To the organization of branded technical service of agricultural equipment

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Abstract. Features of the functioning of the technical service system of technological and transport machines and equipment, low quality and efficiency of equipment supplied to agricultural enterprises, technical services require urgent improvement of the system and mechanisms to increase the level of reliability and operability of the operated and new (supplied) equipment. The paper presents and substantiates the principles of improving the organization of technical service of machinery and equipment in the modern conditions of the functioning of the agro-industrial complex.

1 Introduction

Tough market competition in all spheres of production activity, the need to increase the competitiveness of enterprises, require constant improvement of the efficiency of rural producers. In the conditions of use in the agro-industrial complex of a physically worn-out and obsolete fleet of technological and transport machines and equipment, the costs of their operation, especially to ensure the required level of efficiency, significantly exceed the standard values specified in the passport of the machine.

High costs for maintenance and repair of machinery and equipment, and taking into account the constant increase in prices for repair and technical materials and spare parts, the cost of maintaining machines in working condition increases accordingly. This leads to forced downtime of machinery and losses of agricultural products and requires constant improvement of the organization of technical service of machinery and equipment in the agro-industrial complex. As the domestic and world experience of innovative development of technology, improving its quality level and competitiveness shows, the main direction on this path is the development and implementation of a proprietary method of technical service of machines and equipment [1-7].

2 Problem statement

The expediency of organizing and continuously improving the technical service of machinery and equipment and, above all, complex repair work is determined by the different wear resistance and different resource of the working surfaces of parts, assemblies, aggregates;

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saving of material costs for the manufacture of new and restored parts; reducing the cost of restoring the resource of parts, assemblies, aggregates and machines when capital repairs. Nametall costs are 1.5–2.7 times less, electricity 1.2–2.5 times, maintenance of fixed assets more than 5 times. However, the labor intensity for the repair of one object is 1.8-2.7 times greater than the manufacture of a similar new object. At the same time, 60-70% of worn-out parts are subject to restoration, and no more than 40-50% are restored during major repairs, which determines the main need to increase the efficiency of restoring the components of machines as a whole [7-8].

At the same time, the low quality of equipment, the lack of an effective system (organization) of technical service, the narrow corporate interests of equipment manufacturers and technical service enterprises in relation to the consumer of equipment, reduce the efficiency of the economic, technological and technical components of the feasibility of technical service of machinery and equipment.

Taking into account the determining role of the organization of technical service in machine use, the purpose of the study at this stage was to improve the quality and efficiency of the organization of technical service of technological and transport machines and equipment in real production, economic and technological conditions of agricultural enterprises.

To achieve the designated targets, the following research tasks were set and solved: the analysis of the state of the organization of technical service of technological and transport machines and equipment in real production conditions of their operation was carried out; the analysis and synthesis of best practices and scientific research in this area was carried out and the main ways of solving the problems of innovative development of the organization of technical service in modern conditions were determined.

3 Materials and methods

The following methods were used in the implementation of the research tasks: analysis and synthesis of production processes and technical service of equipment, monographic, logical, abstract-logical, comparative technical and economic assessments, and others.

4 Results and discussion

Worldwide, there is a trend of widespread high-quality technical service. By tradition, many more machine-owning enterprises carry out machine maintenance on their own, but due to the complexity of their design, a steady trend is forming in which the direct user of the machines is not engaged in their technical maintenance and repair. This is done by dealers (trading companies) or specialized service companies.

In the practice of advanced countries, the service is of high quality if it provides at minimal cost:

1. maximum reduction of losses arising during the operation of tires for technical reasons;
2. the maximum indicator of the reliability of machines [1, 3, 9].

Due to poor-quality service provided by third-party organizations, during the operation of any machine, its consumer may experience the following primary losses:

- unplanned downtime due to technical reasons due to machine failures, maintenance operations, etc.;
- decrease in productivity per hour of continuous work;
- the presence of defects in work;
- injury by personnel on the work site;
As a result of the above losses for individual machines or groups of machines, there will be a decrease in the productivity of machinery, a significant increase in all types of costs (labor, material, energy and monetary), which will entail an increase in the number of necessary equipment, a decrease in the reliability of production processes, a decrease in profits, an increase in the time of work, etc.

