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Methods for Assessing the Effectiveness of the Organization of Maintenance and Repair at the Enterprise

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***Abstract*—Maintenance and repair of equipment as a field of activity has come a long way in its development and formation. Currently, this type of activity is very costly in any industrial enterprise, since any malfunctions or downtime of equipment can lead to multi-million dollar losses. This explains the current heightened interest in the management of the operation and repair of equipment in industry. Ensuring a rational organization of maintenance and repair of equipment required the formation of a system of norms and standards governing this area of activity. In today's world, in pursuit of high rates of efficiency, profitability and productivity, most large enterprises develop their own approaches to measure them. Evaluation of the effectiveness of the enterprise is important from the perspective of both external, for the enterprise, and internal. The first is understood as the competitiveness and image of the entire enterprise in the market, the second – internal stability, productivity and efficiency at all levels of the organizational and production system. Calculation of the assessment of the effectiveness of the activities of some services in the enterprise allows you to identify problem areas and factors affecting this activity in the organization, be it management decisions or problems in the production process itself. It should be noted that the management of enterprises that have technically sophisticated equipment in their fixed assets pays close attention to the effective management of the maintenance and repair of this equipment, which, with methodological knowledge, allows them to get a significant return with relatively small financial investments.**

Keywords—maintenance and repair of equipment, efficiency of repair production, efficiency assessment

I. INTRODUCTION

At any enterprise that has its own rolling stock, the service for the maintenance and repair of equipment plays an important role. The performance of a given organizational unit will always have an impact and be reflected in the work of the entire enterprise. High-quality repair of equipment, order delivered on time, overhaul or planned repairs, scheduled maintenance – this type of work allows the company to work in a "non-stop" mode, avoiding downtime and costs or losses associated with them. In this service, there are a number of indicators that characterize the smooth operation, responsible for its high-quality performance.

II. PROBLEM STATEMENT

If we talk about evaluating the effectiveness of the organization of maintenance and repair at the enterprise, then we can say that this topic is not covered in full and is not sufficiently worked out. There are many methods for assessing the efficiency of the enterprise as a whole, but they do not cover the indicators that are important for us that characterize the activities of the repair service, which, as we found out, is not the least important in the activities of the entire organization [1-5]. Due to the lack of a unified methodology and system of indicators, enterprises use data as performance criteria that do not always fully reflect the activities of the repair service, due to which sometimes they are hidden deliberately or due to omissions – bottlenecks, which in the

future can lead to additional costs or problems.

At the moment, it is difficult to determine a single, and most importantly, a qualitative methodology for assessing the effectiveness of repair work, but most enterprises use the standards of the Unified System for Preventive Maintenance as this assessment.

III. Research Questions

The main research questions formulated in the work and acting as the research task are the following:

- analysis of existing methods for assessing the effectiveness of maintenance and repair work at the enterprise;
- defining a promising methodology and identifying indicators that characterize the smooth operation of enterprises;
- revealing the advantages of the proposed methodology and its indicators.

IV. Purpose of the Study

The purpose of the study is to conduct a comprehensive comparative analysis of the existing and proposed methods for assessing the effectiveness of maintenance and repair work at an enterprise, which will describe the mechanism of work and identify indicators for assessing the effectiveness of the maintenance and repair unit and determine the main advantages and disadvantages of the existing methods and indicators.

V. Research Methods

The research is based on traditional methods of information processing: monographic method, logical method, comparison and others.

VI. Findings

At the moment, there are a number of indicators characterizing the work of the unit responsible for repair and maintenance, presented in Fig. 1. As mentioned above, there is no uniform methodology for the effectiveness of repair work. The efficiency indicator is put in relation to several efficiency criteria: the cost of repairs, the complexity of the repair [6-15].

In the first case, we are talking about the funds spent, their amount, which was definitely for this or that type of work. In the second case, the concept of productivity is touched upon. Comparing this indicator with the downtime indicator, we can talk about the efficiency of the repair service. The efficiency of work is presented in Fig. 1, characterizing the level of repair production is presented in Fig. 2.

