

Importance of Work wear and New Innovations

Amrita Jathar,

Freelancer Textile Technologist, Australia

amritajathar29@gmail.com

Abstract

Workwear are the outfits mandated by the work environment. There are various categories of workwear like regular workwear, technical workwear, corporate workwear and protective workwear. Increasing demand for workwear to protect the wearer from occupational hazards, gradually reviving construction industry, steady growth in the foodservice industry and the expanding healthcare sector along with the subsequent rise in employment in these sectors are few critical factors promoting growth in the global workwear market. Increasing emphasis on worker health and safety issues, stricter government rules, upcoming technology innovations, and growing pressure to reduce costs associated with workplace related injuries, will drive future growth in the market. Also due to the desire among men and women to wear stylish and functional attire to work, growth in demand is expected to be driven by urban expansion, and rural urbanization. Comfort, safety and functionality playing a major role in the selection of workwear, fabric innovation becomes an important focus area among the manufacturers. This paper highlights the importance of workwear in various industries, new innovations in the market worldwide along with a brief scenario of workwear market in India.

Keywords: Workwear, Protective clothing, Hazard, Innovation, Fashion, Safety, Multi-functional.

Introduction

We all have an “off duty” wardrobe. Depending on our suitability we differentiate between the clothes we wear at work and those we wear at home or out which may be leisure wear, casual wear or party wear. What is suitable depends on a number of factors, including the nature of organization and role within it. For example, if work is within an office, smart casual might be fine. If work is in a restaurant or within the healthcare industry, person is expected to wear a uniform and if work is kind of practical nature like in chemical or mining industry or oil and gas industry or any other hands on sort of job, protective workwear is required. Here we shall talk in detail on workwear or uniforms which have practical applications or say functional applications. Workwear is basically clothing worn for work, especially work that involves manual labor. Workwear doesn't necessarily have to meet a (safety) norm, but has to be very functional. It is also important that the workwear clothing should offer good value for the money, which often translates to durability. Uniforms or other items of workwear basically have practical applications to do with safety, hygiene and utility. Workwear accessories include items such as safety gloves, safe respiratory masks, safety goggles, and safety footwear and safety helmets. Workwear are made using fabrics and accessories that can be waterproof, impermeable for people working with hazardous chemicals, bullet proof, bacterial resistant or fire-proof/flame-retardant. One of the trends in market is for multi-functional fabrics that meet a variety of requirements. So an inherently flame-retardant fabric will have small composition of nylon or some other high performance fiber in it for durability. The same fabric may have an anti-stat grid finish or an anti-static fiber built into that system during manufacturing i.e. weaving of the fabric. It might be high-visibility dyed for chemical protection. Overall it would be a multi-functional fabric that offers flame retardancy, anti-stat, high-visibility and chemical resistance all in one fabric. Various trends for multifunctional fabrics are constantly

in demand in market depending on the type of industries whether electrical or chemical or mining, defense services, hospital sector and so on. Along with functional application there is also trend more for image wear, corporate wear and incorporation of fashion into workwear. We shall see in following sections health risks in work environment with need for assessment, the importance of workwear in various industries, and what brings in demand the new innovations in workwear range with more emphasis on protective clothing. A brief update is also given on growing workwear market in India.

Health and Risk Assessment

Employers have recognized the need to provide safety wear to protect their staff from carrying out tasks in a high risk environment. For example, employers working close to hot ovens or furnaces need protection from burning. When an employee has to work in a risky environment, and if they do not feel completely protected, they will be constantly concerned about protecting themselves rather than carrying out the task as efficiently and effectively as they could. When considering purchasing new assets for a company, management will assess the best equipment looking at concerns at output, performance and value of it. If the outputs can be improved on a new piece of equipment, then the cost is justified. In same manner considering health and safety of workwear for employees is equally important. Too often employers do provide the basic level of protection to cover the risk, but do not think about the quality and best workwear options available. Poor quality workwear may protect the employee, but can impact on their productivity. Staffs who are supplied with well fitting, and quality workwear are more likely to feel valued and more motivated to work. Ultimately this helps in retention of good staff. Workplace risks are of varied types. There may be serious electricity risks, fire risks, chemical hazards and dangerous machinery risks which can cause fatality or loss of limbs or sight. There are other hidden risks that may not necessarily cause an immediate problem, but can lead to significant issues to an employee's hearing or impair the functionality of brain, lungs and breathing. It is important to assess and weigh up risks with comfort. The comfort factor should not be considered just from a production and value perspective, but from knowledge that wrongly fitted personal protecting clothing can have fatal consequences. For example, loose fitting protective clothing can easily get caught in machinery, causing a serious accident. Complete protection is required for people working close to electricity and fire. Protection should not just cover clothing, gloves and footwear. The tools an employee uses should also be fit for purpose and provide additional protection; for example, all insulated hand tools should also be considered. Few factors to include while carrying out health and safety risk assessment are as below [1];

