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THEORETICAL JUSTIFICATION FOR IMPROVING THE DESIGN OF SPECIAL CLOTHING TO OPTIMIZE ITS DESIGN

Mirboboeva Gulhayo Abdusattorovna
Lecturer, Department of Light Industry Technologies and Equipment,
Fergana Polytechnic Institute, Fergana, Uzbekistan
E-mail: nabidjanovanargiza@gmail.com

Tursunov Davron Shamsiddin ogli
Master's Degree Student, Polytechnic Institute, Fergana, Uzbekistan

Abstract
The development of scientific and technological progress, and transformations in the field of production at modern industrial enterprises, along with others, bring to the fore the task of optimally solving the issue of ensuring the safety of people in production, including by designing special clothing to protect people from the harmful effects of the production environment. This article discusses the research and development of workwear for workers with high ergonomic, aesthetic, protective and hygienic characteristics, taking into account specific working conditions and the image of the enterprise, which can provide a high overall quality indicator and effective individual protection of workers.

Keywords: modern industrial enterprises, ergonomic, aesthetic, protective and hygienic characteristics, modern special clothing.

Introduction

The workwear currently offered on the consumer market does not always correspond to the specific level of the set of requirements and does not always ensure the implementation of the specific needs for modern special clothing for, often, purely unique conditions of the production environment. In addition, the current discrepancy between the system of basic designs of overalls and the real variety of design situations from the standpoint of functionally Ergonomic requirements for clothing does not allow solving this problem in full [6]. It should be especially noted that ensuring the dynamic conformity of clothing designs to the conditions of its operation to the actual tasks of designing special clothing for any industry is no exception and machine building.

One of the leading places in mechanical engineering and metalworking is occupied by the automotive industry since it provides about 22%Russia's gross income [7]. Given the growth in car consumption per world, including the domestic markets, the relevance of a comprehensive study of the problem of providing workers with special clothing in this sector of the economy becomes quite obvious. One of the most important issues of complex optimization of production processes in the automotive industry is the issue of balanced functioning of the elements of the system "man - working conditions - the object of work", in which a significant role is given to human clothing, which can not only effectively protect

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him from industrial hazards, but also provide maximum comfort. The need for exploratory research to create adapted versions of special clothing with improved parametric characteristics for the automotive industry is due to the specifics of its operating conditions in this industry,

Research and development of clothing for workers with high ergonomic, aesthetic, protective and hygienic properties based on specific working conditions and enterprise image, which ensures a high overall quality indicator and effective individual protection of workers, fulfils the requirements allows to increase.

The problem of purposeful improvement of the range and quality of special clothing that adequately meets the range of needs of customer organizations in modern economic conditions is of particular importance. Personal protective equipment (PPE) occupies a special place in the complex of measures to ensure the safety of workers and the prevention of occupational diseases [1]. Among the widely used PPE is special clothing, which is one of the necessary conditions for reducing the impact of dangerous and harmful production factors on a person and maintaining his high performance and health.

At present, a large scientific material has been accumulated, methods and criteria for the physiological and hygienic assessment of special clothing have been developed, a relationship has been established between the technical parameters of materials and overalls in general, the main methodological principles for its design and industrial manufacturing technology have been formulated following the requirements determined by the specific operating conditions of overalls.

A person, performing labour operations, makes movements with different speeds, amplitudes and at different rates. At the same time, the size and shape of parts of the human body are constantly changing. As a result, overalls made of various materials with different stiffness, thickness and other properties either move relative to the human body, causing skin irritation or resist movement and put pressure on the body if the possibilities of movement are limited [2]. Overalls are subjected to tensile, compressive, abrasion and other influences both from the side of a person and from the side of objects that they come into contact with in the environment. This leads to the appearance of mechanical stresses in it, eventually causing its destruction [3].

The purpose of this section is to apply the principles of constructing optimal workwear designs that are ergonomically rational from the point of view of design, i.e., choosing the best solution from a certain set of feasible solutions for a specific production situation.

The Main Part

Product parameters that achieve the best combination between effects and costs, determined from the standpoint of reasonable goals and taking into account reasonable restrictions, the initial state and upcoming changes over time, are called optimal, and the theoretical and experimental procedures for their determination are called optimization [4-8].

Following the variety of optimization conditions and the requirements for the quality of optimization results, a set of various optimization methods has to be used to establish the parameters of overalls.

As it was established in [9-12], the use of a variety of optimization methods in the design of overalls is due to both objective difficulties inherent in the design task - ensuring the necessary protective

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effectiveness of overalls at the lowest physiological stress of the body, and the lack of sufficient information about the operating conditions of overalls during its operation.

Thus, as rightly stated in [13-16], the task of creating optimal overalls with improved parametric characteristics is a multicriteria one. The solution to such a problem is associated with general optimization i.e. the design solution should be optimized as a whole as a single object with a given purpose, but partial (local) optimization options are possible due to the division of the design process into stages, and the design object into parts according to its individual parameters. In this case, the optimized object can be not only the product as a whole, but only one or another part of it.

