Information Provision For Design Of The Range Of Industrial Clothing

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ABSTRACT

The article deals with the development of information and methodological support for the decision-making process in the formation of the assortment, industrial clothing. The structure of the information retrieval process at the initial stages of design is proposed, which provides a search for options for graphic solutions for special clothing based on the identification of optimal zones of contamination and wear of clothing in accordance with real operating conditions. A database of graphic diagrams of various design and technological solutions has been developed, which allow expanding the functional modules of automated systems. The use of a graphic base for displaying a collection of industrial clothing in computer-aided design significantly reduces design development time and reduces the number of errors caused by the human factor.

Keywords: special clothing, graphic solution, design, contamination zones, protective materials, automated system

Introduction

Today, the progress of science and technology in the world opens up wide opportunities for the production of special clothing of competitive quality, including from innovative materials with high protection rates, computer-aided design (CAD) systems based on the intellectualization approach, aimed at promptly updating the range of clothing and increasing production efficiency. With increasing technological competition, the importance of customer-oriented interactive design not only for household goods, but also for industrial clothing is increasing. Possibility of enhancing the creative work of designers and constructors based on the use of artificial intelligence methods in solving complex formal problems of interactive clothing design [1]. Possibilities have been proposed to enhance the creative work of designers and constructors based on the use of artificial intelligence methods in solving complex formalized problems of interactive clothing design [1]. The works [2,3] proposed an information system that provides complete and differentiated coverage of the needs of various professional and production groups, providing the opportunity to solve design and organizational issues of special clothing, and also created a reference and search engine. providing a creative process for creating clothing models for groups with an established project status. However, the proposed information support for the formation of an assortment of industrial clothing, the search for structural, decorative, technological elements does not provide a solution to the issue of creating sketches based on the direct dependence of clothing on factors of pollution

and quality deterioration. Therefore, at the initial design stage, it is necessary to solve the problem of expanding the functional modules of automated systems in order to develop original solutions for special clothing that ensure predictability and extension of the service life of special clothing in accordance with the requirements of the standard.

This article highlights the issues of developing information and methodological support for the decision-making process on the formation of an assortment of industrial clothing. At the initial design stage, a structure for the information retrieval process was proposed that provides a search for graphic solutions for serial clothing models based on determining the optimal contamination zones and abrasion zones of clothing in accordance with real operating conditions (Figure 1).

