

## **FACTORS AFFECTING SAFETY SELECTION AND USAGE OF CLOTHING**

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### **ABSTRACT**

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Safety of specific textile product may decide about the health of the user, and in special condition also about his life. Most popular textile product is clothing, which plays a very important role in human life, first of all giving the protection against external factors. For the potential user the process of making a selection of clothing is essential also in some psychological aspects. Everyone makes individual choices in this area, based on own preferences, but at the same time the large part of society is fashionable in a non-reflective and automated way. Safety of textile used in relation to articles of clothing, encompasses flammability and the ability to maintain smoking, smoke-generation and toxicity of combustion products, the ability to generate and accumulate static electricity, the release of the products in conditions of normal use certain substances with harmful effects on the human body and in any case hygiene, in particular water vapour permeability. The question of the safety of clothing is a multi-faceted, relating, inter alia, with the construction and technology of obtaining of textile products, but it should be noted that textiles are all the time more produced for the comfort of users, their health and safety.

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## INTRODUCTION

A man is accompanied by textile products in his daily life, because clothing is produced of them, as well as household and vehicles textiles. Security, as a supreme human need is clearly connected with the necessity of health protection<sup>1</sup>. Safety of specific textile product may decide about the threat to health, and in special cases also the users life. In the first place the product manufacturer is responsible for product safety, declaring that what he has produced meets the necessary requirements. The control of the products (goods) that are present in the market belongs to the Trade Inspection, whose mission is to inform the supervisory authority, that is, the Office of Competition and Consumer Protection, on the apparent irregularities. The members of the European Union also have the obligation to provide each other with information about dangerous products, disclosed on the market of any of them.

Textile clothing should also be appropriate for the individual user/client in terms of functionality and the external form.

## PSYCHOSOCIAL ASPECTS OF THE SELECTION OF CLOTHING

Articles of clothing, and therefore these products of the textile industry, which are known by almost everyone play a very important role in human life, first of all giving the protection against external factors. For their potential user/client the process of making a selection of clothing is essential also in some psychological aspects<sup>2</sup>. People dress up usually in accordance with applicable standards, principles of social and cultural force in their place of residence, as well as social and professional functioning. Regardless, everyone makes individual choices in this area, based on own preferences. The way of making selection, in terms of materials from which clothes were made and the clothes themselves, is often determined by the fashion. The large part of society is fashionable in a non-reflective and automated way.

As an example, one can specify the fashion trends for men's jackets, which over a period of several years are chosen by their users in this way,

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<sup>1</sup> J. Piwowarski, *Three Pillars of Security Culture*, "Security Dimensions", 2015, no 15, p. 17–28; J. Piwowarski, W. Czajkowski, *Strumienie kultury bezpieczeństwa w perspektywie wpływu społecznego*, „Rocznik Bezpieczeństwa Morskiego”, Rok X – 2016 (II), p. 133–152.

<sup>2</sup> W. Czajkowski, J. Wąs-Gubała, *Bezpieczeństwo personalne w perspektywie kulturowej*, „Studia nad Bezpieczeństwem”, 2017, no 2, p. 5–16.

that by the outside observer are usually seen as too small by at least one size (fig. 1). But it's hard to find such an outside observer because we all are subjected to the influence of fashion and once the trend is widespread, treats it as a norm in the way of dressing.

FIG. 1. FASHIONABLE VISTULA JACKETS PRESENTED BY THE MEMBERS OF POLISH NATIONAL FOOTBALL TEAM



Source: <http://www.vistulagroup.pl/biuro-prasowe/aktualnosci/vistula/formalny-stroj-reprezentacji-polski-w-pilce-noznej-w-limitowanej-sprzedazy-marki-vistula.html>.