When designing optimal overalls, and this means ergonomically rational, it is advisable to use methods of partial optimization, because, as studies have shown [15-19], it is fundamentally possible to divide the process of providing the necessary ergonomic level of quality into separate components: hygienic, anthropometric and psychophysiological.

Anthropometric conformity of overalls to the size and shape of the human body is considered from two positions [19-214]: static and dynamic conformity. Basically, it is provided due to the rationality of the design parameters of overalls. Since the main purpose of workwear is functional, its ergonomic system also manifests itself in dynamic processes, that is, its dynamic correspondence to the nature of the main labour movements of the worker is of paramount importance for the choice of the principal design scheme of workwear.

It was found [3] that the dynamic correspondence of overalls to the dimensions of the human body can be characterized by two complex indicators (level 3): the degree of restriction of human movements and the tension of the clothing sections. The latter indicator can be determined by the following single indicators: the tensile strain of materials in the details of the product, the tensile force of the material and the seams of the product.

The “man-clothing-environment” system operating in production in dynamics, by its main target function, allows you to select and justify the necessary and sufficient number of individual ergonomic indicators of dynamic compliance. The system characterizes the ability of the worker to perform specified movements with a maximum range, with the lowest level of clothing pressure on the body surface, minimal deformations of materials in its details and limited movement of individual sections of the product relative to the worker's body surface.

The ergonomic evaluation of overalls uses as criteria such single indicators as the movement of clothing relative to the human body, the tensile deformation of the material of clothing parts along the warp and weft, the deformation of the fabric mesh, tension, stretching and pressure of clothing, while the complex criterion of the system "man - clothing - environment » (CHOS) is the functional state of the body - its performance. The validity of these provisions, confirmed by numerous experimental data, is beyond doubt, therefore, in our study, they were taken as the basis for solving the problem of optimizing the parameters of overalls for workers in the automotive industry.

Physical ergocriteria are considered the most informative for assessing the ergonomic level of quality of workwear designs because they show the direct effect of the interaction of the elements of the CSP system in dynamics and make it possible to carry out their objective measurement.

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The functioning of this system during the performance of labour movements cannot be considered separately from each other. The main element of this system is the figure of a person, which, in the process of performing labour movements, changes its position in space, thereby involuntarily forcing the shape and position of the clothing structure worn on him to change. Moreover, at the beginning of the performed working movement, the clothing structure freely moves after the position of the human body, but at some certain moment, the internal reserves of the structure's mobility begin to be lacking, which leads to the appearance of tense clothing areas where loads begin to act.

The physical and mechanical properties of workwear materials to a certain extent affect the optimization criterion for the "clothing pressure on the human body", because its value is determined not only by the geometric parameters of the shells but also by the deformation abilities of the materials from which it is made.

In the process of operation of workwear items that are identical in design but made of different materials, as the author notes [20-22], contact pressures and tensile strains of different magnitudes arise. Consequently, the ergo criterion "tensile strain" will be considered informative in the comparative assessment of the dynamic compliance of the finished and designed overalls. The pressure of clothing that occurs in the dynamics of labour movements also affects the functional state of the body of the worker.

This situation allows us to conclude that it is advisable to choose the contact pressure between clothing and the human body as one of the main single ergocriteria for assessing the dynamic conformity of clothing design. In the process of dynamic contact, clothing is observed to move relative to the human body, which is also of interest from the point of view of assessing the dynamic conformity of the structure. For the design of special clothing, this is especially true. It characterizes the movement of free sections of the structure of the bottom of the product, and not the movement of the product in the zones of the stressed state and may depend on the value of the coefficient of tangential resistance of the workwear fabrics, which to a certain extent will affect the ergo-criterion "displacement". However, studies [17-22] showed that the value of this coefficient is largely due to the characteristics of the material of linen worn under overalls. Therefore, the ergo criterion "displacement" mainly depends on the design parameters of the product and will be another informative ergo criterion of the dynamic conformity of the structure. Analyzing the mechanism of interaction between the elements of the "man-clothing" system in the dynamics of working movements, we can conclude that the most informative ergocriteria for assessing the dynamic conformity of structures for optimization is the contact pressure between clothing and the human body and the movement of clothing (bottom lines of the jacket of a set of overalls) relative to the human body, especially dependent on the optimization of the parameters of the "armhole-armhole" knot, as the most exposed to dynamic loads due to the high degree of mobility of the arms relative to the human body. Thus, for an objective study and solution to the problem posed, it is necessary to study the working movements characteristic of the production environment under study.

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Conclusion

A theoretical justification for improving the design of overalls to optimize the process of its design has been carried out.

As a result of the research, the topography of the damaged areas of the overalls used in the technological process, the matrix values of the areas of the destroyed areas for all types of impact were compiled, and the intensity of the impact of the OVPF was calculated.

An analysis of possible ways to optimize the interaction between the components of the "man-clothing-working environment" system for the conditions of the technological process of assembly and body products made it possible to determine that the study of the operational reliability of the system should be carried out based on the development of its mathematical model.

