International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Application of Smart Textiles

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Abstract: ***People today are more closely related to textiles than anything else. Nanoengineering, information technologies, electronic device and Wireless communication miniaturization have all advanced significantly in the last few decades. A protective textile is a garment or fabric item that is designed to protect the wearer from harmful environmental effects. In many cases, protective and safety textiles are technical textiles with a high - tech character. For adequate protection, special clothing is required. Personal protective equipment (PPE) is intended to protect employees from serious workplace injuries or illnesses caused by contact with chemicals, radiological hazards, physical hazards, electrical dangers, mechanical hazards, or other workplace hazards. PPE includes a variety of protection textiles and protective clothing, such as garments, coveralls, gloves, safety vests, and life jackets, in addition to face shields, safety glasses, hard hats, earplugs, respirators, safety shoes, and others. In this context, bastardization of relevant test methods, safety requirements, quality assurance measures, certification procedures, and so on is extremely important. Extensive research is being conducted in order to develop protective textiles for a variety of occupations.***

Keywords: Protective textiles, safety textiles, Personal protective Equipments, etc.

1. Introduction

Textiles must balance functional factors with structural and aesthetic considerations, as well as the important subjective factor of comfort. Intelligent textiles are the next generation of fibres, fabrics, and products made from them. They are textile materials that can think for themselves, for example, by incorporating electronic devices or smart materials. Many intelligent textiles are already used in advanced clothing, primarily for protection and safety, as well as for added fashion or convenience. specialized Employees wear textiles or equipment to protect themselves from health and safety hazards. The safeguarding against heat and radiation for a firefighter clothing, molten metals for welders, bullet proof jackets, and so on are all achieved through the use of technical textiles with high performance fibres. Protective Textiles refers to all textile materials and products used in the manufacture of various types of protective clothing. The global protective textiles sector is also benefiting from the increased use of high - performance textiles.

2. System of Protective Clothing

The use of personal protective equipment is intended to protect many parts of the human anatomy, including the eyes, head, face, hands, feet, and ears. When responding to a design request, the first factors of protection clothing that must be determined. Textiles systems can range from a single garment or layer to multiple layers that expand outward from the skin. Protection apparel operates independently based on the needs. First, Second and Third layer.

- **First layer:** The First or base layer - The skin's surface is in direct contact with the body. As a result, the fibres used in garments such as pants, vests, t - shirts, socks, sportswear or swimming costumes must be soft and smooth. Base layer garments can also have antibacterial properties. For example, the Adidas Jet concept - V - shaped ridges to reduce drag in the water - was worn by Ian Thorp in the 2004 Athens Olympics.
- **Second layer:** Second or Middle layer is immediately prior to the base layerabove the base layer. Middle layer garments, like base layer garments, must be durable, wicking, and provide insulation and ease of movement. At this level, additional protective functions such as stain resistance to stab (pointed weapon) and ballistic protection can be introduced. Shirts, blouses, sweaters, fleeces, and lower body wear items such as skirts and trousers, as well as whole body protective coveralls, are examples. Brand Sport wool - Arctic Heat vest - is the best example. Encapsulation into a body protector of hydrophilic crystals that form a gel when immersed in water and can keep the core body temperature hot or cold for an extended period of time.
- **Third layer:** The final layer is the external layer. Textile that has direct contact with the hands, neck, or on the head is wind and water proof, and it carries most of the protective functions specific to the external environment, such as coats, jackets, heavy fleeces, whole body coverings, footwear, hats, and so on.

Figure 1: Ballistic protection Textile products

Figure 2: Textile productsagainst Microbes

Figure 3: Chemical protective clothing

3. Textiles with Protective Functions

Textiles that can think for themselves! Is known as Intelligent or smart textile. The material revert to their original state, smart materials appear to "think" and some have "memory. " In three ways, smart textiles can help with protection and safety. The performance of smart textiles are Passive smart Active smart Passive smart materials are sensors that can only sense the environmental condition; •Active smart materials can sense the stimuli from the environment and react to them; and •Very smart materials can sense, react, and adapt to the environmental condition.

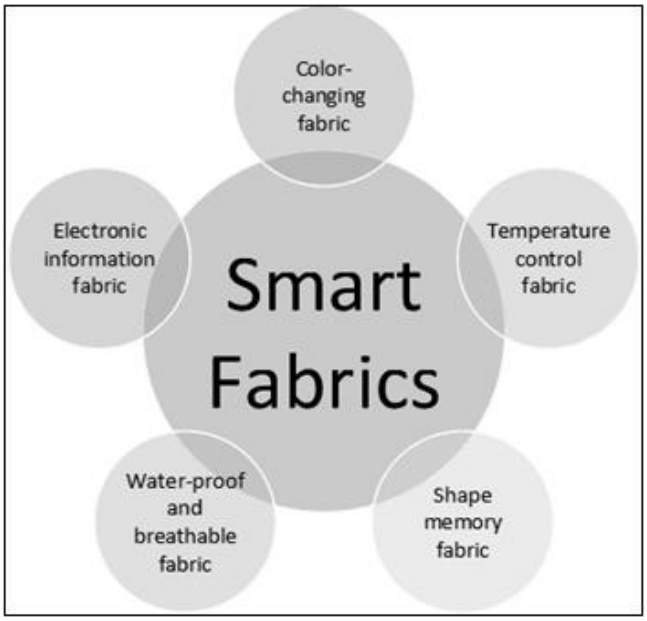

Figure 4: Smart Fabrics

4. Purpose of Protective Textile

The textile comes into contact with the skin all over the body. This means that monitoring can occur at multiple points on the body. However, the clothing can also measure environmental parameters. Temperature, electro - magnetic signals, acoustic/ultrasound, motion, chemicals (liquids and gases), electrical properties of the skin, mechanical parameters, radiation, and odour are some of the parameters mentioned in the literature. The first generation of intelligent clothing was made up of traditional components that were attached to a textile structure. They are primarily concerned with medical, sports, space, and military applications.

1) Heart signals
2) Strain sensors: respiration and motion
3) Pressure sensors
4) Optical fibres: a multifunctional tool
5) Colour change mechanisms: sensors we can see

Figure 5: a) Heart signals to IoT b) Strain sensors

c) Pressure sensors

5. Conclusion

Textiles are expected to play a significant role in the development of protective textiles over the next decade. The fundamental objective of any protective textile would be to recognize a hazard and then change its characteristics in order to provide complete protection against the hazard. The development of textiles in faster computers, as well as process and quality control, will keep evolving. The protective clothing market is open to new and innovative products. There may be long lead times, strong opposition to new products, and significant costs associated with bringing new products to market. As our understanding of textile materials and their interactions grows, the engineering material section approach to designing protective clothing against particular hazards may be feasible.

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