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Control of Production Personnel when Performing Vehicle Maintenance

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ABSTRACT

The objective of this article is to analyse labour discipline of production personnel when performing vehicle maintenance works. Currently, many car service enterprises practically do not control the quality of the work of the employees. These responsibilities are assigned to the lower management level – foremen, however, they are either heavily loaded with work, or are not interested in performing control functions. In addition, labour intensity of technical maintenance and repair work is set by the manufacturer at the lowest possible level, assuming that the staff is highly qualified, and the company is provided with all the necessary special tools. As a result, it is difficult or impossible for employees to meet the standards, therefore, to fulfil the plan and not lose part of the wages, they miss or do not perform part of the work paid by the client. The studies were carried out in Perm at a typical car service enterprise, which is an official dealer of a domestic car brand. The analysis of the work of the personnel was carried out by comparing the actual work performed following the technology defined by the manufacturer. For this, video recording of all the actions of an employee was carried out. The completeness of each operation was noted, as well as the time spent. Work efficiency was assessed using Spaghetti diagrams, which indicate all movements of the performers. A methodology is presented that allows to give a final assessment of the work of locksmiths, which consists in calculating penalty points for exceeding standard time, partial execution or omission of operations. A scale for evaluating performers has been developed. The results of studies of carrying out maintenance of two identical cars are presented. The shortcomings of the production personnel are discovered and analysed.

To increase labour productivity, it is possible to use the principles of lean production of the 5 «S» system. It is necessary to equip the posts with tools, issue checklists to the performers and use the movement scheme at the maintenance post, equip posts with video surveillance cameras and periodically carry out selective control of work. To motivate staff, it is necessary to revise the system of bonuses and fines, considering the results of work.

Keywords: personnel assessment, car service and maintenance, labour discipline, vehicle maintenance.

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In a market economy, car maintenance enterprises are forced to compete for customers. Reducing the cost of services provided can be effective only in the short term to attract new customers, in the long term – it will lead to a decrease in profits. A more promising way is to improve quality of services provided. When paying for services, consumers expect as a matter of course that all declared work will be completed in full and the car will be ready for operation exactly on time. Although in reality this is not always the case. Manufacturing plants, aspiring to sell as many cars as possible, attract customers particulalry by low prices for technical maintenance and current repair, which are achieved by reducing the standard hours while maintaining the volume of work. At the same time, many service workshops do not have the necessary list of equipment, rigging and tools, and their employees have not attended for a long time the advanced training courses and do not work efficiently [1–3]. On the other hand, a locksmith's salary depends on the number of hours worked to execute the received workshop orders, so to meet the standard, you might go for tricks, for example, skip or incomplete part of the work that is difficult to check (inspection, control, fastening). As a result, the client pays the full cost of the work that probably has not been performed. The quality of service depends on organisation of work at a particular enterprise and conscientiousness of a particular locksmith.

The *objective* of this article is to analyse the work of the production personnel of a car service enterprise during technical maintenance work.

The problems of personnel management are relevant for all countries of the world, for example, the study [4] shows the difference between anti-crisis management in China and the experience of Western countries. Public opinion is key for China, therefore, dissatisfied customers through social networks can cause significant damage to business, for example, to boycott the KFC [4–5]. In Russia, customers are also becoming more active online and are trying to pay attention to reviews, but public opinion is not a fundamental factor. Many studies have been conducted by European researchers, however, they focus either on human resource management in general, or on other sectors of the economy: mechanical engineering, light industry, medicine [6–7]. Car service in developed countries was formed in the middle of the last century, it is rather tightly controlled, therefore, in foreign countries, such problems are not so urgent, especially in terms of maintenance and repair by official dealers.

The research was carried out at GAZ car centre in Perm. The main activity of the centre is maintenance and repair of GAZ vehicles, additional activity refers to sales of GAZ vehicles and spare parts. The production area is equipped with universal maintenance and repair stations, as well as with diagnostic, cleaning and washing stations, and tire fitting. The production staff consists of 12 people: eight locksmiths, two technicians-receptionists and two shift foremen. This enterprise as for its equipment of the production area, personnel, labour organisation and other things is typical of the service industry.

In 2019, 894 GAZ cars were sold in the car centre, 3516 car entries were recorded, of which 1116 were for maintenance. A significant amount of work on technical maintenance is due to the fact that car owners prefer to carry out maintenance in a car centre only during the warranty period, then they turn to independent services or carry out maintenance on their own.

Materials and methods

The performance of the production personnel was assessed using *a spaghetti diagram*. When using this *method*, the observer on the plan of the workplace (maintenance area) notes all the movements of the employee, as well as the number of steps taken, or time spent on moving and performing the operation.