- What are the hazards?
- Who might be harmed and how they might be harmed from the hazards?
- What existing controls are in place and what other reasonable, practicable controls could be implemented?
- Record and review

After making an assessment of the potential risks, it is necessary to identify the right type and grade of protective clothing/equipment. Various standards for protective clothing are vast and can appear quite daunting, however the differences need to be understood, as an item of clothing that might appear to be of the highest protection is likely to be useless in other work settings. For example, a protective glove that is insulated would offer no

protection against a dangerous chemical burn. Once an employee is equipped with the protection they need, the employer needs to establish an effective system of maintenance to ensure it continues to provide the necessary levels of protection. Regular recording and reviewing of the risk is also vital. An effective maintenance system of any equipment should include examination, testing, cleaning, repair and replacement as well as checking that the allowable exposure limits from the manufacturer have not changed. Nothing in the workplace stays the same for long so it is vital that regular risk assessments are carried out to review if any situation has changed. It is also important to consider the worker as an individual (men or women), work environment (temperature, humidity, light, noise.) and work equipment (layout, access to controls, harmful accessories.). All of these ergonomics when considered during risk assessment and PPE specifications will ensure both a safe and productive worker. [1]

Importance of Protective Work wear

Protective wear in the workplace refers to garments, helmets, masks, shoes and goggles which are all termed as PPE (personal protective equipment). They are designed to protect a worker from airborne matter, chemicals, fire, electrical, heat and biohazards. They are worn for health purposes and job-related occupational safety. The type of occupational hazard, the area of body to be protected and the type of accessory or garment categorize protective work wear. For example a respirator protects a worker from breathing contaminated air. Strong rubber gloves that are heat or cut resistant and work coats provide protection to construction site workers. Protective work wear for ears consists of earmuffs and earplugs. Chemical agents from contaminated surfaces, aerosols or splashes in the workplace cause skin diseases such as skin cancer or contact dermatitis. Ultra violet rays, high temperatures and solar radiation can damage skin. Mechanical trauma can occur as abrasions, contusions, friction, and lacerations. Parasites, plants, animals and microorganisms can also affect the skin and that is why protective work wear is important in the workplace. According to the 2011 NSC Injury Fact Book, there were 667 fatalities and 28,958 injuries in work zone crashes in 2009. [2] That's almost two deaths per day. These statistics show that struck-by accidents remain a major workplace hazard. They outline the importance of making safety vest fully compliant to safety standards. Protective work wear should provide effective protection and be selected according to recognized standards. They must be also maintained in good working order at all times. There are quite a few different protective clothing market segments. Recently there are some innovations in the National Fire Protection Association's (NFPA) standard 70E-2000, which covers arc flash protection. The standard's aim is to protect electricians from arc flashes, and it's a growing market because the NFPA has recommended that electricians be more protected. The trend is hence for the fabrics to be more protective against arc flashes. Another important trend is for light weight clothing, so fabrics and garments that weigh 7.5 oz. per square yard are being reduced to 6.5 oz. with some of the new fabrics. The addition of nylon 420 denier to the fabric increases the protection and increases the comfort because it's lighter weight. [3] One another likely trend for protective workwear is for multifunctional fabrics in garments. If a worker is wearing a garment for long period and is sweating, the garment can still maintain good odor-free characteristics with anti-microbial treatment that keep odors from forming on garments. These treatments, along with the addition of stain- or soil-resistance finishes, are other features that can be added to the fabric and the final garment. High-visibility apparel used by construction workers, airline and transportation workers, and other service personnel should have three major elements which should be compliant with ANSI/ISEA 107, the high –visibility industry standard: Background material, retro reflective material, and garment design. They also must pass tests by an independent third party. Protective workwear for defense

