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METHOD OF DESIGNING SPECIAL CLOTHING BASED ON APPROVAL OF CONTAMINATION ASSESSMENT METHODOLOGY

ABDUKARIMOVA MASHKHURA

Associate Professor of National Institute of Art and Design named after Kamoliddin Behzod
E-mail: mashkhura1720@gmail.com

NURIDINOVA ROKHILA

Doctoral student of Namangan Institute of Engineering and Technology
E-mail: nuriddinova_a93@mail.ru, Phone.: (+99897) 263-83-63

MAHSUDOV SHOHRUKHMIRZO

Senior teacher of Namangan Institute of Engineering and Technology
E-mail: shohruxmahsudov@gmail.com, Phone: (+99894) 309-77-90

Abstract:

The article covers the issues of developing the informational and methodological support of the decision-making process on the formation of the assortment of special clothes. At the initial stage of design, the structure of the information-search process is proposed, which provides the search for graphic solutions of production clothing models based on the determination of the optimal zones of clothing contamination and wear areas in accordance with real operating conditions.

A graphic base of various constructive-technological solutions has been developed that allows expanding the functional modules of automated systems. The use of a graphical display base in the automated design of a production clothing collection significantly reduces the time of model design development and reduces the number of errors caused by the human factor.

Keywords: custom clothing, graphic design, design, sewing zone, automated systems.

Today, advances in science and technology in the world offer a wide range of opportunities for the production of special clothing of competitive quality, including innovative materials with high protection indicators, automated design systems (ALT) based on an intellectualization approach, aimed at operationally updating the range of clothing and increasing production efficiency. With the increasing technological competition, the importance of customer-oriented interactive design of not only household goods, but also industrial clothing is increasing. Opportunities to strengthen the creative work of designers and constructors based on the use of artificial intelligence methods in solving difficult formalized issues of interactive design of clothes [1] have been proposed. In [2,3], an information system was proposed that provides a complete and differentiated scope of the needs of various professional-production groups, providing an opportunity to solve project-organizational issues of special clothes, and a reference-search apparatus was created that provides the creative process of creating clothing models for groups with a set project status. However, the proposed information support of the formation of the assortment of production clothes does not provide a solution to the problem of creating sketches based on the direct dependence of the clothes on the factors of contamination and decay, the search for constructive-decorative, technological elements. Therefore, at the initial stage of design, it is required to solve the task of expanding the functional modules of automated systems in order to develop original solutions of special clothes that provide predictability and prolong the service life of special clothes in accordance with standard requirements.

This article describes the issues of developing the information-methodical support of the decision-making process on

the formation of the assortment of special clothes. At the initial stage of the project, the structure of the information-search process is proposed, which provides the search for graphic solutions of production clothing models, based on determining the optimal zones of the areas of contamination and decay of clothing in accordance with real operating conditions (Fig. 1).