The experimental procedure was as follows:

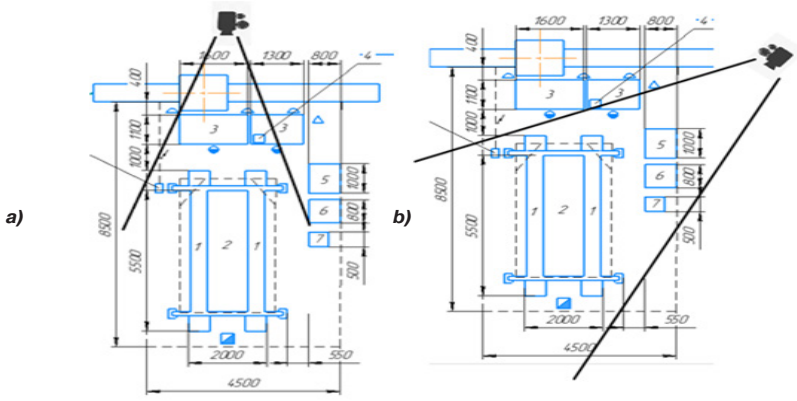
1) video recording of all actions of the employee was carried out;

2) the observer, on the prepared form with the plan of the maintenance area, noted all the movements of the employee and the time spent;

3) then the maintenance record was analysed, the actual execution time of each operation and errors, if any, were noted on the factory technology form.

Video recording was carried out using an EKEN H9 digital camera with the ability to record at a frequency of 60 frames/s and a resolution of 1080 p. In order not to distract the employee from the work, the shooting was carried out on tripods, the area plan and the location of the cameras are shown in Pic. 1.

In the course of the study, maintenance was analysed regarding GAZelle «NEXT» cars



Pic. 1. Foreshortenings of GAZ vehicle maintenance (made by the authors).

Pic. 2. Examples of frames from video recordings.

with a mileage of 20 thousand kilometres (technical maintenance-1). In total, two video recordings were made, the cars had the same equipment and a completely identical list of works to be performed. Employees were full-time auto repair technicians, aged 32 and 38, both have continuous work experience of at least eight years. The equipment, tooling and tools at the workplace are identical. Each employee was informed about the video recording before the experiment.

As a result, two video recordings with a duration of 138 and 121 minutes were obtained, examples of frames are shown in Pic. 2.

The mistakes of the employees were divided into three groups; for a comprehensive assessment, penalty points were awarded for mistakes:

- the technician failed to complete the operation on time (1 point);
- the technician did not complete the operation in full (3 points);
- the technicain did not complete the operation at all (5 points).

Of course, all maintenance operations are particularly important. Actually, they are minimum necessary to maintain the vehicle's working condition. However, operations are labour intensive and have an impact on operational safety. For simplicity, it was decided to take into account only labour input when calculating penalty points:

$$PP = K \cdot t_{all}, \quad (1)$$

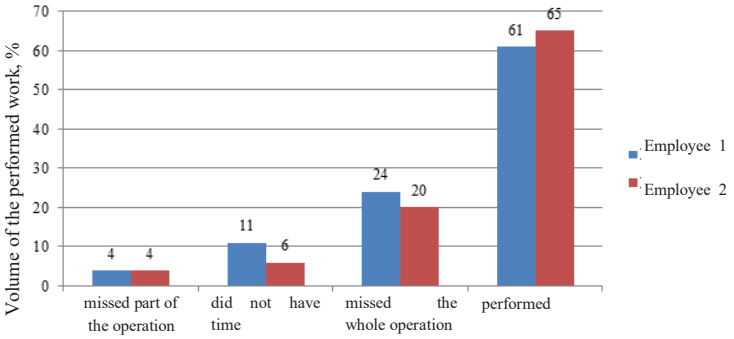
where PP – total penalty points assigned to the employee for the operation;

K – error coefficient (1, 3, 5);

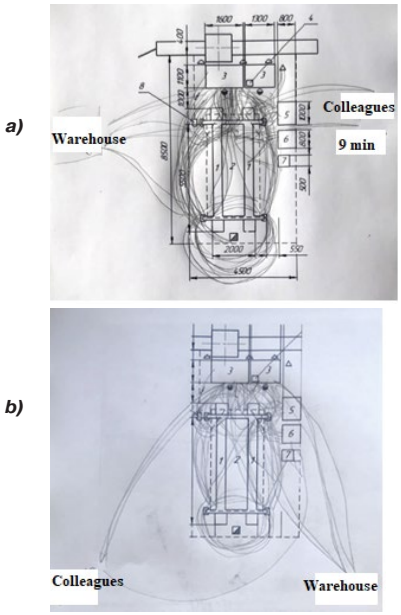
T_{all} – time allotted for the operation according to the factory technology.

