



DEVELOPMENT OF FUNCTIONAL PRODUCTS FOR PREMATURE BABIES USING THE CAD SYSTEM

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Abstract: *The development and implementation of a new model of sustainable clothing through the automated design system aims to optimize the design process and provide optimal solutions. The paper presents the SMART design concept implemented to obtain functional products for premature babies. The obtained results describe the process that integrates the sustainable design and the way of designing the clothing. The intention is for the model of sustainable clothing to provide wearers with functionally sustainable products and to solve some of the environmental problems in terms of clothing production. The proposed original constructive and technological solutions offer the necessary thermal and psychological comfort to premature babies, anthropometric correspondence both for the child's static positions and for his dynamics, and the product system reduces the dressing-undressing time in medical emergencies.*

Key words: *prematurity, SMART design, functional clothing, CAD system.*

1. INTRODUCTION

The basic criteria for designing clothing for premature babies is that the products are functional and comfortable so that medical staff can undress and dress the child in less than 1 minute to provide routine medical treatments, medical examinations in emergency situations. Clothing must maintain a stable body temperature of 37° C in an environment with air conditioning of 24° C and relative humidity of 62% and be designed to reduce heat loss, allowing certain control areas to be easily opened, as needed, during checks and medical treatment by minimizing the body's exposure. Probes, tubes, wires and other devices used to monitor the patient's health should not be twisted when handling the child or as he / she moves when wearing the clothing. Clothing should allow children to move their limbs easily prematurely. The size of the product and the locking elements must be designed in such a way as to encompass the child's body, not to be too loose or too tight, so as to impede freedom of movement, increase ventilation or heat levels for the premature newborn. In addition, the selected seams should be as simple as possible to reduce the thickness in the assembled areas.

For the elaboration of the clothing products, the dimensional characteristics of the group of wearers, the additions of lightness and the adjusted clothing models were taken into account to allow the movement, growth and application of various threads from medical devices, etc. However, the



garment has minimal processing seams to reduce thickness, which could cause discomfort and increase productivity in the manufacturing industry, obtaining minimal waste and thus opting for the manufacture of sustainable functional products.

2. DEVELOPMENT OF FUNCTIONAL CLOTHING PRODUCTS USING THE CAD SYSTEM

Currently, we can note the importance of developing and using information technologies in the design of children's clothing.

The application of information technology in different stages of design and technology for the development of functional products for premature babies [1] will not only reduce the preparation time for the production of new models, but will also reduce the cost of developing new products, will respond quickly to the requirements imposed, but most importantly will improve the quality of the production process of clothing for premature babies.

The design of functional assortments of children's clothing aims to meet the requirements [2] of consumers and medical staff who are directly involved in the medical procedures to which these children are subjected. In order to obtain appropriate products, anthropometric data, the degree of child development and advanced methods of designing shoulder-supported and waist-supported products based on the use of computer technology will be taken into account.

Ensuring these requirements is the initial stage in the development of children's clothing. In this sense, creating a database of information assistance for computer-aided clothing design is a task that needs urgent solution. The solution to this problem, in addition to increasing the efficiency of children's clothing [3], ensures an increase in meeting the needs of children in clothing with a high level of comfort and quality.

Based on the above, the paper presents the results of the process of optimizing the design of children's clothing, which consists in researching, creating and implementing scientifically justified input parameters: the results of anthropometric examinations of children's bodies, innovative design methods, rational design - technically adapted technological processing, which can reduce not only design and manufacturing terms, but also most importantly, significantly increase the quality of products that meet the needs of premature babies.

To achieve this goal, the following tasks have been solved:

- Study of the requirements imposed on this type of products for the design of functional clothing for children born prematurely.
- Classification of the range of functional clothing for boys and girls.
- Anthropometric data were taken from children with varying degrees of prematurity.
- A rational system of values has been defined, which allows the unification of dimensional parameters.
- Product lengths are determined based on anthropometric measurements.
- Development of technical documentation for the manufacture of clothing for premature babies.
- Development of the database that includes the basic patterns in the CAD system for the proposed models.