personnel have to meet stringent safety standards and should be in good working conditions all the time. They should protect the soldiers from any injury due to flash fire and extreme heat exposure. Outer garments might be flame retardant (FR) but combining them with inner FR cotton lining or wearing with comfortable FR inner garments, can help soldier to save his life when exposed to explosive devices. Workwear and protective clothing comes in all shapes, sizes, materials and weights to ensure a person involved in a specific task or environment is adequately protected and able to apply the level of physicality required. Disposable coveralls protect the skin against hazardous, dry particles and chemical sprays. These are used in various applications and include asbestos removal, construction and pharmaceutical purposes. Disposable coveralls act as a lightweight, full body protector allowing the individual to work freely and safely. Despite being multi-purpose, disposable coveralls must not be used as fire retardant clothing. Very often protective clothing needs to be worn in a hazardous area, where people need to be noticed. For example, if an individual is welding rail lines or laying hot tarmac they need to be protected both from the risk of the task and the environment around them. Many protective clothing manufacturers now supply materials that are lightweight, fully breathable, have high heat resistance and are of high visibility too.

New Innovations in Work wear

The workwear clothing manufacturers and suppliers are increasing and consumers have numerous retailers to choose from. Dickies, Mascot, Portwest, Bulwark, Carhartt are few of top retailers which offer wide range of PPE and different types of workwear for men, women and kids. Staying ahead of the technology curve is critical task for retailers and suppliers, but equally important for them is to partner with customers. This is mainly important so customers can use their products as solutions for their specific needs and provide apt feedback. High tech, or high performance fabrics are designed not to look attractive, but to offer a significant added value in terms of functionality. The customer is consulted several times during the course of development for a new range of workwear. Sometimes extensive analytical work with the involvement of the end-user is made before concrete product development is commenced. Below are listed various recent innovations in last few years which lead suppliers to come up with new protective wear clothing segments, thanks to the advances in fiber, yarn, fabric, manufacturing technologies and design. Invista is one of the world's largest integrated producers of chemical intermediates, polymers and fibres. The company's Cordura fabric, known for its resistance to abrasions, tears and scuffs, is a primary ingredient in many high-performance gear and apparel products ranging from luggage, upholstery and backpacks to footwear, military equipment, tactical wear, workwear and performance apparel. In the Work 'N' Mode contest at Expoprotection 2014 in Paris, they came up with wide array of fashionable workwear designs. They showcased unique fabric designs with stylish functionality using Cordura Classic, Denim and Nyco fabrics. [4]

Few of featured items included in the contest were as below:

- Blaklader's latest craftsman trouser designs (1960 and 1961) featuring Cordura NYCO fabric.
- Dunderdon's stylish P60 and P49 work jeans featuring hardwearing Cordura Denim fabric.
- Cordura Classic fabrics – new fabric constructions and textures for workwear garment reinforcements from mills such as Dae Huyn, LeeJo, CF Weber, Sasytex, Huamao and Dong Jin.
- Cordura NYCO fabrics – durable, comfortable, light weight constructions and styles with durable water repellent finishes suitable for next to skin work apparel from Penfabric, Malaysia.

- Cordura Denim fabrics – rugged, hardwearing work denims with stretch and thermoregulation capability from Artistic Milliners, Pakistan, and the latest styles from Arvind, India.

Glen Raven is the company which provides high-performance fabrics for various industries including automotive, petrochemicals, construction, mining, logistics, geosynthetics, filtration and protective fabrics for the police, military, and fire fighters. GlenGuard FR, the latest technology from Glen Raven, a leading provider of innovative fabric based solutions have announced a new line of vented, enhanced visibility workwear, with flame resistant (FR) protection. GlenGuard is known for providing comfort and protection by manufacturing lightweight, breathable fabrics designed to keep wearers cool and comfortable while on the job.

