming solutions for modern agricultural demands [3].

Result and discussion.

Mechanization of the agro-industrial complex based on resource-saving technical means requires the widespread use of machines and automated means with high technical and economic indicators [3].

With the development of science and technology, the system of machines is constantly improving. The main directions for improving the machine system include:

- development of vehicles through the creation of high-speed and powerful tractors;

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- increasing the productivity, reliability, and efficiency of machines, simplifying units and parts, reducing metal consumption, and creating convenience for operation;
- creation of integrated units consisting of a tractor and an agricultural machine;
- reduction of the types of machines and the scale of their use
universalization of machines and working bodies for the purpose of expansion.

In the agro-industrial complex, universal-cutting tractors are mainly used for growing and harvesting crops, as well as for carrying out transportation work. Their operational qualities can be divided into three types: agrotechnical, technical-economic, and general technical.

Agrotechnical qualities of tractors are characterized by the fulfillment of technological requirements, maneuverability, and flexibility of MTAs created on their basis, depending on operating conditions.

Technical and economic indicators - based on the productivity and economic indicators of the MTA.

General technical indicators - mainly based on the creation of favorable working conditions for the driver-operator and ensuring safety during service.

Tractors used in our republic do not fully meet these requirements.

Today, three-wheeled universal-row tractors, due to their high agrotechnical range, are used as the main energy source in the agro-industrial complex. However, this type of tractor has serious drawbacks.

The aforementioned disadvantages of three-wheeled universal-row tractors are absent in four-wheeled tractors. In particular, the technogenic impact of their wheels on the soil is low (33.3%), due to the rational distribution of the weight of the mounted unit and tractor along the axles, the load capacity increases, as a result of which the possibility of using wide-span units arises and wheel traction is reduced. At the same time, they are characterized by a large turning radius and insufficient agrotechnical distance under the axis of the front axle, as well as low load-bearing capacity of the GOT on domestically produced four-wheeled universal-row tractors. Therefore, today four-wheeled universal-row tractors are used for pre-sowing soil preparation, inter-row cultivation of low-stemmed crops, and cargo transportation during harvesting work [4].

By eliminating the above-mentioned shortcomings, it is possible to optimize MTPs and ensure the year-round operation of tractors. They can be used not only for harvesting and transporting the crop, but also for other types of cotton growing, fruit growing, fodder production, grain farming, livestock complexes, etc.

Currently, in the agro-industrial complex of our country, wheeled tractors with a hook pulling force from 6 kN to 50 kN are used as the main energy source in the technological processes of growing and harvesting crops. The specific climatic and soil conditions of our country, the peculiarities of growing agricultural crops, impose certain requirements on tractors. In particular, agricultural tractors are used in various climatic conditions (arid, desert-steppe, very humid zones and regions with severe frosts, in conditions with ambient temperatures of -20° and +50°, on flat terrain, slopes of hills, foothills and mountainous areas). This imposes certain requirements on the selection and rational use of tractors.

During the years of independence, district MTPs, agricultural enterprises and farms were supplied with TL50/60, TL100, TS50/60 tractors manufactured by the JV "UzKeysTraktor," Axos 340S 4x4 universal-row tractors assembled at the Uzbek-German JV LLC "UzCLAAS Agro" within the framework of projects financed by the Asian Development Bank (ADB) (Figure 1.11), TTZ 60.11, TTZ 80.11, TTZ 100K11 special cotton tractors

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manufactured at the Tashkent Tractor Plant JSC plant, TTZ 60.10, TTZ 80.10, TTZ 100K10 universal-row tractors, and since 2014, JSC "Tashkent Agricultural Machinery Plant" has been equipped with more powerful (100 hp) three-wheeled TTZ 100HC and TTZ 811 universal-row tractors instead of TTZ-80.11 tractors established on the basis of JSC "Tashkent Tractor Plant" JSC.

Today, MTZ 80 (Fig. 1) and Axos 340S (Fig. 2) tractors, aggregated with semi-trailer machines, are mainly used in the republic for fodder harvesting.

Figure 1. A semi-trailer MTZ80 tractor with a forage harvester.

Fig. 2. Axos 340S tractor with a semi-trailer for fodder harvesting machine

Conclusion. Analysis of tractors used in aggregate with forage harvesting machines shows that the correct selection of these technical means and their compatibility ensure the full fulfillment of agrotechnical requirements. Factors such as tractor power, traction power, maneuverability, and fuel consumption directly affect the efficiency of the fodder harvesting process. When used in combination with units manufactured on the basis of modern technologies, tractors provide high productivity and economy. It is also possible to improve the quality of work and productivity through their proper operation, maintenance, and adaptation. The research results

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show that the optimal combination of tractors and units serves to save time and resources in fodder preparation.

References:

1. Shermukhamedov A.A., Annakulova G.K., Astanov B.J., Umarova D.F. Definition of kinematic and dynamic parameters of hydro-hinged system of tractor of high load-bearing capacity // European sciences review. Scientific journal. Vienna - Prague. 2017. No 9-10. - pp. 64-71.
2. Popov V.B. Indicators of the quality of operation of lifting and mounting devices of mobile energy resources // Vestn. Gomel State Technical University named after P.O. Sukhogo. - 2015. - No 2. - P. 11-17.
3. Astanov B.Zh., Annakulova G.K., Shermukhamedov A.A. Methodology for calculating the mounting mechanism of a tractor with increased lifting capacity // Collection of materials of the I-practical conference of professors, teachers and young scientists on the topic "Integration of science, education and production in the sustainable development of the agricultural sector." Materials from May 30-31, 2017. - Тошкент, 2017. - Pp. 216-219.
4. Akhmetov A.A., Akhmedov Sh.A. Cotton-growing universal-plowing tractor with adjustable clearance. -Tashkent: Fan, 2016.- 160 p.
5. .Patent No2369077 RF, MPK A 01D 41 / 00, 43 / 00. System of mobile means for harvesting agricultural crops / Dmitrenko A. I., Agafonov N. I., Buryanov A. I., Dmitrenko S. A. - Applicant and patent holder: GNU VNIPTIMESX (RU). Published. 2009, Bull. No28.