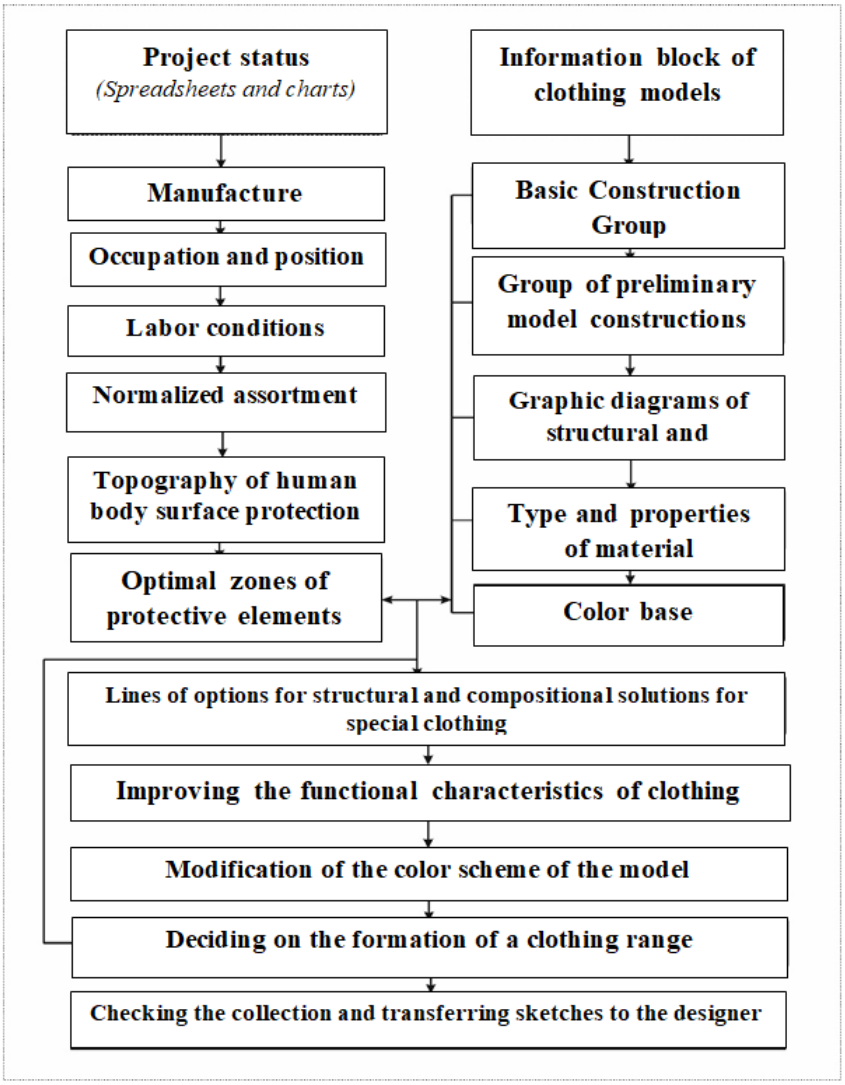

Figure 1. Structure of the information retrieval process of forming an assortment of industrial clothing.

The input data for the information retrieval process of creating a clothing sketch are: positions of employees of a particular enterprise, graphic information about clothing contamination zones by position, indicators of the types and properties of materials, as well as assortment units of clothing. The organization of the basis of the graphic appearance of the clothing sketch is based on providing the basic basis and 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 basic design is determined by graphic

information about contamination zones and the relationship between structural, decorative and technological elements. The solution to this problem is based on the development of methods that make it possible to "recognize" graphical solutions of models based on pollution zones defined by professional positions. The implementation of recognition methods is carried out using expert knowledge that establishes a visual graphical representation of the clothing model.

Based on a comparison of graphic information of contamination zones of the basic clothing form and the parameters of the graphic solution of the designed model, a modification coefficient is determined, reflecting changes in the parametric values of the form and structural lines. Through the judicious use of protective materials by changing the color scheme, various options for stylized images of industrial clothing sketches are obtained while maintaining the integrity of the converted image.

To evaluate the compositional solutions of clothing models, it is necessary to optimize the variation of compositional and design parameters. To solve the problems of determining a set of variable technical parameters, an optimality criterion that ensures quality, and the limits of their variability, special clothing for motor mechanics and welders in the automotive industry was chosen, which quickly wears out as a result of regular exposure to acid and oil spills, as well as various oils in production conditions .

To date, criteria and methods for physiological and hygienic assessment of special clothing according to climatic conditions have been developed, and a connection has been established between the technical parameters of materials and clothing [4-6]. An analysis of the materials used in the production 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 improving the quality of the designed product, on the one hand, and on the other hand, it is difficult to choose one or another fabric sample . In addition, fabrics with high oil-acid-protective properties are expensive, that is, they are practically not used in practice due to the unprofitability of using special clothing made from them for the enterprise, and the addition of additional components leads to a significant increase in the total weight of clothing. It is worth noting that the number of companies in the world is also increasing that want to provide their employees with unique designer workwear that will represent the company on the market.

An analysis of existing analogues was carried out in order to determine the impact on the service life of special clothing for motor mechanics-welders of an automobile plant, protecting against oils, and the artistic and constructive solution of the product [8,9]. In order to determine the priority parameters of constructive and technological solutions for fabric and special clothing, the erosion topography of special clothing for auto mechanic workers (Fig. 2) of the *«Toshavtotamirxizmat»* center was studied, the service life of which has ended according to the results of a visual inspection. In Fig. Figure 3 shows a diagram of the wear topography.

Figure 2. Appearance after the service life of special clothing for auto mechanics.

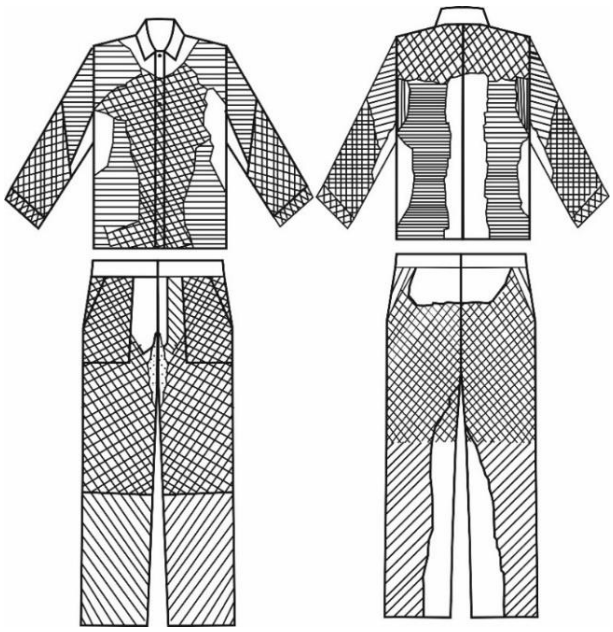

Figure 3. Topography of wear of special clothing for auto mechanic workers.