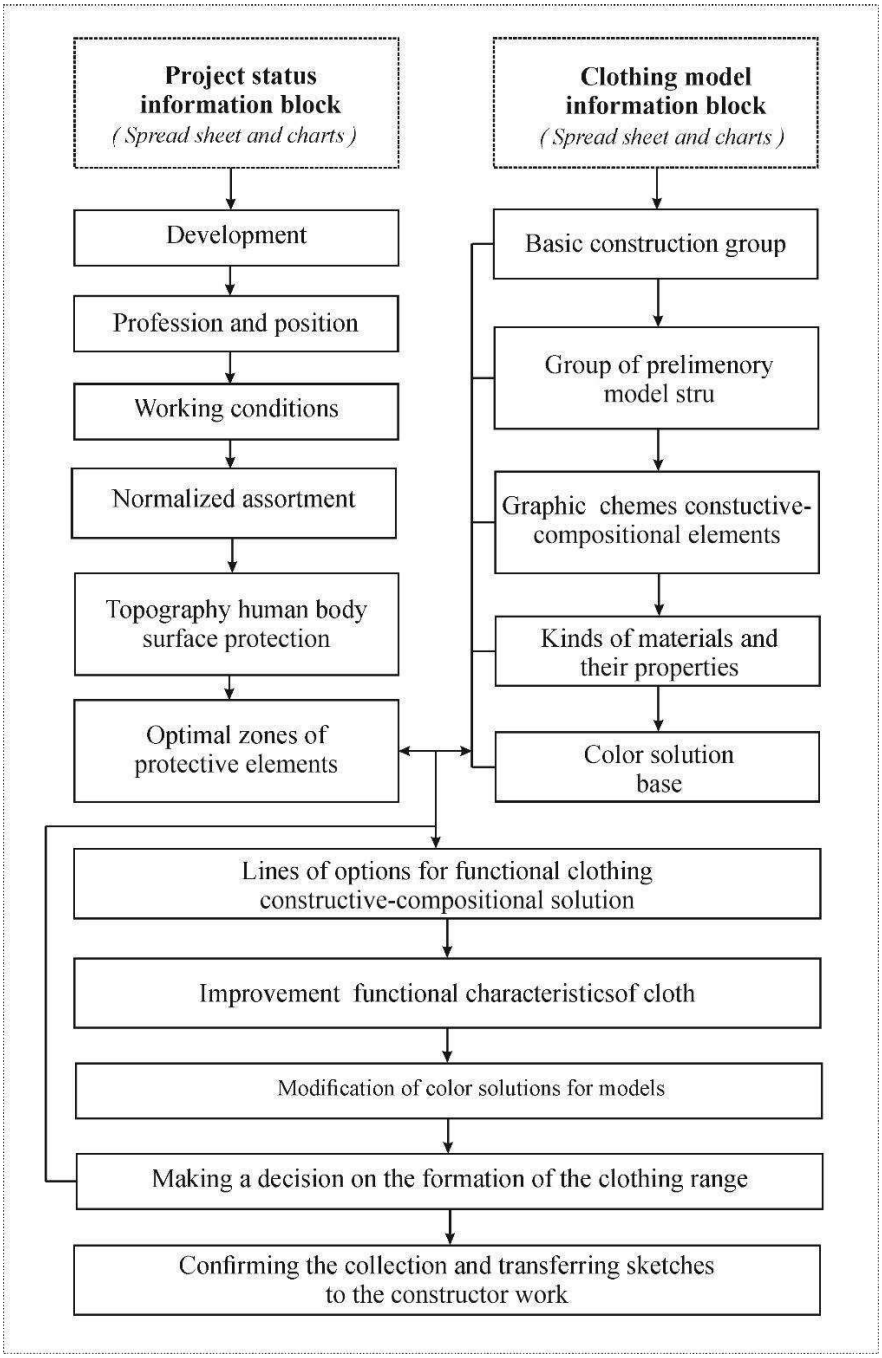

Fig. 1. The structure of the information-search process of forming the assortment of production clothes

The input data of the information-search process of creating a clothing sketch are: positions of employees of a specific enterprise, graphic information on clothing contamination zones by position, indicators of material types and properties, and clothing assortment units. The organization of the basis of the graphic

appearance of the clothing sketch is based on the provision of the basic basis and the structural-decorative, technological elements of the assortment unit according to the shape and silhouette of the proposed special clothing. The formation of sketches in the selected base structure is determined by graphic information on contamination zones and the relationship between constructive-decorative and

Based on the comparison of the graphical information of the pollution zones on the basic shape of the clothes and the parameters of the graphic solutions of the designed model, the modification coefficient is determined, which reflects the change of the parametric values of the shape of the article and structural lines. By judicious use of protective materials at the expense of changing the color solution, various options for the stylized image of sketches of production clothes are obtained, while preserving the integrity of the transformed image.