Type of clothing can also be perceived as a form of non-verbal communication, acting determinant social status, a sign of social role, a form of demonstrate specific views or belonging to specific groups. Items of clothing can also be associated with the profession of the person who wears them. At the same time, the selection of appropriate clothing is a strategic issue in the economic and political marketing, for example during creating ads and public appearances. Then on the color and form

of clothing works staff of specialists. A great example of this range are actions in the field of political marketing to be taken on the staff of Aleksander Kwaśniewski in the process of starting a presidential campaign before the first mandate of his presidency in the year 1995. Of course this was related to the selection of the color of his blue shirts well complementary with his tan and slim the silhouette of a young man. A reference to the classic stereotype of a fit, muscled and tanned young man acts as a kind of child's play with the ease of building a positive attitude to the so-looking candidate<sup>3</sup>.

The attention should be also paid to the mentioned earlier the issue of non-verbal communication and its importance for interpersonal relationships. The external appearance and the associated way of dressing are extremely important non-verbal communication, which intensively modify social collection of man in relationships with other people. Hence, the popularity and rank of media issue the importance of appearance, way of dressing, awareness of the rules and fashion trends. At the same time, especially desired information in this regard are those related to celebrities, who in quite automatic and non-reflective way become idols and models to follow in the way of dressing, prefer such and no other models of garments and clothing materials etc.

#### SELECTED ASPECTS OF THE SAFETY OF CLOTHING PRODUCTS

As shown in the numerous studies<sup>4</sup>, a continuous and prolonged contact of textiles with the skin made garments does not remain indifferent to the user health. Clothing may have in this case, both the positive and negative impact. It is therefore increasingly textiles are produced for the comfort of users, their health and safety. Nowadays on the textile market is more and more examples of modern manufacturing processes elaborated in order to meet the needs of the customer. They are realized by modern technology in the field of the formation of fibers, spinning, weaving, and, above all, finishing products<sup>5</sup>.

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<sup>3</sup> W. Cwalina, A. Falkowski, *Marketing polityczny. Perspektywa psychologiczna*, Gdańskie Wydawnictwo Psychologiczne, Gdańsk 2005, p. 200–205.

<sup>4</sup> R. Salerno-Kochan, *Analiza wybranych wskaźników określających zdrowotność wyrobów odzieżowych*, „Zeszyty Naukowe AE w Krakowie”, 2006, no. 718, p. 127–154.

<sup>5</sup> L. Van Langenhove, *Smart textiles for protection: an overview*, [in:] *Smart Textiles for Protection*, R. Chapman (ed.), Woodhead Publishing Limited, Cambridge 2013, p. 3–33.

Safety of textile used in relation to all groups of textile products, including articles of clothing, encompasses the following groups of its properties:

1. flammability and the ability to maintain smoking, smoke-generation and toxicity of combustion products;
2. the ability to generate and accumulate static electricity;
3. the release of the products, in conditions of normal use, certain substances with harmful effects on the human body;
4. hygiene and, in particular, water vapour permeability<sup>6</sup>.

FIG. 2. THE PIECE OF FABRIC DAMAGED UNDER THE ACTION OF HIGH TEMPERATURE.



Source: Archive of the Institute of Forensic Research in Cracow.

Most of the currently used textile fibres is characterized by a small fire resistance, and therefore they can either cause the formation of fires or affect its scale by moving the fire from its source to other combustible items<sup>7</sup>. In addition to the type of fibre, the flammability of textile products is affected by their physical structure (e.g. the construction of the textile), and at the same time, an easiness of access of oxygen from the air to the textile

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<sup>6</sup> S. Brzeziński, *Problematyka bezpieczeństwa użytkowania wyrobów włókienniczych*, „Przegląd Włókienniczy +technik włókienniczy”, 2001, no. 2, p. 22–25.

<sup>7</sup> J. Wąs-Gubała, *Analiza uszkodzeń powstających w wyrobach włókienniczych na skutek ich kontaktu z ogniem i podwyższoną temperaturą*, [in:] *Badania przyczyn powstawania pożarów*, P. Guzowski (ed.), Izba Rzecznawców Stowarzyszenia Inżynierów i Techników Pożarnictwa Delegatura Poznań, Poznań 2003, p. 265–272.

product during the process of its combustion, and thus the ability to maintain smoking (Fig. 2)<sup>8</sup>.