References

1. Mirboboeva Gulhayo Abdusattorovna, & Nabidjanova Nargiza Nasimjanovna. (2022). Technological features of the work of a double-knitting machine. International Journal of Advance Scientific Research, 2(06), 22–34.
2. Tursumatova Shaxlo Samiyevna, & Mamatqulova Saida Raxmatovna. (2022). The importance of creating embroidery patterns from the methods of artistic decoration in the light industry. Innovative Technologica: Methodical Research Journal, 3(05), 1–10.
3. Toyirova, G. T., Mirzoyeva, S. S., & Bozorov, B. B. (2022). PAXTA xomashyosini mayda iflosliklardan tozalash samaradorligini oshirish maqsadida tozalagich konstruksiyasini takomillashtirish. Studies in Economics and Education in the Modern World, 1(4).
4. Fattakhovna, Y. N., Bakhtiyarovna, T. D., & Bakhtiyorovna, A. M. (2022). Use Annual Plants as an additional Raw Materials for Obtaining Technical Cellulose. Central Asian Journal of Medical and Natural Science, 3(3), 620-623.
5. Abbazov, B. T. O. G. L., Sharopov, B. N. O. G. L., Anarboeva, X. G. U. Q., & Ergasheva, S. R. Q. (2022). Paxtani yirik iflosliklardan tozalash uskunalarining texnologik tahlili. Science and Education, 3(5), 388-397.
6. Tayirova, D., & Shermatova, K. (2022). Chemical properties of silver element and influence on human health. O'rta Osiyo ta'lim va innovatsiyalar jurnali, 1(3), 29-35.
7. Тайирова, Д. Б., кизи Шерматова, И. Б., Шакирова, Д. Н., & Намозов, Ф. Ш. (2022). Изучения антимпкробного действия наночастиц серебра с использованием жидкого экстракта juniperus Communis L. Eurasian Journal of Medical and Natural Sciences, 2(5), 171-175.
8. Kobilov, E. E., & Tukhtaev, M. K. (2022). Current treatment of acute bacterial destructive pneumonia in children. World Bulletin of Public Health, 17, 1-4.
9. Kobilov, E. E., & Tukhtaev, M. K. (2022). Comparative Evaluation of the Results of Treatment of Acute Adhesive Intestinal Obstruction in Children. Eurasian Medical Research Periodical, 15, 1-3.
10. Kobilov, E. E., & Tukhtaev, M. K. (2022). Current treatment of acute bacterial destructive pneumonia in children. World Bulletin of Public Health, 17, 1-4.
11. Bakhtiyor, B., Asliddin, A., & Fakhriddin, S. (2022). Analysis of improving the efficiency of

ISSN: 2776-1010 Volume 4, Issue 3, Mar., 2023

lubricating oil use in quarry trucks. Universum: технические науки, (6-7 (99)), 15-17.
12. Abdullayeva, B. Y. (2022). Повышение эффективности инновационных процессов на предприятиях текстильной промышленности. Nazariy va amaliy tadqiqotlar xalqaro jurnali, 2(4), 107-115.
13. Yuldashevna, A. B. (2021). The digital economy as a key factor in the formation of a favourable investment climate. ResearchJet Journal of Analysis and Inventions, 2(12), 1-6.
14. Yuldashevna, A. B. (2020). Characteristics of fruit and vegetable development in the regions. Национальная ассоциация ученых, (54-2 (54)), 20-21.
15. Muhiddinovna, B. Z. (2020). Functions and forms of chemical experiment. European science review, (1-2), 48-50.
16. Мухаммадиева, З. Б., & Бердиева, З. М. (2020). Пищевая безопасность CO2-экстрактов из растительного сырья. Universum: химия и биология, (4 (70)), 8-12.
17. Бердиева, З. М. (2020). Способы обучения учащихся решению химических задач. Достижения науки и образования, (6 (60)), 4-8.
18. Бердиева, З. М., & Мухамадиева, З. Б. (2020). Проблемы и перспективы цепи снабжения агропроизводства. Universum: технические науки, (5-1 (74)), 10-13.
19. Бердиева, З. М. (2019). Виды химических реакций и связей. Academy, (12 (51)), 7-9.
20. Salimov, A., & Salimov, O. Sh. Khusanova, I. Khakimov “The problems of natural fiber and textile materials on fire resistance” Saarj journal Akademicia: an international multidisciplinary research journal april-2020.
21. Sarimsakov, O. S. N., & Sh, S. Z. X. (2020). Improvement of the Process in Disassembling of Cotton Stack and Transfering the Cotton into Pneumotransport. International Journal of Advanced Science and Technology, 29(7), 10849-10857.
22. Salimov, A., Khusanova, S. A., Salimov, O., & Khakimov, I. Study of constructive and technological parameters of. In International scientific and practice conference on" international experience in increasing the effectiveness of distance education: problems and solutions. journal mai-2020. www. iejrd. com.