Today, criteria and methods of physiological-hygienic evaluation of special clothes according to climatic conditions have been developed, the relationship between technical parameters of materials and clothes has been determined [4-6]. The analysis of the materials used in the preparation of protective clothing against oils and acids [7] showed that today there is a wide range of protective fabrics and their use is aimed at increasing the quality of the designed product, while on the other hand it is difficult to choose this or that sample of the fabric. In addition, fabrics with high oil-acid protection properties are expensive, that is, they are almost not used in practice due to the unprofitability of using special clothes made of them for the enterprise, and the addition of additional components leads to a significant increase in the total weight of the clothes. It is worth noting that the number of companies in the world who want to provide their employees

technological elements. The solution of this task is based on the development of methods that allow to "recognize" the graphical solutions of models according to the zones of contamination defined according to professional positions. The implementation of recognition methods is carried out with expert knowledge that establishes a visual graphic representation of the clothing model.

In order to evaluate the compositional solutions of clothing models, it is necessary to optimize the variation of compositional-constructive parameters. In order to solve the tasks of determining the set of variable technical parameters, the criterion of optimality that ensures quality, and the limits of their variability, the special clothing of motor welders of the automobile industry, which wears out quickly as a result of regular acid and oil spills and acid spills in working conditions, was chosen as a research object.

with unique design work clothes that will introduce the company in the market is also increasing.

An analysis of existing analogs was carried out to determine the effect of the service life of the special clothing of motorists and welders protecting against oils and fats on the artistic and constructive solution of the product[8,9]. In order to determine the priority parameters of fabric and special clothing constructive-technological solutions, the erosion topography of the special clothing of auto mechanic workers at the end of their service life of the "Toshavtotamirkhizmat" center was studied based on the results of visual inspection. The degradation topography scheme was developed by dividing 100 suits (jacket and trousers) into high, medium and relatively contaminated zones according to the difference in the distribution of contamination on the surface of the garment (Figure 2).

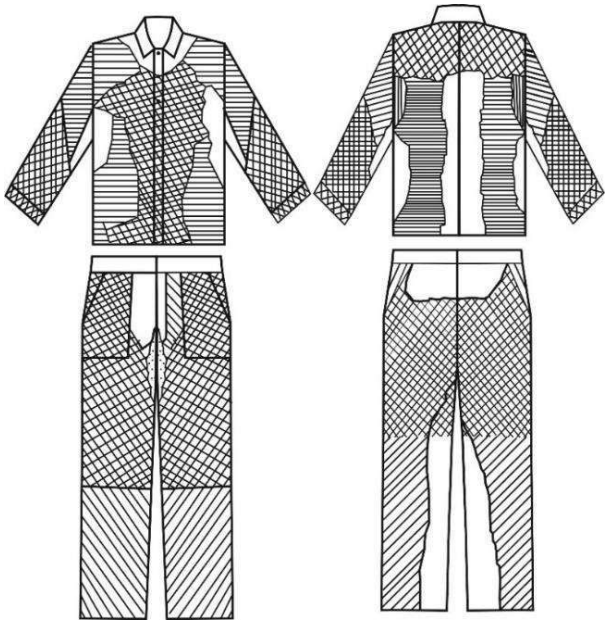

Figure 2. Degradation topography of special clothing of auto mechanic workers

By determining the optimal size of the protective element for the alternative use of protective materials during the development of a special clothing design, the creation of a special clothing design provides an opportunity to predict the service life of the item. From our side, a proposed method of assessing the level of contamination of different parts of special clothing based on changes in the physical and mechanical parameters of the material of the article [9] is presented. This method refers to the color change (darkening) of the surface of the material due to contamination from acids, fats and oils, and the degree of contamination is determined using the optical evaluation method. As a result of pollution, particles of oils and impurities fall on the surface of the fabric, the texture and color of the fabric change, which is visually visible as darkening or discoloration of the fabric surface. The degree of darkening and the size of the darkened area can indicate the degree of contamination. The color of the material affects the visual perception of the degree of pollution: the lighter the color of the material, the more clearly the degree of darkening is determined. Figure 4 shows the process of identifying contamination zones on an Empyrean Panalytical X-ray diffractometer.

