

Potential Threats of Consumer Textiles

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Local is global and global is local. With globalisation, the perception of things and happenings has changed radically. With multidimensional reservations and challenges, the threats that the textile industry proposes and promises assume greater importance, especially when considering potential threats in everyday use consumer textiles. The global concerns regarding various textile processes has surged to an almost alarming extent. The global trend for eco-friendly products has also been extended to textile and apparel products. An effort is being made to create awareness among consumers of textile products regarding their potential safety threats. It involves highlighting the threats and hazards which should be controlled so that this sector becomes a responsible partner in the creation of a nontoxic environment. A review of probable hazardous textile chemicals is presented here along with a discussion on the expected venues of health risks. Such awareness might help in bringing to light a list of damaging textile chemicals that should be restricted for the sake of environmental protection, controlling occupational illnesses among workers in the textile sector, and the provision of nontoxic, safe textile products for consumers.

Key Words: *consumer textiles, environment protection, globalisation, hazardous chemicals*

Introduction

Nearly everyone on this planet are consumers of textile products. A vast range of everyday products is prepared by the textile sector. The consumer range spans across all user segments, regardless of age, gender, nature of social or professional engagement, and health. This gigantic contribution places the textile sector as a leading partner in global economic activity. The magnitude of textile activities, from production to marketing, usually involves international and intercontinental movement of products. As a result of such global movement of products, their content has also become a global concern (Das, 2000). Almost all textile-oriented products are used in a way that every consumer is directly or indirectly exposed to the chemical



content of these goods. The endless array of textile production dominantly utilises large quantities of chemicals. This sector is known for its intense use of chemicals. It is an established fact that among these textile chemicals some are harmful for the environment and some are dangerous to human health, producing allergic reactions which can be persistent or bio accumulating (Hangzhou, 2013). Attention has only recently been given to the hazardous aspect of chemicals contained in textile products. With technological advancement, an enormous expansion of textile activities has occurred.

The increasingly complex, longer, and global nature of the textile supply chain has made it difficult to identify the presence and nature of hazardous textile chemicals in textile products and production exactly (Nazia, 2010). However, some unharmonised, voluntary efforts are seen in the textile industry regarding labelling or listing of restricted chemical content (Nations, 2011). Additionally, the absence of unified legislation covering the permissible range of textile chemicals and the permissible level of hazardous textile chemicals has exposed consumers to potential environmental and health risks. This all reflects an urgent need for an organised handling of the regulation of textile chemical usage, locally as well as globally. The failure to do so might result in disastrous human health and environmental impacts (Kevin, et al 2014).

Objectives

The objective of this concept paper is to create awareness among the arena of consumer textiles regarding its potential safety issues by highlighting threats and hazards which should be controlled so that this sector becomes a responsible partner in the creation of a non-toxic environment (Textiles, 2005). All this is driven by the increased knowledge about hazards associated with chemicals used in textile sector. Among the numerous commodities of today's world, textile products are identified as a group that might contain hazardous chemicals. A review of probable hazardous textile chemicals is presented here along with the discussion on the expected sites of health risks. Such awareness might help in the formulation of a list of damaging textile chemicals which should be restricted for the sake of environmental protection, controlling occupational illnesses among workers of the textile sector, and the provision of non-toxic, safe textile products for consumers (Soytas, 2006).

This awareness will help bring to light the dire need for the creation of a pool of specific rules, locally as well as globally, for chemicals used in different groups of textile products. Emphasis should be placed on the availability of complete information about chemicals throughout the lifecycle of textile products. While seeking options for such legislative decision-making, consultants from the textile industry, experts on environment protection, and authorities on consumer rights should join hands for the larger benefit of humanity (Agency, 2013).

Nature of Consumer Textile Sector

The consumer textile industry involves all industrial segments in the designing, manufacturing and distribution of textile goods for use. Industry activities comprise of production of fibres from natural or synthetic sources, spinning activities for the formulation of a variety of yarns, knitting or weaving units responsible for the structuring of textiles, the additional steps of dyeing, printing finishing, final make-up, and packaging and distribution (Hangzhou, 2013) . Apart from these fibre-oriented practices, all steps involved in the manufacturing of leather articles are also part of textiles (Kevin, et al 2014).

Textiles play an important role in the global economy and are an important component of world trade flows. For many developing countries, the outcome of textile activities account for a major proportion of annual exports. According to the World Trade Organization, the total world export of textiles is estimated to be worth around US\$196 billion. Clothing represents US\$258 billion, representing 2.2% and 2.9% respectively of world merchandise trade. According to World Trade Organisation statistics, most of the world's textile exports are done by developing countries with India, Pakistan, Turkey, Indonesia, Thailand and Mexico ranking among the top 15 textile exporters. Overall, Asia accounts for 46.1% of world textile exports. On the other hand, the biggest importers of textiles include the EU and US (Agency, 2013).