Also important is the type and characteristics of the substance incorporated into the fibre or on its surface during the production process (e.g. *flame retardants*)<sup>9</sup>. In addition, the flammability, smoke-generation and toxicity of combustion products are very important. Analysis of the effects of fires proves that a huge number of deaths is caused by poisoning and the inability to leave the burning premises, for example, as a result of a large smoke in evacuation routes<sup>10</sup>. The quantity and toxicity of the gases emitted during the fire is the fastest cause of death of people, and to the most dangerous, under the terms of the breakdown and the burning, textile burning products belong: carbon monoxide, carbon dioxide, sulphur dioxide, hydrogen chloride, hydrogen cyanide, nitrogen dioxide, cyanates and isocyanates<sup>11</sup>.

Another basic property of textile products, including clothing, which are essential for the safety of their use, is the negative impact on the health of users through the ability to generate and accumulate an electrostatic load<sup>12</sup>. This is particularly important in the case of hydrophobic chemical fibres, made of synthetic polymers. In such cases, as a result of friction occurring during use between clothing and human body, the electric charge is generated. The result of this process may be unwell to the user and depending on its sensitivity, also symptoms of allergic reactions. As a result of static electrostatic discharges, some products may enhance feelings of discomfort. They reduce the hygienic comfort, associated with adherence of textiles, in particular the underwear, to the skin of the user by making it more difficult to breathe. To prevent generating and accumulating of a large electric charges and the presence of significant differ-

<sup>8</sup> J. Wąs-Gubała, *Badania włókien i wyrobów włókienniczych w kryminalistyce*, [in:] *Mikroślady i ich znaczenie w postępowaniu przygotowawczym i sądowym*, J. Zięba-Palus (ed.), Wydawnictwo Instytutu Ekspertyz Sądowych, Kraków 2015, p. 51–72.

<sup>9</sup> A. R. Horrocks, *Textiles*, [in:] *Fire retardant materials*, Horrocks A. R., Price D. (ed.), Woodhead Publishing Limited, Cambridge 2001, p. 128–181.

<sup>10</sup> A. Ipatiev, *Zastosowanie współczesnych metod ustalania właściwości dymu w badaniach pożarowych*, [in:] *Badania przyczyn powstawania pożarów*, P. Guzowski (ed.), Izba Rzeczników Stowarzyszenia Inżynierów i Techników Pożarnictwa Delegatura Poznań, Poznań 2003, p. 143–149.

<sup>11</sup> E. Stauffer, *Concept of pyrolysis for fire debris analysts*, „Science & Justice”, 2003, no. 43 (1), p. 29–40.

<sup>12</sup> S. Przeziński, *Problematyka bezpieczeństwa użytkowania wyrobów włókienniczych*, „Przeгляд Włókienniczy +technik włókienniczy”, 2001, no. 2, p. 22–25.



ences between the potential of the human body, and textiles the reasons are eliminated e.g. through the use of fibre mixture (blends) in clothing. To compound these blends, fibres located in opposite parts of the range of electrostatic charge are mixed, reaching in this way suppressing electrostatic, generated by both types of fibre, in contact with the human body. Also the efficiency of the discharge of electricity from a textile product to the surrounding area, is realized through the addition of conductive fibres or application of appropriate additives (finishing agents)<sup>13</sup>.

One of the most important characteristics of clothing associated with the safety of their use, is present during use or emerging in them desorption of the certain harmful substances that have a direct impact on the health of users (which falls within the scope of the so-called human ecology of textile products). For eco-friendly to user a such textiles shall be deemed that do not release harmful substances or release them in such amount, which in the course of the use of these products in the manner and under the conditions in accordance with their purpose, will not adversely affect the health and well-being<sup>14</sup>.