The new vented enhanced visibility garments have been designed to keep the wearer even cooler with two back horizontal flame resistant mesh vents and under arm vents for improved air flow. GlenGuard FR products including the new line of enhanced-visibility garments (non-vented) are now available through G&K Services. G&K Services, is a service focused market leader of branded uniform and facility services programmes in the US, and is the largest such provider in Canada. [5]Designed to reduce fatigue and mitigate the risk of injuries, led King Gee Workwear in Australia to invest in Workwear Compression Range. King Gee have recently released a line of next-generation undergarments that looks like it can change the game of workwear design forever. The G2 compression workwear are antistatic, to conform to the Australian standards for mining workwear, and the stitching is specially designed to target specific muscles while working to give full range of support through all physical tasks. They have also incorporated silver in the clothing for the antimicrobial properties. All of this is pretty revolutionary, but the biggest kicker of all is that these clothes can actually regulate your body temperature. The fabric of the G2 garments is impregnated with thermoactive nanotechnology, which means there are microscopic capsules of paraffin which are solid until warmed by body temperature. Through movement the capsules release the heat away from the body, keeping workers cool throughout the day. The most convincing thing about these shirts, however, is that they've been rigorously tested in an independent study, and the numbers are impressive. Participants who wore the G2 clothes experienced decreased heart rates after performing tasks, 10.5 per cent lower than those without the compression garments, demonstrating that the G2group of workers were less fatigued while performing tasks. Surveying revealed that upper body muscle soreness during the 24 hours after performing tasks was reduced by 50 per cent, and lower body soreness was reduced by 23.8 per cent. Overall fatigue ratings in G2 groups were 37 per cent lower than participants in ordinary workwear. [6]

Snickers Workwear in an exclusive agreement with D3O Impact Protection, came up with the best knee protection available on the market. D3O® LITE is a high-tech material combining superior comfort, cushioning and protection. It's flexible yet durable and cut resistant according to CE standard EN14404, ensuring reliable force distribution and cut protection. With the new 9112 D3O® LITE Craftsmen Kneepads, workers can count on extreme functionality, comfort and long-lasting protection.



Fig1: Snicker's Workwear Kneepad D3O® LITE

As all of Snickers Workwear's kneepads, are designed to fit the Snickers Workwear KneeGuard™ positioning system. It allows the user to adjust the kneepads at different heights in the kneepad pockets to ensure correct positioning for maximum protection. 9112 D3O® LITE Craftsmen Kneepads comes in one size and fits the knee pockets on all Snickers Workwear trousers. [7] Recent growth in the market for FR (flame retardant) clothing combined with a revision of ISO standards have encouraged companies like WL Gore and Associates and Armadillo Merino to establish new lines offering added protection to firefighters, police officers and first responders. [8] DRIFIRE is a leading brand of flame resistant fabrics and flame resistant workwear. They have dedicated ongoing innovation in flame retardant fabrics and garments. They make Comfortable FR Wear by providing optimal combination of moisture management, flame resistance and comfort in all of our flame resistant workwear, selection of outer and undergarments. DRIFIRE's product line ranges from ultra-lightweight, next-to-skin shirts and bottoms that feel as soft, durable, combat-ready ensembles and flight suits that offer comfort and protection that won't wash or wear out over time. DRIFIRE garments can also be layered to achieve greater levels of FR protection without compromising comfort. [9] As more and more companies need qualitative FR workwear fabrics, Wirtex's Flame retardant range have incorporated quality and reliability in their anti-flame fabrics used in gas, fire, electricity and petrochemical industries. All flame retardant fabrics are treated and meet with EN340, EN11611, EN11612, EN1149-5 (antistatic only) certification. Wirtex also came up with a special acid proof & waterproof fabric which is available in 245 grams. This acid proof fabric complies with EU standards EN340, EN14419, EN6530 and EN24920. [10] Arvind Ltd in India is the only licensed manufacturer of Proban® treated Flame Retardant fabrics and garments. In last few years, they have come up with offering various flame retardant clothing similar to those supplied by western manufacturers which save precious human lives from electric arc exposures, molten metal splash, flash fire etc. in various industries. Specialty protective workwear fabrics are tested from international testing labs like BTTG (UK), Underwriters Laboratory (USA) for different safety standards like ISO 11612, ISO 11611, NFPA 2112 and NFPA 70E. Proban® fabrics are also tested by Rhodia's UKAS (ISO 17025) accredited lab in UK before use. Proban is basically a durable chemical applied to fibre and blends to make them flame retardant. The Proban® is trademarked, quality controlled technological process and is used only by textile finishers licensed by Rhodia Consumer Specialties. Proban can be used not only for industrial, sport and military applications but across many civilian industries including hotels, public buildings, hospitals, nursing homes, anywhere fires are a risk. [11] Bruck Textiles in Australia and Arvind advanced material division in India are one of very few manufacturers who have come with supplying PBI® fabrics