Chemicals Used in Textile Sector

The textile industry is known for its intense use of chemicals from the production of raw material to the desired finished article. This excessive use of chemicals reflects the complex and wide range of requirements dictated by the desires of a large variety of consumers. From textile fibre production to finished consumer articles, the process involves the utilisation of numerous chemicals. Some of these chemicals are destined to remain with the product for its lifetime and some are designed to act as carry-over during the manufacturing steps of production (Soytas, 2006).

The definition of hazardous chemicals is a priority of this exploration, which will lead to the formulation of a non-exhaustive list of chemicals and will serve as an indicator of chemicals which might be restricted. Such elements used or present during the textile industry processing stages can be found in the final product. More focus is required to spot all such chemicals in textile products or production. These include endocrine disrupting chemicals (EDCs), chemicals that are persistent, bioaccumulating and toxic (PBT), and those that are part of a group of chemicals which are very persistent and very bioaccumulating (vPvB) (Agency, 2013).

Table 1 contains an overview of the most commonly used chemicals as well as their function or required performance during the processing chain of textile production. Table 1 also contains

information about the release pathway of these commonly used textile chemicals during the use phase (Textiles, 2005).

Some recent studies have been conducted to measure concentration levels of such chemicals in the products on the rack. A Swedish study exploring presence of Nonylphenol Ethoxylates (NPE) in towels found evidence of its presence in almost every item. A similar study on water repellent sports clothing also found evidence of Perfluorinated Compounds (PFCs) in all sampled pieces (Agency, 2013).

Table 1: Chemicals of concern in Textiles.

Chemical category	Chemical name	Release pathway
Detergents and auxiliaries	Nonyl Phenol Ethoxylates (NPEs)	Water
Wrinkle, water oil or stain resistant coatings	Perfluorinated Compounds (PFCs)	Water
	Formaldehyde	Air
Fire-retardant finishes	Poly Brominated Diphenyl Ethers (PBDEs)	Water
	Hexa Bromo Cyclo Dodecane (HBCD)	Water
	Short Chain Chlorinated Paraffins (SCCPs)	Water
	Asbestos	Air
Plastic Coatings	Phthalates	Water
	Heavy Metals	Water
Anti-bacterial and anti-mould agents	Silver	Water
	Triclosan	Water
Dyes and Colorants	Heavy Metals	Water
	Azo-Dyes	Water
Leather Finishes	Chromium	Water
	Short Chain Chlorinated Paraffin (SCCPs)	Water
Others		

Threatening Textile Chemicals

Groups of chemicals listed in Table 1 are identified as being of some concern. But textile processing contains many more chemicals utilised in multiple stages of processing like spinning, pre-treatments, dyeing, printing or finishing. Most of the chemicals are used without intending for their presence in the final article; these are designed to be released during processing after they fulfil their function in some stage of processing. However, the promised



absence of such chemicals is only possible if optimum conditions are maintained throughout the manufacturing phase. Strict quality control standards should be in place to signal product impurities and abnormalities during processing that may result in residual content in final products (Kevin, et al 2013).

Legislation Regarding Substantial Existence of Hazardous Chemicals in Consumer Textiles

Enormous textile productions involving significant applied chemistry and global utility of textile products necessitates clear regulations. The following is an overview of the major legislation applicable to textiles concerning their chemical content (Das, 2000).

REACH is a European legislation for the level of chemicals contained in textile products. It emphasises the disclosure of information with respect to certain substances which meet a set criterion for substances of very high concern (SVHC). The list of SVHC keeps on increasing with more available knowledge of the probable hazards associated with certain chemicals. Most of the substances listed in SVHC are related to textiles as described in European Chemical Agency website. Regarding chemicals in products, REACH requires information disclosure to protect the safety rights of consumers (Kevin, et al 2013).

Consumer Product Safety Improvement Act (CPSIA) is a US federal law that requires third party testing for the levels of lead in goods for children (Agency, 2013).

California Proposition is an initiative against the exposure of consumers to toxic chemicals found in products. According to this, companies are required to publish an updated list of harmful chemicals in products which might cause cancer, birth defects or other reproductive harms. It empowers users to be informed about the significant amount of chemicals in the products they purchase or those released into the environment during product manufacturing. This information is regarded as a “clear and reasonable” warning before exposing anyone to listed chemicals. Allowed levels of chemicals are in accordance to human health standards. Random sampling for chemical content testing of different products is regularly conducted to ensure compliance with the set standards (Soytas, 2006).

Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture is a Japanese law governing the control or prohibition of hazardous compounds to humans or the environment (Hangzhou, 2013).

