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The Importance and the Role Of Programming Fire Rescue Units' Operational Actions Improvement

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Abstract:

The article provides recommendations for evaluating the results of fire rescue units, separating units with the highest and lowest performance, analyzing the work efficiency of individual units, and at the same time evaluating fire rescue units with different conditions and serving different radii according to their private indicators. Algorithm development and programming are discussed.

Key words: *emergency situation, rescuer, modeling, rescue center, programming.*

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Introduction

Today, the quality indicator is one of the most urgent problems in the world, and the interest in it is constantly increasing. Such an indicator determines the market priorities of the quality of products and services of our country, and the security of the state. In addition, it ensures the stability of development, serves to ensure the environment, human health and human standard of living.

In recent years, the huge construction works, the high-rise public and residential buildings being built, improve the living conditions of our people and citizens, as well as increase the

responsibilities of the personnel of the Ministry of Emergency Situations. Because in modern construction works, construction structures and equipment are aesthetically beautiful and neat, but from the point of view of fire safety, various toxic substances released during fire from building materials made of polymer products increase the possibility of people dying. [3]

If we pay attention to the analysis of fires, the number of fires in our country is decreasing every year. The fact that the material damage caused by the fires is still large, the number of injuries and deaths of people is high, does not leave a person without concern. Eliminating fires in time, preventing people from being killed and injured, and reducing material losses is the main task.

In this regard, the role of fire-rescue units is very high. In practice, generalized indicators are often used to analyze the activity of fire-rescue units. These indicators are used as "number of fires", "deaths and injuries", "property damage", "time of containment and extinguishment of fire", etc. However, its indicators can be divided into a number of components, whose specific indicators affect the overall indicators. For example, the time to surround a fire depends on the development of the fire, the time of arrival of fire rescue units and other objective factors. In this regard, the following problems at present are the non-existence of methods for assessing the rapid activity of fire-rescue teams (FRT) based on statistical data based on specific (time) indicators, the lack of a calendar plan based on statistical data that determines the level of fire risk according to the intensity of the flow of calls to the FRT, as well as , the current constructions, the large number of traffic jams in the city raise the issues of revising the control of territorial fires of the National Fire Service. [4]

Operational documents of fire-rescue units are drawn up taking into account the regulations, instructions, normative-legal documents and the characteristics of local garrisons. The instructions of the Ministry of Emergency Situations administration mainly provide general information on the structure of documents, their structure and forms, therefore the conditions and characteristics of local garrisons are not fully taken into account.

The head of the garrison and his officials play an important role in the development of service documents. Now it will be appropriate to develop a number of programs to find a positive solution to such problems.

As indicators of the rating system, the service times of fire-rescue parts can be taken. Here, we present the private specific evaluation indicators under consideration:

$\tau_{r.t}$- the time for the rescue team to reach the place of fire;

$\tau_{con.t}$ - time of containing the fire;

$\tau_{sup.t}$ -fire suppression time.

The comprehensive assessment of fire-rescue units according to the above special indicators can be calculated using mathematical modelling formulas and programming works can be carried out using these indicators.

$$K_j = \sum_{i=1}^{m} \alpha_l F_j^l \rightarrow \min. \quad [1]$$

$$\sum_{i=1}^{m} \alpha_l = 1, \quad F_j^l = \sum_{i=1}^{k} P_i^l x_{ji} \quad (2), \quad l = \overline{1,m}, \quad j = \overline{1,n}.$$

Here, **m** is the number of times, **n** is the number of fire-rescue units.

$\mathbf{X_{ji}}$**-j** - according to the team's private indicators over time; i – the number of exits in the interval. And the theoretical probabilities is found from the formula:

$$P\left\{\tau_k \le \tau_{xizm.} \le \tau_{k+1} \right\} = e^{-\mu\tau_{k+1}} - e^{-\mu\tau_{k+1}} \quad [2]$$

Here $\mu = 1/\boldsymbol{\tau_{serv.}}$ parameter of the exponential distribution law

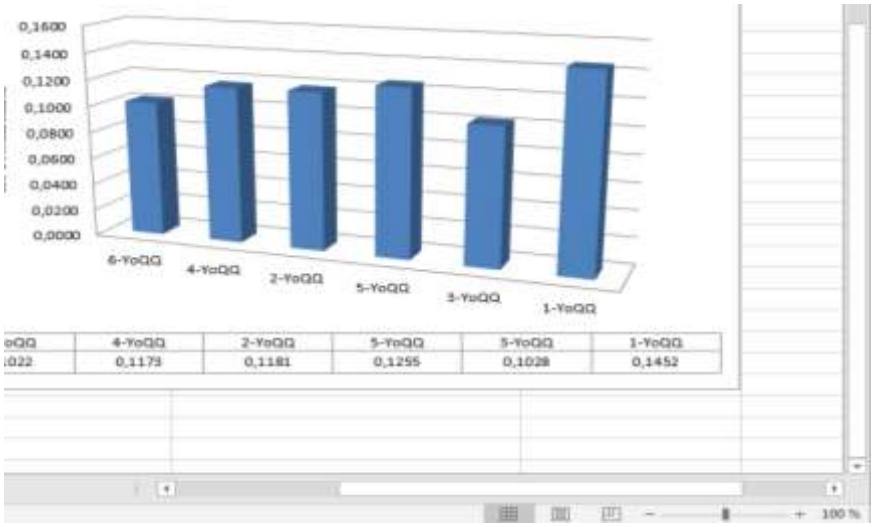

Figure 1. A view of the estimation of time indicators of fire-rescue units in the Microsoft Excel program window. The average time of units to serve we expressed by the following formula:

$$\tau_{хиз,кил,} = \frac{\sum_{к=1}^{n} m_к \left(\frac{\tau_к + \tau_{к+1}}{2}\right)}{\sum_{к=1}^{n} m_к} \quad [2]$$

Here m_k – the number of calls dwing this or that time period; τ_k- the lower limit of the interval; τ_{k+1}- the upper limit of the range (it will be lower for the next range).

Performing calculations in this modelling in modern versions of the Microsoft Excel software system gives an effective result.

Thus, this method can be used to evaluate the performance of fire rescue units, distinguish the highest and lowest performing units, analyze the performance of individual units, and make recommendations.

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