which has got dual benefits in terms of flame retardancy and moisture management to reduce the heat stresses. Aramids still today are very popular as protective clothing but for unique applications like fighter pilot clothing's or NATO suits, PBI fabrics are good replacement for their high performance characteristics. Similarly they are one of few who are also licensed to supply Nomex[®] fabrics which are inherently flame retardant making workwear garments more light weight. Adoption of innovative fabric technology for healthcare worker and patient attire is growing, as more healthcare facilities forego traditional uniforms in an effort to better protect patients and staff from healthcare-associated infections (HAIs). Vestagen, are a developer of a new class of active barrier technology, which combines fluid repellent, antimicrobial and breathability properties in one fabric, and it is proven to reduce harmful contaminants on the fabric in a hospital setting. [12] Comfort should be a high priority in workwear design, particularly for people in situations where concentration and reaction time are critical factors for safety and effectiveness, according to studies conducted at Hohenstein Institute. Scientists developed a method to measure reaction time, concentration levels, and error rates for people wearing different kinds of clothing in test scenarios requiring long-term, intense concentration. The findings indicated a strong correlation between the test subjects' performance and their clothing. People wearing comfortable clothing performed considerably better on the tests. Researchers were specifically focused on people in the military, aviation, high-tech manufacturing, transportation, medicine, public safety, and other stressful and concentration-intensive occupations. In addition to validating the comfort and performance link, Hohenstein Institute also created the testing technology to predict a fabric's or garment's effect on the wearer. Throughout the development process, Hohenstein helps top manufacturers and designers to engineer comfort into the product in ways that are pertinent for the intended use. [13] Corporate fashion was an important theme highlighted at Texcare International. The ready-to-wear industry, hire services and the customizing sector are increasingly being called on to develop new solutions for individual corporate apparel. Important aspects of this include smaller batch sizes, no restrictions on colour combinations within existing ranges and a uniform overall concept for protective, business and professional clothing. Style and protection are becoming more compatible all the time. Modern protective clothing and work wear will combine both style and function. In the case of jobs involving a lot of moving around, e.g., in restaurants, elastic fabrics are necessary to ensure full freedom of movement. And the evergreen subject of jeans is also the prototype for high-functional protective clothing with a trendy appearance. [14]

Work wear Market in India

Workwear demand in India has increased and will be increasing further due to fast growing manufacturing sector, emergence of new employment opportunities and growth in the services market. The growth in manufacturing and services market is further driven by entry and expansion of MNC's which see the country as a high potential market. Retail, food, pharmaceuticals, automobiles, security, FMCG and healthcare are industries contributing to increase in demand for workwear in India. In addition there is also growing awareness amongst corporates regarding benefits of workwear causing rise in manufacturing and supply of workwear throughout India. For example workers in manufacturing and allied sectors such as automobile and oil and gas are becoming aware of occupational hazards, and hence companies are enforcing a safer work environment. However, low cost, uncertified and substandard products that decrease the safety levels of personnel and erode the market share of certified PPE manufacturers dominated the protective workwear market in past which is yet to change. End users looking for low price protective wear garments discourage market growth in terms of revenue. Also lack of