European Eco-label is a European Commission Decision. This legislation involves strict legislation and certification and primarily addresses textile consumer products. This involves a stringent set of conditions not only on the level of chemicals in final textile products but also the chemicals used during the processing of textiles and the chemical content of raw textile

resources. According to this approach, certain chemicals are restricted to maximum levels while others are allowed within a safe range according to the hazard classification system. The hazard classes are continuously updated as new chemicals are linked to new hazards (Textiles, 2005).

Declaration Systems of Textile Product Chemical Contents

It is interesting to investigate the mechanisms that exist for the transmission of information regarding the chemical concerns of any textile product. This information takes on various forms. It directly addresses what is in the product and it addresses “negative content information”. These efforts aim to ensure that harmful chemicals should not remain in the final product for guaranteed product safety standards of targeted markets. Along with conventional labels, some companies also provide ecolabels, supplying a little more information about the chemical contents of products. A restricted substance list (RSL) is often given by the buyers which must be observed by the manufacturer to pass quality checks. However, this RSL varies across different companies. There is hardly any information passed on about all the chemicals utilized in the production line or about the chemicals contained in the final product.

Fibre content information

Currently it is found that there exists no authentic information system for knowing what chemicals are contained in textile products except for the information of its fibre content. There are established labelling requirements of certain import countries. For USA markets, the label should include fibre content, country name, and the name of manufacturer. For textile care labelling, some symbols are changed by the International Association for Textile Care Labelling. Such labels are required to be a permanent part of a product throughout its life (Das, 2000).

Restricted Substance List (RSL) is a company specific list. It comprises of chemicals that are strictly prohibited in the company’s products. This imposes an effective ban on the use of chemicals and provides a clear direction to the company suppliers. An RSL is usually put in place by the company for the market; with this list the company requires all suppliers to conform to this standard. However, for conformity and compliance, strict testing standards must be imposed, and administrative control needs to be very tight. In being company driven, there is great variation in contents of the list (Nazia, 2010).

Ecolabels are mostly regional and specifically target aspects of sustainability and the environmental impact of textile processing. Some target the harm full chemical content of the textile products. For the textile sector, over 70 labels are available (Textiles, 2005).



Environmental Product Declaration (EPD) is primarily a life cycle assessment tool. Its major concern is communication regarding the environmental performance of any product or system. The information is directed towards the environmental impact associated with textile products including its raw material acquisition, chemical content, energy utilisation in manufacturing, chemical emission, and waste generation. The Textile sector still lags behind in using EPDs (Soytas, 2006).

Selected Company Systems are small initiatives to make negative content lists or positive content lists of a company's products available to public. This is another advanced level of product information disclosure (Nations, 2011).

ChemicALL System is an extended database and chemical information system, designed to address the needs of designers and textile users. This tool evolved to help designers and end users to make informed decisions or to enable an informed dialogue with suppliers regarding chemicals present in final products (Agency, 2013).

Stake Holders Chain Concerning Consumer Textile Products

For the chemical content initiative, understanding the relevant stake holder chain is necessary. This helps to bring to light the needs and uses of different chemicals in textile sectors at different phases. Different sectors of stakeholders possess different concerns regarding the use of certain chemicals in textile manufacturing. Priorities of each segment are interestingly diversified based on their capacities, roles, priorities, and economic and social context. For this reason, all parties who can contribute to the information system regarding the chemical content of textile product are included here (Das, 2000).

Governments are not directly involved in the designing, manufacturing, or distribution activities of textiles but possess a key role with regard to the control of hazardous chemicals in textile products. They play the very vital part of policymakers and policy enforcers. Governments can exercise their control in varying degrees on different segments of textile manufacturing activities run in their territory. This encapsulates the significant role of governments regarding the sensitive matter of consumer safety. Their contribution is manifold, including control during manufacturing for occupational health and safety standards, during distribution for traceability standardisation, during use for consumer rights protection, and during export to ensure compliance to international standards regarding the exchange of information involving the chemical content of textile products. The government is needed in making rigorous efforts for the identification and control of a hazardous substance that might become part of consumer articles (Soytas, 2006).

Manufacturers are the major partners of the stakeholder chain of the textile product life cycle. They are directly concerned with all decision-making regarding the use of harmful chemicals

in different stages of manufacturing. Generally, they have much influence on their suppliers and can easily influence the different steps of the multistage fabrication of consumer textiles. Thus, their role in controlling hazardous chemical content in textiles is vital. They are directly responding to the legislative authorities and the policies of the markets in influencing suppliers to abide by the ultimate consumer demand of product safety assurance. Activities of the global textile manufacturing environment are very complex (Hangzhou, 2013).

Manufacturing stages require clear chemical content information of textile materials being used. Designers are held responsible for making the right decisions about the chemical content of selected materials to fulfil the desired functional performance of products as well as promising personal and environmental safety standards. It is widely recognised that the information delivery system at this stage should be capable of providing efficient, complete and authentic information. Multistage processing of textiles requires continual information exchange with regard to its chemical content across different stages of manufacturing.