To assess the work, a scale is proposed (Table 1), it is designed in such a way that the omission of any operation leads to an «unsatisfactory» assessment since this is considered a poor-quality service and is a violation of Art. 4 and 10 of the RF Law «On Protection of Consumer Rights» [8].

It is only possible to get «excellent» assessment if all the operations that are part of the technical maintenance will be performed. In this case, it is allowed to slightly exceed the labour intensity established by the factory technology. The employee will receive «good» score if he exceeds the factory labour intensity by more than 15 minutes, and «satisfactory» score if one or two



Pic. 3. Results of the analysis of work of employees (compiled by the authors).



Pic. 4. «Spaghetti» diagrams: a) first employee, b) second employee (compiled by the authors).

operations are partially skipped (mainly inspection work).

Results and conclusions

As a result of the analysis of video recordings (Pic. 3), it can be seen that 35–39 % of operations were performed with violation of the technology, locksmiths missed operations by an average of 0,63 standard hours, which is about 20 % of the total labour intensity of maintenance. The number of penalty points of the first employee is 2,11, of the second – 2,91, which corresponds in the latter case to the unsatisfactory assessment.

The employees missed operations important for active safety, fire safety, either operations, as a result of non-fulfilment of which, expensive repairs may occur.

Table 1

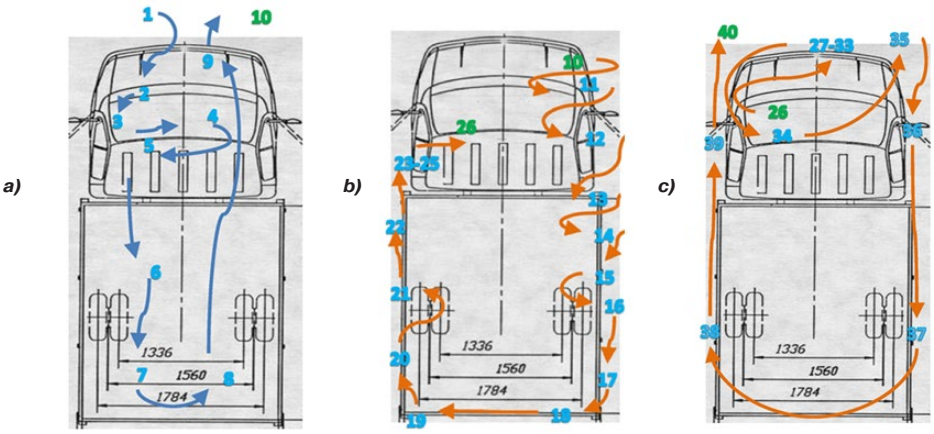
Evaluation of the work of an employee using penalty points

«5»	«4»	«3»	«2»
0–0,1	0,11–1,0	1,1–2,0	2,0–16,7

The «Spaghetti» diagram (Pic. 4) shows that most frequently the locksmiths approached the workbench and toolbox, which indicates ineffective use of the tool trolley and irrational tool placement. They were absent from the workplace several times: the first employee visited the warehouse four times, the second visited it twice. During the maintenance, the first employee did not have the necessary tool, nine minutes were spent on the search, and the second left to the rest room for six minutes. It was noted that both mechanics did not always raise the car to a sufficient height for comfortable work under it.

To increase labour productivity, it is possible to use the principles of lean production of the 5 «S» system [9–12]. It is necessary to equip the posts with tools and rationally place them in an easily accessible place. For example, often used tools should be placed in a tool trolley, rarely used – on wall panels. To prevent skipping operations, it is proposed to issue checklists to employees and use the movement pattern at the maintenance post (Pic. 5). The scheme is easy to apply to the flooring with paint or stickers.

It is advisable to equip posts with video surveillance cameras and periodically carry out selective control of work, which is better to entrust to an independent expert. To reduce the loss of time, it is necessary to purchase enough tools, as well as revise interaction with the warehouse, since obtaining materials for



Pic. 5. Scheme of movement of an employee:
a) operations «from below», b) operations «from above», c) operations «from the compartment»
(compiled by the authors).

maintenance is time-consuming. To motivate staff, it is necessary to revise the system of bonuses and fines, considering the results of work.

Thus, the study revealed serious violations during the maintenance of GAZ vehicles: partial or complete failure to perform 35–39 % of operations. Violations are partly related to ineffective labour organization and low labour intensity of the plant technology. The problem can be solved by equipping the workplaces with tools, improving the work of the warehouse, and tightening control over the performers.

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