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COMPUTER SYSTEM FOR MECHANISMS DIAGNOSIS

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Abstract. *The computer system proposed in this work is aimed at solving the problem of automating a comprehensive assessment of the technical functioning of mechanisms. The system's computational equipment have the minimum necessary computing requirements. No additional paid software is required for installation. Unlike existing systems, the proposed one has a moderate cost. For the majority of industrial enterprises, this factor is crucial when choosing the most beneficial computer system. In addition, the developed system is simple and comfortable to use. Thus, the system has an intuitive and intelligible interface for the operator, which allows the operator to quickly familiarize themselves with it and put it to use immediately; the system monitors the correctness entries in the electronic history - it corrects basic fields that are not properly indicated (repair data, repair requests, part price, etc.). The system has the ability to add individual templates for a specific unit. Unlike existing systems, the proposed system is multifunctional.*

Keywords: *computer system, system window, software, equipment, diagnostics.*

Introduction. Today, documenting the technical state of the functioning of mechanisms takes a large part of the working engineer's time, but is a necessary attribute of any technological institution. Nowadays there are systems for computer diagnostics of the technical state of mechanisms, but they are far from ubiquitously [1, 2]. Due to the increasing amount of information in the technical diagnosis arrangements, there is a need to automate processes of the basic flow of documents. Collection, storage, analysis of information, structuring the informational flows, their distribution, and other operations with diverse types of data are impossible without the use of computer technology.

However, note that computer systems for diagnostics automation of mechanisms and machines, are perhaps the most frequently changed component in

the management structure of a modern enterprise. In addition to the traditional directions of modernization, one of the recently demanded ways of developing computer systems is the integration of systems of various levels of control. Technological safety management is added to the list of functions of these systems.

A variety of hardware and software, structural and architectural solutions, functional capabilities, as well as various degrees of participation of information tools in production and enterprise technology control channels are the main defining characteristics of existing computer automation systems in modern enterprises, in all industries. The management of the automation departments of various enterprises have problems regarding choosing the path of further system development.

On the one hand; the volume of automation, the complexity, and the cost of hardware and software have increased. Along with this, the expences of resources and time for design work as well as the requirements for the qualification of staff and maintenance costs have also dramatically increased.

On the other hand, there is a “patchwork” nature of automation in general, at all levels of management, as a result of which there are losses i.e. non-compliance with the regulations: violations of the operating standards of equipment. Production losses are frequent due to conflicts in the flow of “technological actions” planned by staff who control the technological processes of repair and preventive work, which is organized at the level of production management. The “transparency” of the processes for monitoring the technical diagnostics of systems for external technology control loops is insufficient. In addition, it should be noted that so far, the coordination of actions has been minimal. This was due to the various requirements of the departments and services of enterprises utilizing multiple means of automating the process of system diagnostics.

The purpose of the study. The main objective of the developed information system is a complex solution for the collection and analysis of information about the technical condition and functioning of mechanisms as well as the management tasks of the enterprise in general. Respectively, specific tasks are solved for each unit of the enterprise. However, difficulties in determining the main focus or priorities of the enterprise’s activities significantly complicates the development and

implementation of such information systems. The developed computer system primarily optimizes information gathering, helps an engineer in monitoring and diagnosing the technical condition of the functioning of mechanisms, as well as aid in reducing errors and eliminating negative consequences. The existing experience in the developing of information systems allows one to conclude that as a result of designing such a class of systems, it is necessary to pay attention to both the diagnostic component (the decision support function) and the statistical component (analysis of heterogeneous data, reporting for analysis and forecasting of the functioning of mechanisms), and also economic (optimization of the financial activities of the organization).

Main research material statement. The process of automating the information support of the processes of monitoring the status and maintenance of technological equipment is based off the following principle: at the first stage, the operator enters information into a single database of equipment status for the current period. At the second stage, this information goes to the person in charge, who decides on the appropriate equipment work that needs to be done.

