RELIABILITY INDEX AND QUALITY OF AGRICULTURAL AND MELIORATIVE MACHINERY

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Abstract. *This article talks about the internal structure of the machines used in agriculture, their quality, movement technique and reliability indicator. In addition, the reliability index and quality of agricultural and reclamation machines are also discussed in the article. General conclusions and practical examples are given.*

Keywords: *Machine, technique, friction, corrosion, method, corrosion, friction force, action, detail, reliability, index, quality, control, integration***.**

Tractors, reclamation (ditch, canal digging, cleaning, field irrigation, pipe-laying and closed horizontal drainage excavators), cotton pickers, cars and other agricultural machines are exposed to various external influences. As a result, the reliability, integrity, durability, repairability, and maintainability factors included in the design and manufacturing process are reduced. This is caused by the appearance of various defects in the details of the car and their wear.

A preventive system of technical maintenance and repair serves to keep machines in working condition. Technical service maintenance and repair system means a set of scientifically based organizational, technical, technological and economic activities, as well as means that ensure maintenance and restoration of machines in a workable condition. Adherence to standards and regulations allows to increase the reliable operation of the equipment while minimizing the production costs associated with keeping the equipment in good condition.

The maintenance and repair system encourages services and enterprises that provide technical maintenance and repair of agricultural machinery to rationally organize related work. Determines the most optimal method of repair, helps to reduce the funds spent on the development of the agricultural repair base due to the concentration and specialization of production. System machines can be divided into the following groups:

tractors, reclamation machines:
cotton picking machines;
grain harvesters;
trucks;
other types of agricultural reclamation machines.

The system is mainly intended to increase the possibility of reliable operation of machines due to the prevention of equipment failure. The system also provides for the elimination of defects in machines that are not working.

Performance is the state of the machine (item) in which the machine can perform the given tasks according to the parameters that meet the requirements of the technical documents. The performance of the machine largely depends on the reliability of assembly units, assemblies, parts and details.

Reliability is the ability of the machine to perform given tasks while maintaining the values of specified performance indicators in accordance with the conditions of maintenance, repair and transportation procedures (modes). Reliability is a complex characteristic that may include, individually or in combination, integrity, durability, repairability, and maintainability, depending on the machine's function and conditions of use.

Non-disruptive operation - the ability of the machine to maintain its performance without forced breaks until it completes a certain amount of work. Failure to work is understood as a phenomenon consisting of a violation of the ability to work.

Endurance is the ability of a machine, unit, unit, connection to maintain its working capacity until the last state. The last state of the machine is determined by the fact that it cannot be used further, its efficiency decreases or the safety requirements are violated, and it is explained in the technical documentation. Endurance indicators include the service life or resource (in hectares, tons, hours or kilometers traveled) of the machine from the time it is used until it is written off.

The quality of the machines is not only in their ability to perform given tasks, but also in the level of reliability, or in other words, the ability of the machine to maintain its ability to work (serviceability) for a long time, and if necessary, to restore it with less time, less labor and less materials. Academician A.I. Selivanov proposes to distinguish two groups of elements in each machine and two organizers of its workability. All separately made elements that are part of the machine (regardless of their content, size and shape), i.e. frames, blocks, gears, bearings, gaskets, tanks, pipes, belts, casings and the like are structural elements it is said.

Non-structural elements are all elements that ensure the necessary connection or normal operation of structural elements when the machine is working. Such elements include assembly, adjustment, painting, lubrication and other processes that bring the machine into a condition suitable for performing its service tasks in production. Thus, one component of machine serviceability represents sum l = 1 to n E, the sum of serviceability of all structural elements that make up the machine. Another determinant of the machine's serviceability is sum j = 1 to m G j, the sum of serviceability of all non-constructive elements in it.

Serviceability of the machine (generalized description of service properties) means its ability to perform its tasks or a given process within the limits of permissible deviations (in terms of quality and economy) during the optimal service life of a given process, as well as its potential capabilities. The serviceability of the machine in the consumer sector E_{m} is the function of its use time E_{m} = F(t) and depends on the condition of its individual elements. In many cases, the absolute value of suitability can be expressed in terms of price. The serviceability of the machine is divided into parts, each of which represents the serviceability of some structural or non-structural element. The lifetime of each constructive E or non-constructive G element in a machine in the consumer sector is a function of time within the element's service life. Any structural or non-structural element of the machine has the highest service life, and the worn element (after the end of the service life of the machine) has the lowest service life. The serviceability of the elements in question can be fully or partially restored during its repair. The introduction of the concept of serviceability allows to analyze the general condition of the machine during use and wear, to monitor the change of this condition from the beginning to the end of the use of the machine. The condition of individual elements that make up the machine can be analyzed in this way both within the service life of these elements and within the service life of the entire machine.