Specified substances harmful to health, and that presented in the fibres or textiles have the ability to migrate to the surface of such objects, as a result of direct or indirect contact with the human body, and then transferred to the surface of the skin. According to their toxicological profile, these substances can interact externally, causing certain allergic symptoms and be irritating by calling different types of inflammation of the skin or even cause tissue destruction. They may also be dissolved in a sweat, and then pass in the form of a solution to the inner layers of the skin, to the circulation of blood, to the internal organs. The threat of these substances is associated with their long, gradual effects on humans, and can be disclosed only after a long time, and sometimes can be ignored as a cause of occurred medical condition.

An azo dyes used in textile applications can be example, which under the influence of the interaction of enzymes produced by the human body, are subjected to degradation, and parts of the separated aromatic amines show a confirmed carcinogenicity<sup>15</sup>. The updated list of the harmful sub-

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<sup>13</sup> W. E. Morton., W. S. Hearle, *Physical Properties of Textile Fibres, Fourth edition*, Woodhaed Publishing Limited, Cambrigde 2008, p. 625–689.

<sup>14</sup> S. Brzeziński, *Problematyka bezpieczeństwa użytkowania wyrobów włókienniczych*, „Przegląd Włókienniczy +techniki włókienniczy”, 2001, no. 2, p. 22–25.

<sup>15</sup> Ibidem.

stances are created based on the results of studies of different substances used in the manufacturing of textile products, i.e. at various stages of the breeding and raising of natural fibres, in industrial processes, during chemical treatment of fibres and in the production of dyes and auxiliary agents<sup>16</sup>. In the case of harmful volatile substances, a pair of these substances pollute the air and are then inhaled by the user of the product.

STANDARD 100 by OEKO-TEX® is an independent product label for all types of textiles tested for harmful substances – from yarns and fabrics to the ready-to-use items that are present on the textile market. Textile products are awarded the STANDARD 100 label if, on the basis of the extensive OEKO-TEX® criteria catalogue, they have been successfully tested by one of the OEKO-TEX® member institutes for chemicals that pose a health risk, and therefore contribute to an effective consumer protection<sup>17</sup>. This description has to inform the user of the product about the safety of the product purchased.

The safety of the apparel products are also affected by other factors related to their hygiene properties. Water-vapor permeability by textile product is important from the point of view of the user, as it allows moisture from the skin surface, which affects the regulation of body temperature<sup>18</sup>. In condition of physical activity, human body gives off large amounts of heat, which not paid excess causes unfavorable to well-being increase in body temperature. In these circumstances, a physiological mechanism of self-regulation runs, that causes the secretion of sweat that evaporating from the skin surface, gets the heat of evaporation, and as a result, leads to a reduction of body temperature. The sweat not removed from the inside of the garment accumulates on the surface of the skin and causes moisture of these layers of clothing which are in direct contact with the skin, and as a result, accelerated heat loss. These situation leads to quenching our body and unpleasant sensations, and especially in winter conditions risk for example dangerous hypothermia. On the market there are a whole range of clothing products currently “breathable”, that is, to help maintain the natural micro-organism on the skin and limiting the discomfort resulting from the continuation of moisture between

<sup>16</sup> R. Salerno-Kochan, *Analiza wybranych wskaźników określających zdrowotność wyrobów odzieżowych*, „Zeszyty Naukowe AE w Krakowie”, 2006, no. 718, p. 127–154.

<sup>17</sup> <https://www.oeko-tex.com/>.