enforcement of government's occupational and safety regulations to be used in various industries reduce the potential of total PPE market. Further no incentives are available to those who adopt high quality product offerings. All of these factors hinder the progress of new innovations and product development in this segment. There are many workwear manufacturers and suppliers in India for local and international market like Jayshree Textiles (a unit of Adity Birla Nuva Ltd), Arvind Ltd., and Safechem International supplying technical workwear fabrics. Also there are many like Armstrong Products Pvt Ltd., Malcom (India) Ltd. and 3M India who are supplier of uniforms and all kinds of safety products or PPE in India. But there are very less manufacturers offering Hi-vis warp knit or workwear fabrics on large scale as compared to China which meet US or EN standards. Hi-vis warp knit and also Modacrylic knit fabrics are mainly imported from China and other Asian countries for local supply. Similarly there are very less manufacturers offering protective garments and coveralls for women to cater to international market. The Indian workwear segment is currently estimated at approximately Rs. 6300 crore and is expected to grow by 15 percent annually by the year 2020. Indian industries are growing rapidly across verticals like automobiles, oil and gas, healthcare and pharmaceuticals. However in the Indian workwear market there is no single solution provider who can meet a vast demand with consistent quality. [15]

In addition to above there are also certain setbacks like lack of value added products to choose from, low focus on branding and lacking distribution, and absence of quality service and a one stop shop solutions for all workwear requirements are key issues for which India is not as competitive as American or European workwear retailers. Once these issues are addressed from workwear supplier's side, further rapid growth in this segment can be expected. There is strong need for more investments from international platforms like, Dickies Workwear, increase in awareness among end users and new innovation into technology of manufacturing and design to increase manufacturers offering all types of workwear clothing and PPE products under one roof. Manufacturers also must take steps to introduce a diverse range of products along with catering to various price segments.

Conclusion

Workwear is more than just function alone. It is understood that it is essential to strike a balance in protective workwear to meet the rising workforce, emphasize on investment in the safety and protection of employee and innovation in workwear market in India. On global scale new innovations in workwear are mainly due to important fabric developments, in connection with health and safety or both with increasing use of multi-functional fabrics or high performance fabrics. There is also excellent demand and need in today's trend to combine fashion and function.

References

- [1]. "Importance of Workwear", Health and Safety International Publication, April 2012.
- [2]. <http://www.ishn.com/articles/92647-hi-vis-hits-prime-time>, Industrial Safety and Hygiene News, March 2012.
- [3]. http://ehstoday.com/mag/whats_favorable_fitting, EHS Today, June 2008.
- [4]. http://www.cordura.com/en/press-releases/news_expoprotection_fashion_function.html, October, 2014
- [5]. <http://www.innovationintextiles.com/protective/glenguard-fr-introduce-new-line-of-vented-fr-workwear/>, Innovations in Textiles, December 2014.
- [6]. <http://www.miningaustralia.com.au/features/>, "New clothes to keep workers cool and rested", April 2014

- [7]. <http://www.snickersworkwear.com/news/d3o-lite-kneepads/>, February 2015.
- [8]. https://www.policingtoday.co.uk/PPE_Innovation_at_Workwear_Clothing_Show_22950.aspx, April 2012.
- [9]. <http://bicmagazine.com/finding-peak-performance-in-protective-clothing>, August 2015.
- [10]. <http://workwearfabrics.com/special-workwear-fabrics/>, March, April 2014.
- [11]. <http://www.formula1-dictionary.net/proban.html>
- [12]. <http://www.prnewswire.com/news-releases/increase-in-healthcare-worker-adoption-of-vestex-protective-attire-addresses-healthcare-uniform-contamination-concerns-300109366.html>, July 2015.
- [13]. <http://www.workplacemagazine.com/Ezine/FullStory.aspx?EzineDataID=428>
- [14]. <http://www.aplusa-online.fr/>, Press Release – “Work and Protective Wear is becoming ever more fashionable”, May 2015.
- [15]. <http://www.indiaretailing.com/7/1/15/13568/Dickies-An-iconic-American-brand-now-focuses-on-workwear-business-in-India>, July 2015.