A degradation topography scheme was developed by dividing 100 suits (jackets and trousers) into zones of high, medium and relative contamination depending on the difference in the distribution of contamination on the surface of the clothing.

By determining the optimal size of the protective element for alternative use of protective materials when developing the design of special clothing, the creation of a special design makes it possible to predict the service life of the product. On our part, we present a proposed method for assessing the level of contamination of various parts of special clothing, based on changes in the physical and mechanical parameters of the product material [9]. This method involves a change in color (darkening) of the surface of the material due to contamination with acids, fats and oils, and the degree of contamination is determined by an optical assessment method. As a result of contamination, particles of oils and impurities get onto the surface of the fabric, the texture and color of the fabric changes, which is visually noticeable by darkening or discoloration of the surface of the fabric. The degree of darkening and the size of the darkened area can indicate the degree of contamination. The visual perception of the degree of contamination is influenced by the color of the material: the lighter the color of the material, the more clearly the degree of its darkening is determined. In Fig. Figure 4 shows the process of identifying contamination zones on an Empyrean Panalytical X-ray diffractometer.

X-ray study of the structure of special coatings was carried out on a Malvern Panalytical Empyrean diffractometer. XRF data were recorded using a Malvern Panalytical Empyrean analytical diffractometer with CuKα radiation (λ = 1.54 Å). In this experiment, the accelerating voltage of the radiation generator was set to 45 kV and the current to 40 mA. X-ray diffraction reflections were recorded continuously at a scanning speed of 0.33 deg/min in the Bragg-Brentano beam geometry at 2θ=5° - 80° [10-12]. The system for transforming graphic solutions of a clothing model was implemented in the existing software and methodological complex in the form of a test form of an information technology component. The development of mathematical support for the process of geometric transformation of a clothing model allows you to transform an item in an automated graphical solution mode. In Fig. Figure 5 presents graphical solutions for sketches of special clothing in the front and back parts in accordance with the topography of contamination. Transformation of structural and compositional solutions of clothing based

on the selected base allows you to expand the range of special clothing and effectively use protective elements. In Fig. 6 at the stage of creating a structural, decorative, technological solution for clothing in accordance with real operating conditions, several different solutions for 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 the protection area of special clothing.

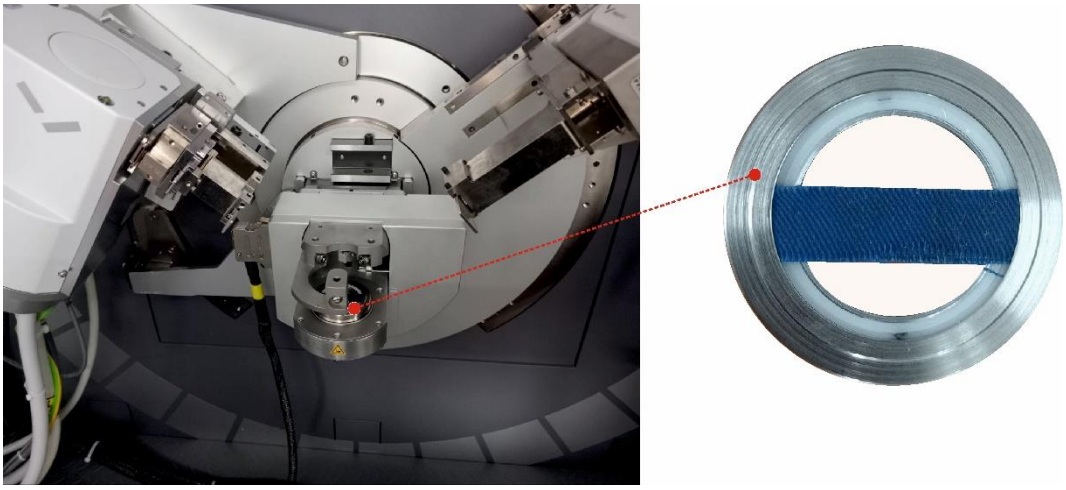

Figure 4. The process of detecting contamination zones on an Empyrean Panalytical X-ray diffractometer.

Taking into account the working conditions of workers and the topography of wearing special clothing, parameters when analyzing existing model analogues, *Golden Ring* LLC developed a model of special clothing using protective materials and prepared an experimental sample.

