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THE DETERMINATION OF FIRE – BRIGADES NECESSITY USING MASS SERVICE THEORY REGULARITIES

The mathematical model of mass service theory (further MST) is effectively used describing the work of fire brigades.

General emergency center's 112 dispatchers, receiving the calls, gather all the necessary information about an incident and transmit it to fire – brigades. A fire – brigade is MST Markov system with *N* chapters. Poisson flows of calls about fires come info a fire – brigade with certain intensity.

According to the number of existing fire – brigades in town, their occupation and their technical provision also the number of receiving calls, the received call may be maintained, partly maintained and completely unmaintained. The refusal to maintain a call occur at the times when fire – brigades are occupied by the maintenance of other calls and non of the fire or emergency car are not able to come to the place of incident.

Having all the characteristics, defining the work of fire – brigade, it is possible to evaluate the important characteristic of fire - brigade – the refusal to go to fire or according to other call probability in the case of all *N* departments occupation, the extinction of previous fires or the maintenance of other calls.

It is very hard to determine the number of teams, which ensured the complete assurance of fires because each fire is unpredictable and may occur anytime and anywhere. However it is possible to determine the optimal number of teams, which reduced the refusals' quantity to the minimum.

According to the statistics of the last year incidents, their time of liquidation the number of teams equipments used to liquidate the incidents it is possible to determine the number of fire – brigades. The frequency of fire – brigades' departures causes the flow of receiving calls. If we would analyze the flow of receiving calls over a period of time, it is possible to distinguish certain dynamic regularities.

Simple call flow is completely described as the function:

$$P\{x(t)=k\}=P_k(t);\ \ k=0,1,2,...,\ t>0,$$

where $P_k(t)$ – The probability that there will be received *k* calls over a period of time.

The given function complies with the Poisson's law:

$$P_k(t)=\frac{(\lambda t)^k}{k}e^{-\lambda t},$$

where λ – the intensity of calls' flow.

One more important factor, affecting the probability of incidents' rise, is

the number of inhabitance, because main culprits of fires and other incidents one concrete persons.

Yet it is not enough to assess the average of fires that way occur over a period of time, because few incidents may happen at some time. For this reason there is one more important parameter the number of simultaneous calls, because in the case of several simultaneous fires during a period of time t to maintain the calls a greater number of forces and equipments is necessary. It is important to know the number of fire – brigades j, which maintain received calls (simultaneous and non). Having assessed the occupation of fire – brigades to maintain all calls it is possible to create a mathematical model, which allow to determine the necessity of fire – brigades in towns and districts.