

Для этого надо осуществить комплекс предварительных мероприятий, в том числе оценку сложности всех видов работ по обновлению каждого технического средства, формирование команд из сотрудников разных отделов с учетом их профессиональных возможностей, нормативную оценку продолжительности выполнения работ, подготовку исходного плана распределения обязанностей между членами команд.

Командная организация производственного процесса по техническому обновлению средств ЖАТ представлена на рис. 2. В целях упрощения на нем не показаны связи, возникающие при исправлении обнаруженных дефектов.

Создание технического средства предлагается разбивать на работы, которые включают в себя обновление одного или нескольких функциональных свойств ЖАТ одной командой, сформированной из сотрудников каждого отдела. К разработке

наименее сложных свойств приступает первая команда. Частично обновленное техническое средство тестируется в этой же команде и лишь затем передается в другую для выполнения и тестирования более сложных работ.

Командный подход к совершенствованию производственного процесса позволит сократить целый ряд потерь, характерных для последовательной его организации, ускорить выполнение каждого заказа, повысить производительность предприятия-исполнителя.

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TECHNICAL UPDATE OF AUTOMATION AND REMOTE CONTROL

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ABSTRACT

The article deals with the issues of improving the organization of technical renovation of railway automation and remote control equipment using the concept of lean manufacturing. Uneconomical losses are analyzed. In order to reduce the losses, such a manufacturing process is offered, which involves the formation of teams of employees of existing business units, but excludes the existing boundaries. Expected results at the same time can have a universal character — along with the improvement of technology they can foster innovation and creative process approach, designed for thrift resources, streamlining the production.

ENGLISH SUMMARY

Background.

Implementation of strategic development programs of OJSC «Russian Railways» provides technical modernization of railway automation and remote control equipment (RARC). Currently the main focus of replacement of existing facilities of signaling, centralization and blocking by more reliable types is a comprehensive implementation of microprocessor devices with their adaptation to the functional characteristics of stations and station- to —station blocks.

Objective. The authors aims at showing how the organization of technical renovation of railway automation and remote control equipment can be improved using the concept of lean manufacturing.

Methods. In the article the author relies on analysis with portion of descriptive method and in addition, method of economic evaluation.

Results. Technical updating of RARC lies at signaling, centralization and blocking distances. In order of selective sourcing they transfer some of their functions to other organizations, such as electrical plants of JSC «Russian Railways», LLC «Bombardier Transportation (Signal)», OJSC «Radioavionika», JSC «Foratek AT», OJSC «NIIAS» etc.

Effective tools for solving organizational problems for them are included in the concept of «lean manufacturing». It is a set of complementary approaches and methods that provide the highest quality construction of products [2, pp.5–6]. The concept provides primarily a process approach to the business and is regarded as a system of interrelated and interacting units (elements) of production. According to [3, p. 3], base of the enterprise, which is oriented to processes, is the principle of regulation of their sequence and their associated operations.

The overall production process of technical modernization of RARC equipment includes the following steps:

- Preparation and approval of technical specifications;
- Development of project documentation;
- Development of technical equipment adapted to the characteristics of the station or station- to —station block;
- Tests of created means;
- Commissioning developed and tested technical means.

The basic principle of lean manufacturing is the elimination of losses and above all the loss of time in order to reduce the duration of execution of customer orders.

Lead time is one of the key indicators of the production process. It is no less important than the





quality of a final product. Product quality and speed of its manufacturing process are interrelated. The level of defects, which amounts to 10%, could slow down the whole process to 40% [1, p. 87].

Speed of the manufacturing process has a positive impact on the costs of the enterprise. Empirically proved that in case of 80% reduction in the waiting time, manufacturing expenditures and quality costs decrease by 20% [1, p. 64].

An important factor in reducing the lead time to modernize RARC equipment and eliminate wastage of time in separate processes is the level of organization of the production system, which in turn is determined, on the one hand, by the consistency of the interaction customer- contractor, and on the other by rational interaction of structural departments of the contractor's enterprise.

Within some enterprises, which carry out technical modernization of RARC equipment, works are performed in a consistent way. One of the known variants is implemented as follows.

The company consists of several production departments and testing department. Each employee of the production department adds to the emerging technological means a certain set of functional characteristics, and then it is sent to another department to add other functional characteristics, etc.

After finishing work in production departments technical tool enters the testing department to identify defects. Testing does not begin until the product is not yet fully created. If a defect is detected, the technical means is directed to the production department, where it was admitted. After elimination of the defect it is retested.

This organization is shown on Pic. 1, where: TC_{BX} – RARC technical means requiring renovation; $TC_{\text{БВХ}}$ – modernized technical means, ready for commissioning; ПО – production department; ОТ – testing department.

In case of sequential organization of internal processes on the enterprises, performing technical modernization of RARC means, there are certain sources of losses.

1. Waiting period. Losses arise when unfinished work is postponed for indefinite time, as well as the inconsistent work of structural departments.

2. Excessive consumer characteristics. Giving RARC technical means functionality that is not required by the consumer, leads to the current and future losses.

3. Alteration. Losses arise by correction of defects, alteration of technical means in connection

with changed, during operation, requirements of the customer.

4. Reorganization processes. Losses are associated with the transmission of technical means under development due to the difficulties of its creation from one employee (or units) to another in the implementation of technical specifications.

5. Irrational movement. Movement route of the proposed technical means from one production unit to another, from the production unit in the testing department and back may not be the most rational, and thus be a source of losses.

The overall process of technical modernization of RARC means and its individual steps are streams of creation of a value for the consumer. The main objective of improving the organization of the process is to reduce the work and operations, which do not add value. This problem can be solved by changing the order of interaction of employees under the current organizational and production structure of the enterprise, but excluding the existing borders of units (departments).

For a more rational organization of work on technical modernization of RARC means a general set of responsibilities should be allocated between each production department personnel taking into account competency of actual performer, work complexity and regulatory duration of their execution.

For this it is necessary to implement a set of preliminary events, including the evaluation of the complexity of all kinds of renovation work for every technical means, the formation of teams of employees from different departments in accordance with their professional capacities, normative assessment of the duration of work, preparation of initial plan of responsibilities allocation among team members.

Team organization of technical modernization of RARC means is shown on Pic. 2. To simplify, it does not show relations arising from the correction of defects found.

Creation process of technical means is proposed to be divided in operations that include modernization of one or more functional characteristics of RARC by one team formed of members of each department. The first team starts developing the least complex characteristics. Partially modernized technical means is tested in the same team and only then is transferred to another team for performing and testing of more complex operations.

Conclusion. Team approach to improving the production process will reduce a number of losses, accelerate the execution of each order, and increase productivity of an enterprise-performer.

Keywords: lean manufacturing, rail transport, uneconomical losses, organization, process automation and remote control equipment, technological upgrade, the speed of the process.

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