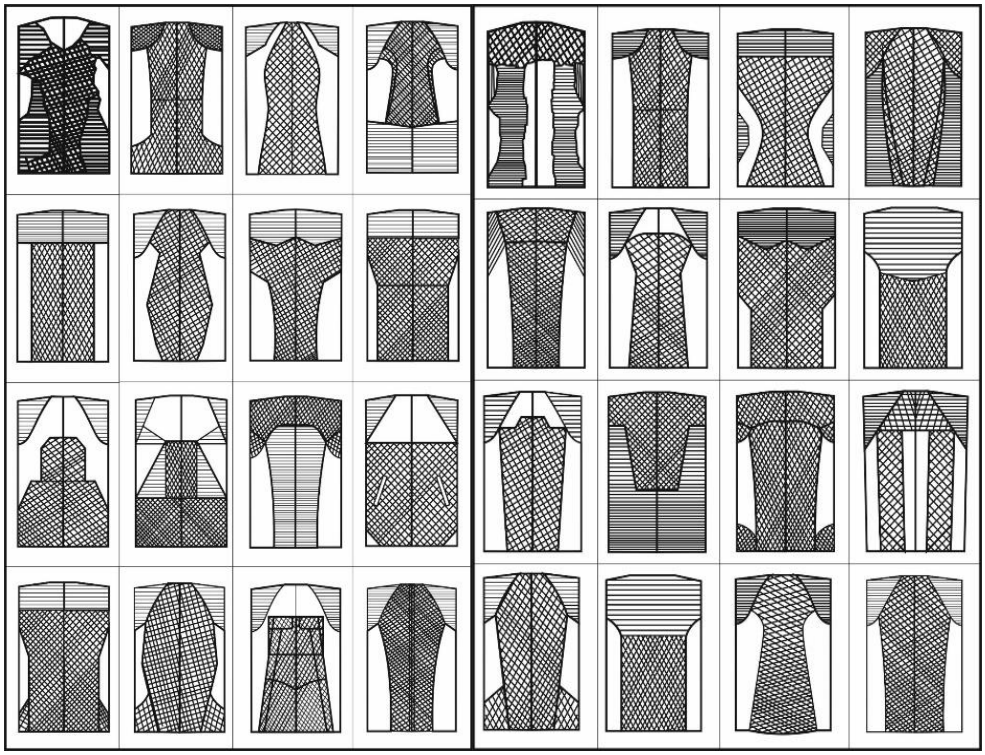

Figure 5. Options for graphic solutions for clothing cleaning sketches in the details of the front and back parts according to the topography of contamination.

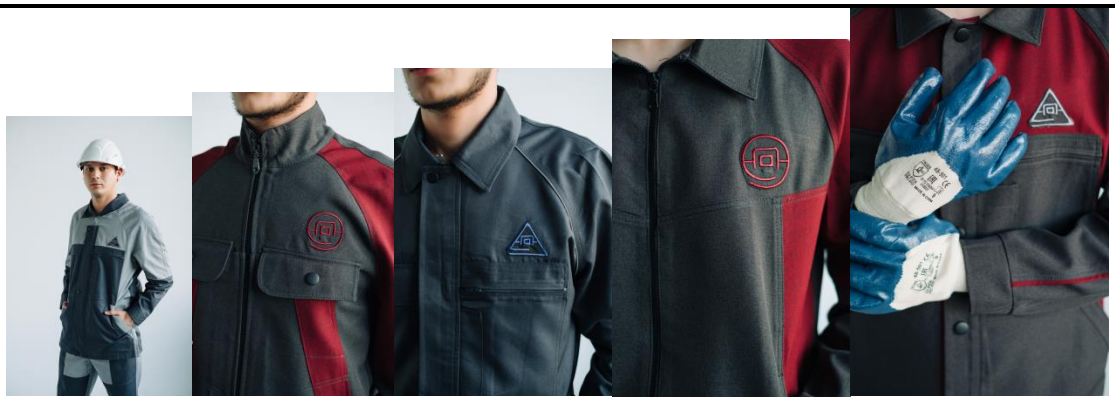

Figure 6. Samples of developed special clothing for motorists and welders in the automotive industry with different design and compositional solutions on a single basic basis.

Thus, at the initial stage of design, methodological support for the information retrieval process was developed, providing a search for graphic solutions for models of special clothing based on determining optimal zones, zones of contamination and abrasion of clothing in accordance with real operating conditions. To create an assortment of special clothing, tools have been developed to evaluate the effectiveness of various design and technological solutions, allowing to expand the functional modules of automated systems. The use of a graphical display database in the automated design of a collection of industrial clothing can significantly reduce the design development time and reduce the number of errors caused by human factors.

When designing protective clothing at the stage of creating a structural, decorative, technological solution for clothing in accordance with real operating conditions, special clothing serves for the rational use of protective material and extending the service life of special clothing by determining the optimal dimensions, contamination zones and protective area. This allows us to assess the level of compliance of the assortment of protective clothing with the real structure of production and consumer situations when forming an assortment of special clothing and make a decision.

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