In turn, the company providing service services (dealer, service company), in case of insufficiently effective service, will suffer the following losses:

- growth of current resource costs for performing service operations;
- growth of capital investments in the repair and maintenance base and in the fleet of reserve vehicles;
- reducing the level of value of all types of services provided in the consumer's mind;
- the decline of the company's authority.

As a result of these losses, the company may have a decrease in demand for services, a decrease in profits, and a deterioration in its financial condition.

If the owner of the machines carries out the maintenance of the machines independently, then it is subject to all types of listed losses.

The quantitative values of the reduced losses depend both on the characteristics of the reliability properties of the machines (reliability, durability, maintainability and maintainability) and the level of service quality in general. With the increase in the service life of machines, there is an annual increase in losses, the value of which for some of them can reach 100% or more in relation to the previous year. The greatest losses occur after 3-4 years of operation of the equipment [10, 11].

In general, losses can have significant quantitative values. A decrease in productivity can reach 50% or more, an increase in monetary costs – up to 100% or more, an excess of the fleet of necessary machines - up to 50% or more, etc. The quality of the service performed also directly affects the reliability characteristics of machines. This refers to the influence of lubricants, adjustments, cleaning operations, etc. The possible increase in the reliability and durability of machines can reach 20-30%.

In the best world practice, the following main directions have developed to ensure high quality of service [12, 13]:

1. Increased attention should be paid to measures to prevent failures, aimed at reducing their number as much as possible;
2. timely implementation of proactive repair of machine units, which is less labor-intensive, less complex and does not require significant expenditure of resources and long downtime of the machine;
3. it is advisable to carry out all actions on technical service and repair of machines during planned downtime of machines or during non-working hours;
4. it is advisable to minimize the time of each repair of the tire and its waiting time.

A simplified model of the implementation of the service of a group of machines is shown in the Figure 1.

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**Fig. 1.** The model of the implementation of the service of a group of machines.
The resources include:
- employees;
- devices, tools, stands, machine tools and other elements related to the means of production;
- infrastructure (buildings, outdoor areas, structures, etc.);
- information;
- financial resources;
- material resources (oils, spare parts, metal, etc.);
- suppliers of products and services.

The results should reflect the characteristics of the service, as well as the impact of the service on the losses that occur during the operation of the tires.

It is important to note that the world's leading manufacturers of industrial equipment, taking into account the important impact of the quality of service on the competitiveness of their products, pay considerable attention to all components of the service. In their centers, they train service personnel and instructors to train workers, carry out operator training by their own forces or by dealers, create expert groups to correctly find ways to solve service problems, in addition to repair and maintenance documentation, provide their dealers with a full set of documents for all service processes, produce special portable diagnostic equipment and equipment, provide fuel and lubricants and spare parts, offer software, develop progressive standards, regulate the efficiency of dealers, etc. It is worth noting the particular importance of timely provision of spare parts to its consumers (dealers, service centers, etc.). Each leading manufacturer strives to constantly develop its network of spare parts distribution, which includes interconnected highly automated spare parts warehouses. From these warehouses, periodic replenishment of consumer parts is carried out, as well as emergency delivery of parts within 24 hours [14, 15].

Of particular importance in the composition of any service system is the rational organization of the service process as a set of interrelated and interacting activities that transform resources into the main results. In general, the progressive service system has the following composition of the most important service processes (Figure 2) [11, 16]:
- implementation of basic production works with the help of rational forms of their organization;
- formation and use of repair and maintenance base and operational materials;
- effective service management and labor organization;
- financial and information support of production.

![Fig. 2. Composition of the most important service processes.](image-url)
The following composition, structure, interrelation and direction of the main work on the service correspond to the previously given main directions for ensuring high quality of technical service (Figure 3) [7, 14].

A prerequisite for trouble-free and long-lasting operation of equipment is constant, objective and comprehensive quality control (I) of both the machine operation process and the service organization process.