3. EXPERIMENTAL RESEARCH

Application part:

The stages of the SMART Design design process that we applied for the production of the series of sustainable functional products for premature babies are presented in figure 1:

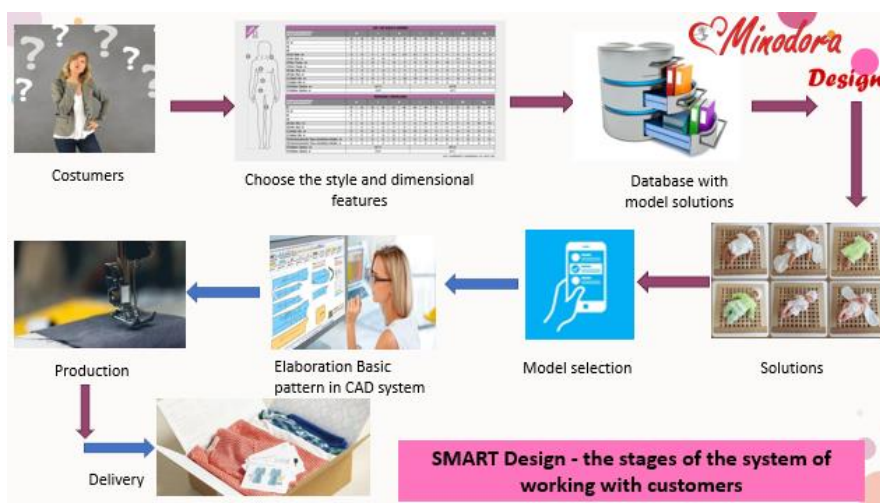


Fig. 1. Product development stages - SMART Design

In order to optimize the process of designing functional clothing for premature babies, we went through the following steps: 1) After analyzing the needs and functional, ergonomic, aesthetic and economic needs of the wearer group, product ideas are generated to meet these requirements. Design requirements for children's clothing include ease of wear, washability, durability and versatility. 2) Based on the initial data, a database is created with basic patterns 3) which later facilitates the elaboration 4) of the appropriate solutions. From the proposed solutions, the model that corresponds to the pre-established requirements is selected 5), after which the basic pattern and the model pattern (BP and MP) are developed with the help of the CAD system (figure. 2). 6) At this stage, the prototype of the product is made, which then passes the verification in accordance with the indicated criteria. 7) The package of technical documentation is sent to the production section and the products are made. At the end there is 8) delivery of the product to the consumer.

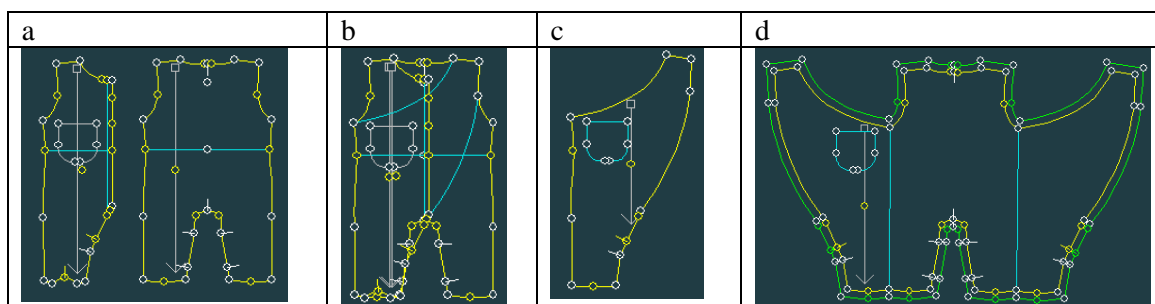


Fig. 2. Development model for children with CAD system:

a) basic pattern; b) model pattern; c) solutions model; d) final prototype model

At this stage, the size of the wearer and the requirements that the product [4,5] must meet have been taken into account. Subsequently, the calculation of materials necessary for manufacturing was made based on the frameworks generated by the system. This method of optimizing product development process for children is an effective and sustainable.

4. CONCLUSION

From the above we conclude the following:



1. The efficiency of the use of information technologies depends to a large extent on the quality of the adapted constructive solutions and of the technological processes of making clothing products for premature newborns.
 2. Based on anthropometric studies on children from various groups of prematurity, the influence of various developmental factors on physical appearance was highlighted.
 3. A classification of functional clothing for children was made, differentiated by groups of prematurity, based on the analysis of the requirements of medical procedures, in order to establish the assortment.
 4. Statistical processing of anthropometric data was performed for 500 premature babies, a rational system of type-dimensions was developed - for different groups of prematurity, which allows the quantitative reduction of product sizes needed to make children's clothing.
 5. Rational design parameters for functional clothing for premature babies have been identified, ensuring a good quality dimensional and aesthetic fit.
 6. Development of technical documentation for the manufacture of children's clothing, which is the initial information for the creation of a database of information assistance for the automated design process of children's clothing.
 8. Algorithms for designing basic and model patterns for premature baby clothing have been developed and introduced into the CAD system.
 9. A database has been developed for the technological design and training subsystem, compatible with CAD design system for automating the process of designing and preparing technical documentation.
 10. Testing the results of the works, performed in the form of an experimental verification and the implementation of technical and regulatory documentation developed for the design of functional clothing for premature babies.
- All these will definitely contribute to obtaining functional clothing products with a high degree of dimensional and ergonomic correspondence for premature babies.

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