According to the results obtained on the Malvern Panalytical Empyrean diffractometer, the XRD data of the contamination zones of special clothes were recorded using an analytical diffractometer with CuKa (λ = 1.54 Å) radiation. In this experiment, the accelerating voltage of the radiation generator was set to 45 kV and the current to 40 mA. X-ray diffraction reflexes were recorded in the Bragg-Brentano beam geometry at a value of 2 theta angle from5 degrees to 80 degrees (2θ = 5° - 80°) at a constant scanning speed of 0.33 degrees/min [10-12].

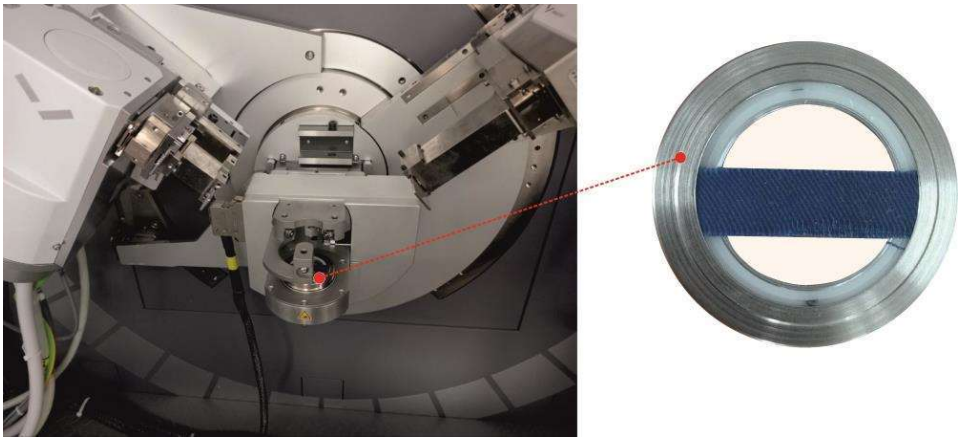

Figure 3. Empyrean Panalytical X-ray Diffractometer Detection Process for Contamination Zones

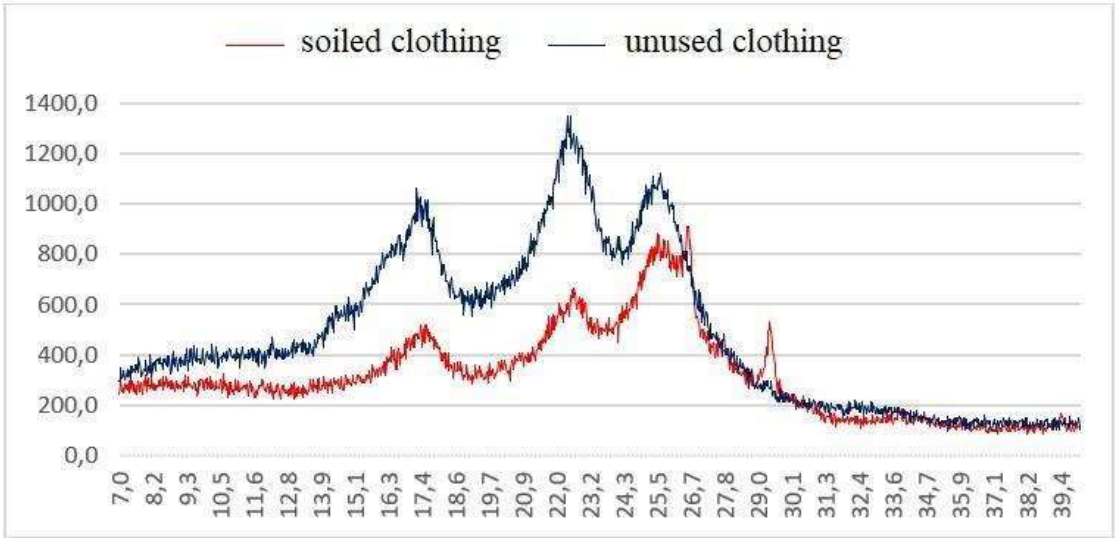

Figure 4. Empyrean Panalytical x-ray diffractometer results from unused and soiled clothing surfaces