As engineering continues to advance, so do the determinants of usability. To be more predictable, all machines can be divided into the following six categories, which differ in the organization of their suitability.

Category I includes machines with the highest level of initial serviceability, which perform the entire service life with the initial samples of the elements that make up it, that is, machines that do not require maintenance or replacement of parts during the period of use.

Category II includes machines with low initial serviceability, but used without replacing any structural element during the entire service life, that is, machines that require periodic maintenance during their operation. Since the adjustments and adjustments of the machines, as well as the shapes and dimensions of the structural elements, are not stable enough, the machines require periodic maintenance.

Category III includes machines with even lower initial service life and used without replacing any structural element during the entire service life. But since the adjustment, and other structural elements of such machines are not stable enough, they require not only periodic maintenance, but also frequent maintenance.

Category IV includes machines with low initial serviceability and used during the entire service life when part of the structural elements is replaced (due to wear and tear) along with periodic maintenance.

Category V includes cars with lower initial fitness. In order to use the entire service life of such machines, they must be serviced and repaired from time to time according to a specific system, and some structural elements with low durability must be replaced from time to time, both in terms that are compatible with the repair of the machine and in periods that are not. it is necessary to stand. Most modern machines and equipment fall into this category.

Category VI includes machines that perform the entire service life and have more reliable components. However, it is required to periodically replace some less durable structural elements of these components and restore some non-structural elements from time to time. It is assumed that less durable structural and non-structural elements in machines belonging to this category are easy to replace.

For consumers, the most important indicator of quantitative assessment of structural and technological excellence of any machine is the coefficient of equality of its structural elements' strength or corrosion resistance.

The strength equality coefficient F is determined by dividing the total serviceability ∑E, value or total cost EQ of the initial structural elements in the machine by the total serviceability EnE, or the total cost of these elements consumed during the entire service life of the machine, by Q:

F_{c} = (Sigma*E_{i})/(Sigma*n_{i}*E_{i}) = Sigma Q i sum n i Q i

from here n_{i} is the number of relevant structural elements consumed during the service life of the machine; Q- the value of the relevant structural element.

In order to calculate the coefficient of equality of strength of any machine, it is necessary to have information on the wear and service life of all structural elements in it. The ability to determine this coefficient is very limited because the wear of many structural elements in the machine has not been studied at all or varies widely. Therefore, to determine this coefficient, it is necessary to use the average standards of spending spare parts. These standards take into account the average conditions of use of the machine and the imperfection of their structure, the average level of competence of service personnel and the repairability of parts, etc. Using these standards, all replaceable structural elements are first special coefficient of strength equality, then the coefficient of strength equality of the whole machine is determined.

If there are specific coefficients of all structural elements that can be replaced according to the specified norms, the general coefficient of the equality of machine strength F is determined using the following formula:

F_{c} = (Sigma*Q_{i})/(Sigma * Q_{i}/(f*c_{i}))

where SΩ is the total cost of structural elements in the original machine; Q_{i} - the price of the corresponding structural element to be replaced; fc, is the specific coefficient of the strength equation of the corresponding structural element. If it is not limited by some special conditions (weight parameters and other parameters), the most perfect machine in terms of equality of strength of its structural elements is the machine with F - =1.0, in which all structural elements fully withstand the specified service life. should be considered.

Thus, reliability characteristics - undamaged operation, durability, repairability and maintainability - are currently the main technical and economic factors for evaluating the quality of the car-tractor fleet.

The relationship between the development of the machine and its technical condition has the property of randomness. Therefore, all works related to the restoration of the working capacity of the machine are required to be carried out according to the need, and the technical maintenance works based on the technical condition of the machine are carried out on the basis of the mandatory technical maintenance system. Machine reliability indicators belong to the categories of probabilistic quantities, and when calculating reliability, it is recommended to determine the confidence limits of the distribution limits along with determining the average values of the connection using probability theories and mathematical statistical methods.

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