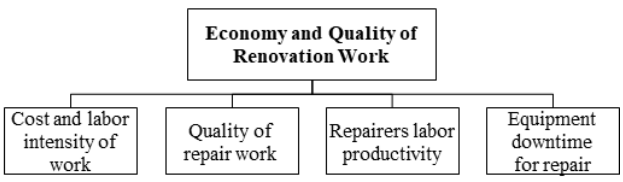

Fig. 1. Indicators characterizing the efficiency of the repair service

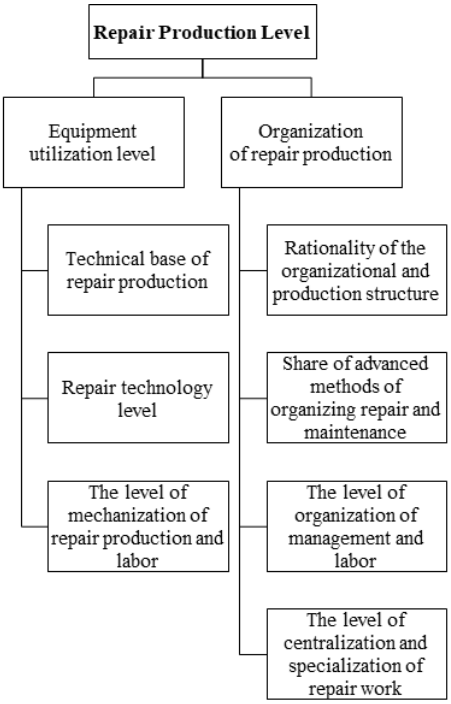

Fig. 2. Repair production level

Judging by this technique, the repair is considered effective if the actual costs, both monetary and labor, do not exceed the standard indicator.

This approach clearly characterizes the activities of the repair service, and most importantly its efficiency, overlooking only the factors that affect the quality and feasibility of costs.

Another technique is the use of drawing up and implementing a repair work schedule. Such a system aims to carry out repairs only for the sake of the repairs themselves, without taking into account again the quality or any costs at all. This method can very superficially reflect the effectiveness of the repair service, as well as evaluate it.

By creating their own company, everyone wants to get as much benefit as possible at the lowest cost. Applying this principle of work, we can talk about minimizing costs, which does not always have a positive effect on the efficiency of both the enterprise and its individual organizational units.

For the sake of increasing the efficiency of repair services, the deduction of most of the finances for their needs has a detrimental effect on the activities of the entire organization. The shortage of funds will not show a positive result in assessing the efficiency of the enterprise. Correct redistribution of costs and finances promises a guarantee for high-quality and efficient operation of the enterprise, increasing its efficiency.

And since we are talking about redistribution, it is worth mentioning here optimization, but not only financial processes, but also about the entire organizational structure of management and maintenance and repair.

There are several types of processes that should be optimized at the enterprise in order to increase the efficiency of repair services:

- maintenance and repair techniques;
- purchases;
- personnel;
- logistics.

It should be noted that there is a difficulty in measuring the results of the work of the repair service, determining the profitability and efficiency of the work performed in the form of a certain indicator, due to the fact that organizational units are not directly involved in the creation of profit.

Also, with such indicators in practice, it becomes difficult to assess the effectiveness of the organization of maintenance and repair due to the large number of criteria that differ from each other in the degree of importance and influence.

VII. Results and Discussion

Taking into account a number of the problems we have identified in the methods for assessing the effectiveness of the organization of repair work, it should be assumed that there is another side, in addition to costs and reorganization. The problem can be hidden in the factors that add up to a simple series of the production process and at first glance do not seem significant in assessing the effectiveness of the organization of maintenance and repair.

Thus, it is worth identifying a number of factors that, in our opinion, characterize the repair service from the standpoint of efficiency.