According to the measurement results of the unused clothing surface, the value of the light reflection in the first 10 degrees of the 2 theta angle is in the range of 298 to 415 intensity, in unwashed clothing this indicator is in the range of 305 to 366 intensity, in moderately soiled clothing it is in the range of 351 to 373, in soiled clothing it is in the range of 245 to 308 intensity.

At an angle of 20 degrees of 2 theta, the value of the reflection of the light is 680 in unused clothes, 547 in unsoiled clothes, 471 in moderately soiled clothes and 369 in intensively soiled clothes, while at angles of 30 and 40 degrees it is 239 and 116 in unused clothes, 216 and 119 in unsoiled clothes, and 192 in moderately soiled clothes. and 112, 244 and 100 intensity in Soiled clothes were noted.

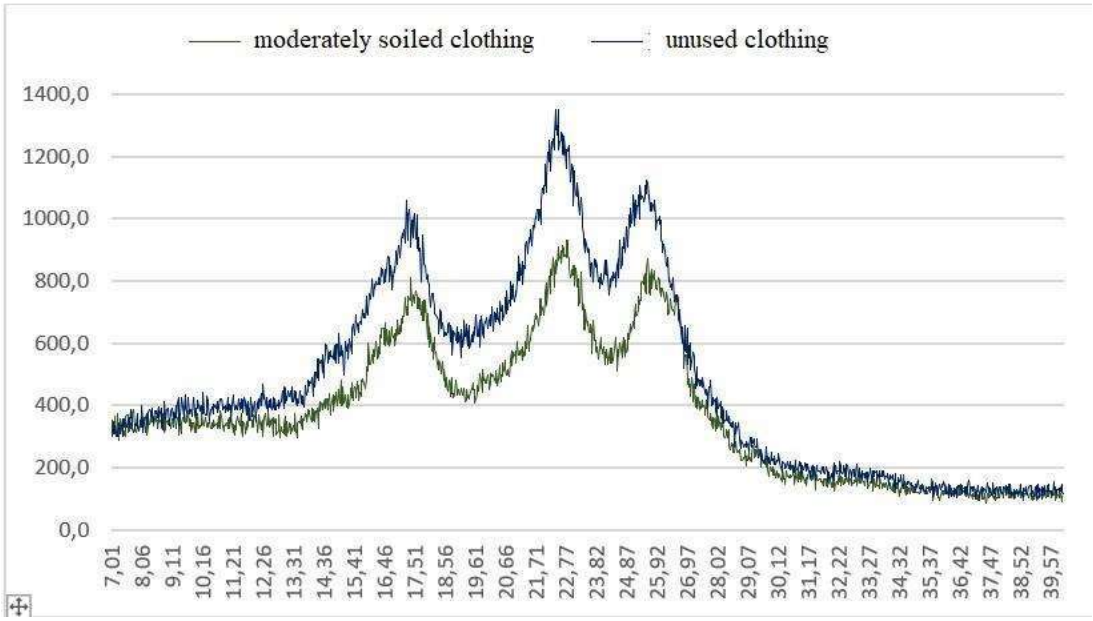

Figure 5. Results for unused and moderately soiled clothing

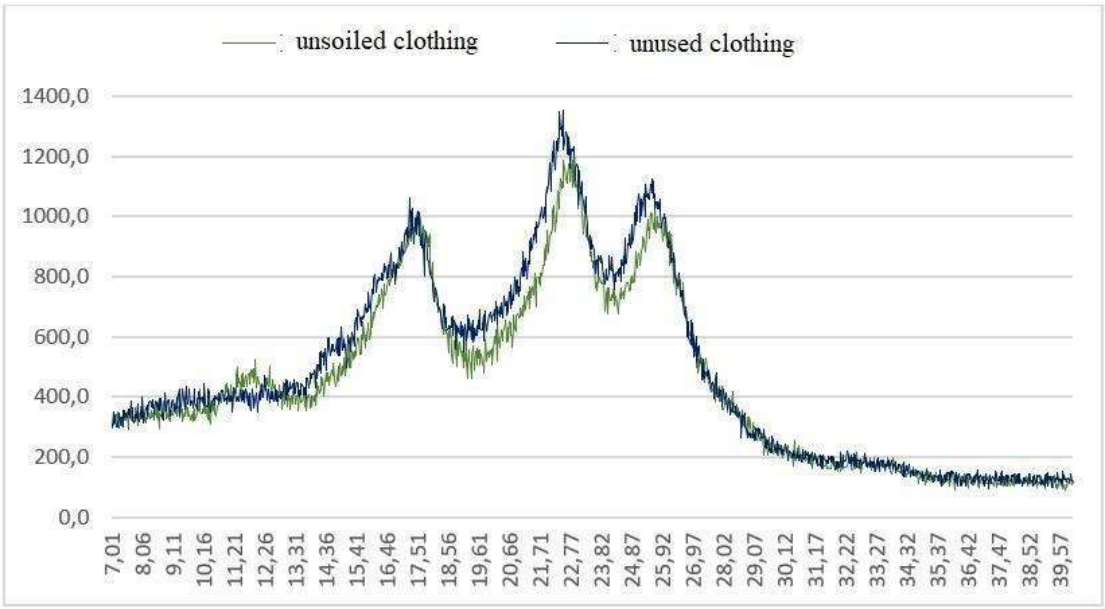

Figure 6. Results for unused and unsoiled clothing

The highest intensity index was recorded at 22.79 degrees of 2 theta angle, and it was found to be 1222 in unused clothes, 1175 in unsoiled clothes, 931 in moderately soiled clothes, and 628 in dirty clothes (Figures 5, 6, 7).

The system of transformation of graphic solutions of the clothing model was implemented in the existing software-methodological complex in the form of a test form of the information technology component. The development of mathematical support for the process of geometric transformation of the clothing model allows to transform the item in the automated mode of graphic solutions. The transformation of clothing structural-compositional solutions on the basis of the selected basis allows to expand the range of special clothing and to use protective elements effectively. In Fig. 8, at the stage of creating a constructive-decorative, technological solution of clothing in accordance with real operating conditions,