If the decision is made to perform certain work tasks with equipment and mechanisms, then:

- data on necessary work are entered into the computer system;
- the entered data goes to the operators through the means of a computer system;
- after completing certain work tasks, data on performed actions is entered.

Diagnostics of equipment occurs at one- month intervals, carried out by the specialists responsible for it. The reports give indications of the current status of the equipment. It also contains information about the condition of the equipment at the beginning of the month, possible problems with the equipment, and recommendations for further work.

The context diagram of the developed computer system is shown in Fig. 1.

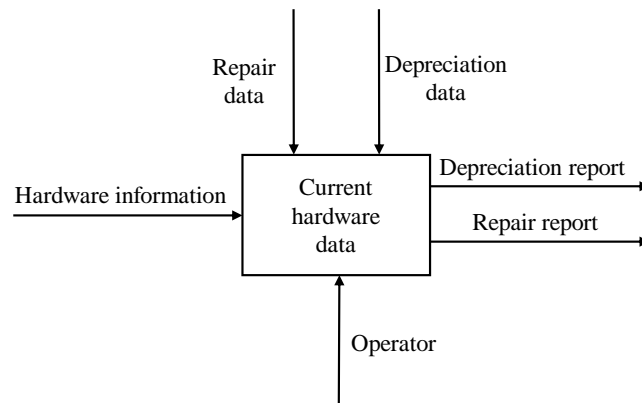


Fig. 1 – The context diagram of the developed computer system

Input and output data of the system. The input data of the system includes data on equipment, data on guarantees, warranty information, data on checking the condition of the equipment. The output data includes information on depreciation, information on repairs performed, information on contracts, equipment health check information. In addition, it is possible to output the data on depreciation of the equipment in and Excel file and sort it by year, as well as output the data on specific repair work in a Word file.

Design features of the computer system. The following tables were created during the design of the computer system:

- table “Depreciation” stores information on depreciation of the equipment;
- table "Equipment" stores information about the types of equipment in manufacturing;
- table "Repair" stores information about the repair work performed;
- the "Employees" table stores information about employees;
- the "Authorization" table stores information about authorization data;
- table “Reports” stores the information about authorization data;
- the “Inspection” table stores information about equipment inspections.

The principal feature of the created tables is the organization of connection between them. In this connection, one of the main requirements for the organization of the developed database is to provide the ability to find certain entities according to the purposes of others, so that specific connections are established between them.

The user of the computer system is given the opportunity to make the required

report and print it out. Here also can be generated a report on the dynamics of the work performed for each type of equipment.

Conclusions. The developed computer system solves the problem of automating an integrated assessment of the technical functioning of mechanisms. The proposed system has the following qualities. First of all, it is ideal for its moderate cost, which is one of the decisive factors for most industrial enterprises when choosing a computer system to use.

Secondly, the proposed system is simple and comfortable to use. The system has an intuitive and understandable interface for the operator, which allows the operator to quickly go through the familiarization stage and increase effective use and productivity; the system monitors the correctness of filling in the electronic history fields - it will correct, if basic fields are not indicated (repair data, repair requests, part price, etc.).

The system has the ability to add users' own templates for a specific unit. When working, it displays only system templates and does not display a huge list of additional embedded templates, i.e. has customization feature for a specific workplace. The system includes a built-in, editable directory of necessary parts and equipment.

Another advantage of the developed system is its stability and reliability. At the same time, the system containing important information about the enterprise is not only stable in operation but also protected from unauthorized access attempts. In addition, it is multifunctional and easily adapts to the profile of the unit.

The computer system is constantly updating, taking into account the wishes of its users. Also, it has minimal requirements for the computer hardware. No additional paid software is required to install the system.

References

1. Sobolev V.S. Software for modern systems for collecting and processing measurement information. Collection of scientific papers Devices and control systems. 1998. №1. P. 55-63.
2. Pokojski J. Komputerowe wspomaganie decyzji wielokriterialnych u dynamice maszyn. Pr. nauk. Mech. Pwarsz. 1990. P. 108.