1) Labor intensity of work performed in a certain time: The effective use of labor potential is accompanied by a number of indicators that help to maintain high-quality and efficient performance of work. This type of indicators affects the main aspects that are characteristic of the repair process. It is worth noting that individually, each of them to one degree or another reflects the effectiveness of the repair work, and together they all add up to a factor that the managerial staff of the organization should reckon with if the enterprise has a goal of increasing the efficiency of the repair service and the quality of the repair work (Fig. 3).

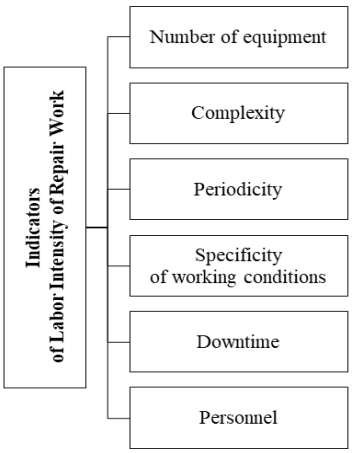

Fig. 3. Indicators of labor intensity of repair work

2) Concealment of costs due to various forms of organization of maintenance and repair: Carrying out repairs is traditionally a “black hole” for the budget. Enterprises do not always monitor the clear distribution of funds for one or another type of technical or repair service, which is an omission from the position of allocating funds and the inability to clearly track the appropriateness of using the allocated budget.

3) Costs for own personnel: Personnel costs are an integral indicator generally recognized for countries with a market economy, including a set of costs associated with attracting, remuneration, incentives, solving social problems, organizing work and improving the working conditions of personnel. At an enterprise where there is a repair service, the costs aimed at maintaining workers whose labor is associated with the repair work are not taken into account in the costs of the repair process. This assumption makes it possible to significantly reduce the cost of repairs in the cost item, and also misses the creation of a direct dependence of the quality of repair work on the activities of the repair personnel, which, undoubtedly, would be one of the methods of stimulating for effective work.

4) Estimates: Budgeting is not legally regulated by the state (executive authorities), but is the object of civil law relations. An unprofessional approach to business can lead to underestimation or overestimation of the estimated cost, which will entail additional costs.

5) Differentiation of the repair process: For the sake of a lean manufacturing strategy and the division of a single repair process into constituent steps or stages, enterprises seek thereby to increase efficiency through the transparency of the repair process. Here it is only worth saying that not every repair or maintenance of equipment is typical and subject to the selection of individual works.

6) Decision-making on the organization and conduct of the repair process: Achieving target indicators and increasing the efficiency of the repair process does not always consist of competent management decisions only by the management apparatus. As for the repair service, here it is first of all worth paying attention to the operational information owned by the line personnel of the enterprise (heads of sections, services, mater, mechanics). It is the prompt joint decision-making that in most cases allows avoiding emergency situations and downtime, which will subsequently entail losses.

7) Weak functional connection between organizational units: Each division, department, organizational unit in the enterprise has a goal in increasing the efficiency of the enterprise itself. It often happens that the occurrence of conflict situations for the most part bears losses not only in the interpersonal plan and the general working environment in the team, but also has a detrimental effect on the production process that they control. This factor, for the most part, is quite difficult to eliminate without applying certain measures on the part of the leadership in resolving the conflict. And the creation of such a situation will only lead to inconsistency of actions, downtime, inappropriate costs, which will in no way contribute to the effectiveness of the organization in general of any activity at the enterprise.

VIII. Conclusion

The factors highlighted by us relate for the most part to organizational activities. Only after making competent, balanced and prompt decisions is it worth talking about the

effective work of not only the repair service, but also about the activities of the entire enterprise as a whole.

Thus, the methods we have considered are not a standard for assessing the effectiveness of repair work and maintenance work. Many of them lack a number of indicators, factors that also characterize the repair service and are no less important.

It is impossible to analyze one indicator of the activity of the repair service and talk about efficiency. Now it is worth raising the issue of developing an integral indicator that would take into account a number of factors and criteria, which in turn would have their weight and significance in the organization of repair work. The development of this methodology, using such an indicator, would greatly simplify the performance assessment, as well as facilitate the search for problem areas at the enterprise and would give a hint in the direction of eliminating the identified bottlenecks.

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