several different solutions of special clothing were proposed and put into production on one basic basis, with the rational use of protective material by determining the optimal dimensions of the contamination zone and protection area of special clothing.

Taking into account the working conditions of workers and topography of wear of special clothing, parameters in the analysis of existing model analogues, a model of special clothing was developed using protective materials, and an experimental sample was prepared at "Golden Ring" LLC.

Figure 7. General view of a special clothing model using protective materials according to the contamination topography

Thus, at the initial stage of design, a methodical support of the information-search process was developed, which provides the search for graphic solutions of special clothing models based on the determination of the optimal zones of areas of contamination and decay of clothing in accordance with real operating conditions. Tools for evaluating the effectiveness of various constructive-technological solutions have been developed to form a range of special clothes that allow expanding the functional modules of automated systems. The use of a graphical display base in the automated design of a collection of production clothes can significantly reduce the time of construction development and reduce the number of errors caused by the human factor.

In the design of protective clothing, at the stage of creating a constructive-decorative, technological solution of clothing in accordance with real operating conditions, special clothing serves to rationally use protective material and extend the service life of special clothing by determining the optimal dimensions of the contamination zone and protection area. It allows to assess the level of compliance of the range of protective clothing to the real structure of production-consumer situations in the formation of the assortment of special clothing and to make a decision.

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