



ANALYSIS OF METHODS FOR ASSESSING THE FIREPROOF PROPERTIES OF PRODUCTS OBTAINED ON THE BASIS OF NATURAL RAW MATERIALS

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Abstract

This article analyzes the methods of assessing the fire-resistant quality of fabrics obtained on the basis of natural raw materials to ensure the safety of firefighters. Firefighter clothing is one of the most widely used individual protection tools and is one of the prerequisites for reducing the dangerous and harmful effects that occur during the production process, as well as maintaining the high working capacity and health of workers. Of the main goals of the world's large competitive sewing enterprises specializing in the production of special clothing, this is, first of all, the production of protective clothing, the ecological, aesthetic properties of which are improved, which do not exert the influence of hazardous substances (harmful gases and acids, and other chemicals) on the human body. With this in mind, one of the urgent tasks is to expand the production of firefighter clothing with a high level of protection and provide workers serving in the rescue service of the Ministry of emergency situations of the Republic with competitive special clothing[1]. Existing firefighters have identified a number of shortcomings in terms of material properties and protective functions in clothing. Fires are common accidents that cause severe human damage and property damage, threatening public safety. World fire statistics for 2021 showed an average of 3.7 million fires a year from 1994 to





20201, resulting in at least 1.1 million people killed. In addition, the number of injuries and deaths of firefighters during this period reached 100,000 people [2].

Currently, one of the main problems in fire extinguishing is the wear of fire extinguishers. Firefighter clothing should be made of high flame retardant fabrics and have a high quality index. However, modern organic fabrics burn easily at high temperatures, while inorganic flame retardant fabrics need to be processed again so that they are comfortable to wear. Therefore, the study of the quality of fireproof fabrics obtained on the basis of natural raw materials helps to solve the above problems. The main cause of damage and death of firefighters is the poor ability of their protective clothing to withstand active fire at high temperatures. For this reason, extremely high flame retardant fabrics are urgently needed to reduce the risk of accidents, and their quality indicators should be improved.

To date, many studies have been carried out to improve the flame retardant properties of fabrics using chemical coating or layer modification techniques for processing natural fibers and fabrics. However, there are several problems. For example, organic fire extinguishers usually contain carcinogens that can damage the nervous system, which, if released during a fire, pose a risk to the health of firefighters. The main thing is considered to be the large number of factors affecting the flammability of textile materials, their interdependence, as well as the fact that the boundaries of change are not clear. Production of quality products is the satisfaction of consumer needs. In order to ensure the safety of firefighters, it is required that the special clothing provided is high air permeability, low water permeability, convenient for rapid movement and fire resistance, depending on the type of work the firefighters are doing. The following styles of determining the quality of fabrics for which firefighters are intended for clothing are used:

Experimental method, organoleptic method, computational method, sociological method and expert Method [3].

To determine the quality of products according to the first method, the properties are measured, the defects are measured, and the quality is determined.

In determining the quality of products according to the second method, the human sense organs are used.

According to the method, the quality of the product is determined. In this case, indicators about technical processes are used from information about raw materials.

By the fourth method, the quality of the product is determined by knowing the opinion of consumers, the formation and generalization of its choice. The effectiveness of this method lies in the fact that the consumer needs this mole, and this is due to the large number of consumers. To determine the quality of a particular product by the method





of experts, a special group of experts is formed. As an expert, a professional specialist with a high level of knowledge is invited. The group to which the product is made is recommended and the issue of assessing the quality of the product is put. Each expert gives his assessment of the same product [4].

The results obtained are summarized and the quality of the product is evaluated.

In this case, the most necessary and interpretive recommendations of the selected gaslama are distinguished, in the following order, settlement work is carried out. Interpretive characteristics of the fabric for which firefighters are intended for clothing (number n). The number of experdepends on how accurately the assessment comes out, the number of which (m) should not be less than seven. Experts put the conclusions in place and give them Grades (P). The most significant in this putting them in place, they are given grades (P). In this case, P=1 is given for the most significant indicators, and P=n for the insignificant ones.

If, in the opinion of experts, the significance of several properties is the same, then the sum of the grades located side by side is taken and an average assessment is given for each of these properties.

The result of the data obtained from the experts is written in a table and evaluated in a statistical style. The sum of the grades given by the escperts is determined and the sum of the grades for each expert on the horizontal is constant and $\sum K_{ij}$,

$$\sum K_{ij} = (1+2+3+\dots+n) = 0,5n(n-1);$$

For each feature on the vertical C_j Each indicator X_j

$$C_j = S_j \sum K_{ij} \quad n_i=1; j=1,2,\dots$$

Is the coefficient of significance for each property

$$J_j = mn - C_j / mn - m \sum K_{ijn} \quad i=1$$

We determine the most significant features found in the calculations performed. To do this, we refer to the following condition

$$J_j > 1/n$$

Relative importance for the most significant characteristics identified

$$\lambda_{K_{jc}} = \frac{mn - S_j a}{mn \cdot n a - \sum_{i=1}^n S_{ij}}$$

In this case, m-is the number of experts; n-is the number of characteristics; na - is the number of specified characteristics; $S_j a$ - is the ymgindi of its assessments by characteristics;

K_{ij} - is the sum of the assessments by experts; S_j - is the sum of the assessments by characteristics. The opinion of experts is the following coefficient for determining the degree of compatibility with each other.



$$W = \frac{\sum_{i=1}^n (S_j - C)^2}{\frac{1}{2M^2(M-H)} - M \sum_{i=1}^n T_i}$$

T_i – features at the same price, C - average collection by feature.
The significance of the concordance coefficient is determined using the Pearson criterion X_2

$$X^2 = Wm(n-1)$$

Calculated X^2 . It should be larger than on the table

$$X^2_{a} > X^2_{j}$$

The questionnaire consists of the following characteristics:

1. Breaking power- X_1 ;
2. Air permeability- X_2 ;
3. Color consistency- X_3 ;
4. Friction resistance- X_4
5. Continuity – X_5 ;
6. Water permeability- X_6
7. Heat preservation feature- X_7 ;
8. Appearance- X_8 ;
9. Accessibility- X_9 ;
10. Stiffness to bend- X_{10}

For each of the properties, the coefficient of significance is determined.

$$\sum_{i=1}^n K_{ij} = (1 + 2 + \dots + 10) = 0,5 \cdot 10 (10 - 1) = 45$$

$$K_{sc} = \frac{m \cdot n - S_j}{m \cdot n - m \alpha \sum_{i=1}^n K_{ij}}$$

Results of expert opinion:

No	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}
1	2	10	2	1	3	4	6	9	10	10
2	9	5	1	2	7	6	8	3	4	7
3	5	8	6	1	4	3	8	7	4	6
4	4	2	6	1	5	7	9	5	3	10
5	8	7	1	2	4	3	5	9	10	6
6	3	6	1	2	8	9	4	5	7	10
7	5	3	2	9	7	7	1	8	9	10

The opinions of experts are the coefficient of concordance to determine the degree of compatibility with each other:



$$W = \frac{\sum_{i=1}^n (\check{S} - S_j)^2}{\frac{1}{2} m^2 (n^3 - n) - m \cdot \sum T_c}$$

$$W = \frac{1863,4}{\frac{1}{2} * 7 * 7 * (10 * 10 * 10 - 10) - 0} = \frac{1863,2}{24255} = 0,0768$$

$$X_{2a} = W \cdot m \cdot (n-1) = 0,0768 * 7 * (10-1) = 4,83$$

$$X_{2a} \geq X_{2j}$$

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