Compliance with the rules of operation of machines is also of great importance (II.1) on the part of the machinists of agricultural enterprises, for which he must have high qualifications and constantly improve it.

Maintenance (II.2) of machines should include a set of necessary operations to maintain their operability or serviceability during production operation, waiting, storage and transportation.

With the help of diagnostics (II.3), the technical condition of the machine elements should be determined with high accuracy. The purpose of conducting diagnostic checks is to prevent the detection of malfunctions, i.e. until they cause the failure of the equipment. Also, the purpose of diagnostics is to eliminate as much as possible the maximum number of such malfunctions during scheduled stops and downtime of equipment in order to extend the working time until the next stop (planned or not planned). In world practice, diagnostic examination is carried out by a machinist who has undergone special training and highly qualified service specialists.

According to the results of the diagnosis, if necessary, scheduled or unplanned maintenance is carried out. In compliance with the rules of equipment operation, scheduled repairs should prevail over unplanned ones. The main method in best practice is aggregate repair (III.1, III.2). For a number of critical units, manufacturers recommend, in the absence of failures, to set the maximum operating time, upon reaching which the unit must be removed from the machine to replace its seals and bearings. If the time of elimination of the failure of the machine exceeds the established value, a replacement machine (IV) is installed in its place for the time of repair.

Certain types of basic work (see Figure 2) can be performed either entirely by the company's own forces, or partially by its own forces with the involvement of service organizations (dealers, specialized service enterprises, etc.).

The search for new sources of increasing the competitiveness of firms and their limitations within the firm itself led to the expansion of the search area for reserves not only in the divisions of firms, but also beyond. This requires optimization not of individual components of the production and commercial process, but of their totality by setting the task.
of optimal use of all the resources of the company. This became the subject of the study of logistics - the theory of planning, management and control of the processes of movement of material, financial, labor, energy, information flows in human-machine systems. The logistics method differs from the traditional one by the close interaction of all subsystems, minimizing the uncoordination of actions and eliminating duplication of functions performed. An important role in achieving this position belongs to the rationality and completeness of the information flow, which allows the manufacturer to obtain objective information about the volume of consumption and the wishes of the consumer. Possession of this information allows the manufacturer of equipment to organize production on the principle of "pulling material flow control systems". The logical method of integrated flow management is a method of managing the movement of material, financial and information flows based on a logistic approach that eliminates the shortcomings of the traditional flow management method.

The organizational structure of the regional logistics system for ensuring the operability of agricultural machinery is based on branded, or connected by contract with the manufacturer (intermediary dealer), centralized specialized industries, as organizations combining the advantages of large and small enterprises.

A branded technical service can provide a study of offers and demand for equipment and technical service services; provide information about its reliability and consumer requirements; improve technology, technical means and organization of technical service during the warranty and post-warranty periods of machine operation; ensure the restoration of worn-out or manufacture of new parts; recycling the creation of a secondary equipment market; organize professional development of repair and technical personnel and operators (drivers) of the machine (equipment); to provide consumers with technical and operational documentation, control and diagnostic, repair and technological equipment; to ensure the introduction of scientific achievements and best practices in production.

Despite the evidence, significance and effectiveness of the practical implementation of this area of research on the feasibility of switching to a proprietary method of organizing technical service of technological and transport machines and equipment, to date, the solution of this problem is under discussion and discussion. The main results of this study were reported and approved at various scientific and practical conferences of leading research institutes and universities of the country. The principles of organization proposed in this paper should be the basis for a long-time emerging system of firm technical service of agricultural machinery, and can also be used in the training of specialists in this profile in the universities of the country.

5 Conclusion

Thus, the results of analytical studies show that in order to improve the quality of technical services of modern agricultural machinery, it is advisable to introduce a full-format branded technical service. The transition to a proprietary organization of technical service in Russia is necessary because of the indicators of quality and efficiency of works and services of technical service demonstrated in past practice. And most importantly, the transition to a proprietary method of organizing technical service stimulates the production of domestic equipment with the quality (reliability) of the best world analogues.

References

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