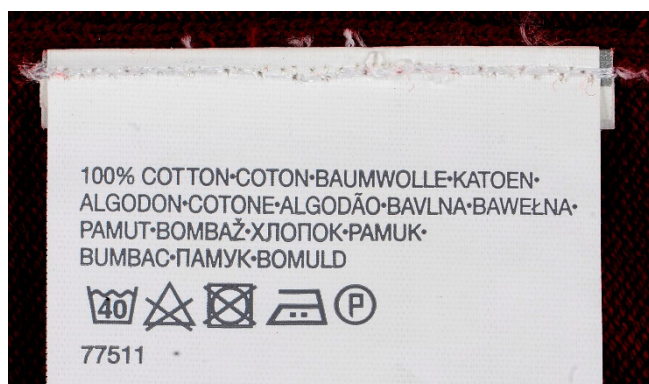
<sup>18</sup> S. Brzeziński, *Problematyka bezpieczeństwa użytkowania wyrobów włókienniczych*, „Przegląd Włókienniczy +technik włókienniczy”, 2001, no. 2, p. 22–25.



the clothes and body. This mainly concerns protective clothing and sportswear, for use in extreme environmental conditions (water, cold and wind), and at the same time, in situations of increased physical exertion (known as products of “High-Tech” type).

When considering the security of use of clothing one should also pay attention to the design and the accuracy of the marking of the fibre composition. Too tight or stiff dress might hinder freedom of movement, cause fatigue and sweating, promote the irritation and friction on the skin, cause trouble leading to hypoxia of the body<sup>19</sup>. However, incorrectly labelled the composition may cause allergies, for example, to the specific kind of fibres. Often, the composition of clothing on the tag is not consistent with the facts, and its revision requires the use of appropriate techniques and research methods<sup>20</sup> (Fig. 3).

FIG. 3. LABELLING OF THE CLOTHING COMPOSITION, WHICH REQUIRES VERIFICATION IN THE CASE OF THE FORENSIC RESEARCH



Source: Archive of the Institute of Forensic Research in Cracow.

<sup>19</sup> R. Salerno-Kochan, *Analiza wybranych wskaźników określających zdrowotność wyrobów odzieżowych*, „Zeszyty Naukowe AE w Krakowie”, 2006, no. 718, p. 127–154.

<sup>20</sup> J. Wąs-Gubała, *Badania włókien i wyrobów włókienniczych w kryminalistyce*, [in:] *Mikrosłady i ich znaczenie w postępowaniu przygotowawczym i sądowym*, J. Zięba-Palus (ed.), Wydawnictwo Instytutu Ekspertyz Sądowych, Kraków 2015, p. 51–72; J. Wąs-Gubała, *Identification of modern synthetic fibres in forensic laboratory*, [in:] *Innovations in Clothing Design, Materials, Technology & Measurement Methods*, I. Frydrych, G. Bartkowiak, M. Pawłowa (ed.), University of Technology Press, Lodz 2015, p. 145–152.

Currently manufactured clothing, even for everyday use, increasingly show already working safe, anti-bacterial, anti-fungal, can be waterproof, impervious to UV, flameproof, saturated with the smell of able for example to deter insects, and may also include reflective elements. The ability to integrate with the textile product miniaturised sensors, electronics and power supply elements, allows the production of textiles and clothing, which can be used in health care, medicine, rescue, communications, logistics, as well as sports and entertainment, finally can be used safety work<sup>21</sup>.

## CONCLUSIONS

The question of the safety of clothing is multi-faceted, related, inter alia, with the construction and technology of obtaining of textile products. In determining the requirements that ensure the safety and comfort of clothing, and thus its positive effects on human health, one should also take into account the purpose and conditions of use of the product.

Currently one can meet more and more clothing products on the market, that already reveal specific properties affecting the improvement of the security of their use, including, for example, protecting the user from the adverse effects of weather conditions (wind, frost), UV radiation or bacterial flora. Integration of the textile product with electronic devices, miniaturized sensors and supply items, among other things, allows the creation of products, which may serve the safety work.

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<sup>21</sup> W. Sybilska, I. Frydrych, *Perspektywy i kierunki rozwoju odzieży inteligentnej*, „Przegląd Włókienniczy – włókno, odzież, skóra”, 2007, no. 2, p. 50–53.

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