Distributers: Distributers are companies who receive final manufactured goods and deliver these to a point of sale. Distributers can be large brand name companies who may or may not operate retail chains. Apart from retailers, all types of importers and people involved in logistics are categorised as distributers. This group of stakeholders directly relate to legislated requirements. They have to obey all legal responsibilities and maintain a system of check and balance of appropriate chemical content information to meet these obligations.

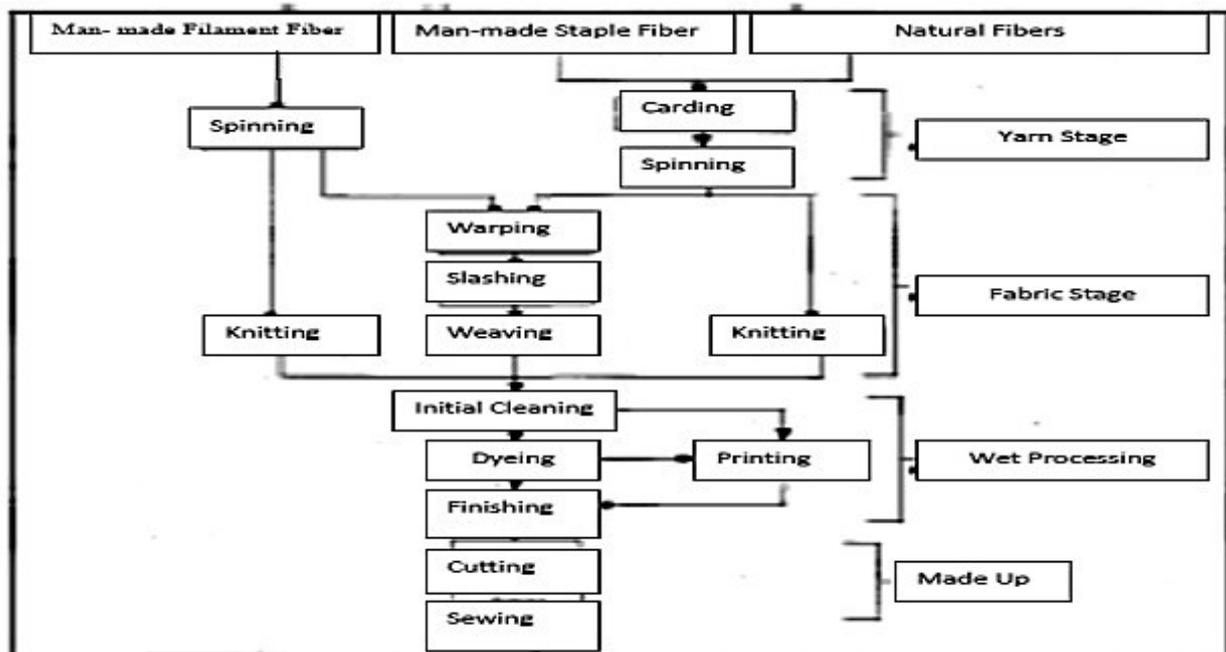


Figure 1: Typical multiple stage complex flow of textile processing.



Large brands need to develop an appropriate corporate policy based on the need for knowledge about a product's chemical composition (Hangzhou, 2013). A common practice among the distributors is widespread ignorance of hazardous aspects of textile chemicals. On the contrary this sector is trying its level best to devise a system to comply with the current legislation and regularities (Nazia, 2010). Amidst the textile value chain sectors, distributors are specifically leading the efforts to establish efficient control over the textile chemical content of the consumer products (Agency, 2013).

Consumers: It is strongly felt that the development of a system to effectively communicate the chemical contents of consumer textile products to the consumers is needed. This will not only help in making the right decisions in purchasing but, if consumers are kept informed, they can take appropriate action with the products at hand. Consumer safety assurance should be promised at all stages of manufacturing. Consumers, more than any other group of stakeholders, are directly affected by the absence of an effective information exchange system (Nations, 2011). Thus, consumer demand is estimated as a major force for the increased exchange of information regarding the chemical content of textile products. The general public must be given awareness and education about the facts of environmental and health risks from the textile chemicals in daily used products. Currently there is no sound system for an efficient information exchange for consumers (Das, 2000). The presence of eco-labels bridges this gap to some extent but does not provide enough behind the scenes information (Textiles, 2005). There is a dire need for media articles about the hazardous aspects of textile chemicals found in products to create public awareness, but this campaign might not be fruitful to the textile chain segments in developing countries. The presence of chemicals of concern in textile products can only be reduced if it can be communicated systematically to all stakeholders so that processing procedures can be revisited to bring needed improvements. Consumer choices are predominantly affected by price, design, perceived quality, and awareness about damaging chemicals (Kevin, et al 2013).

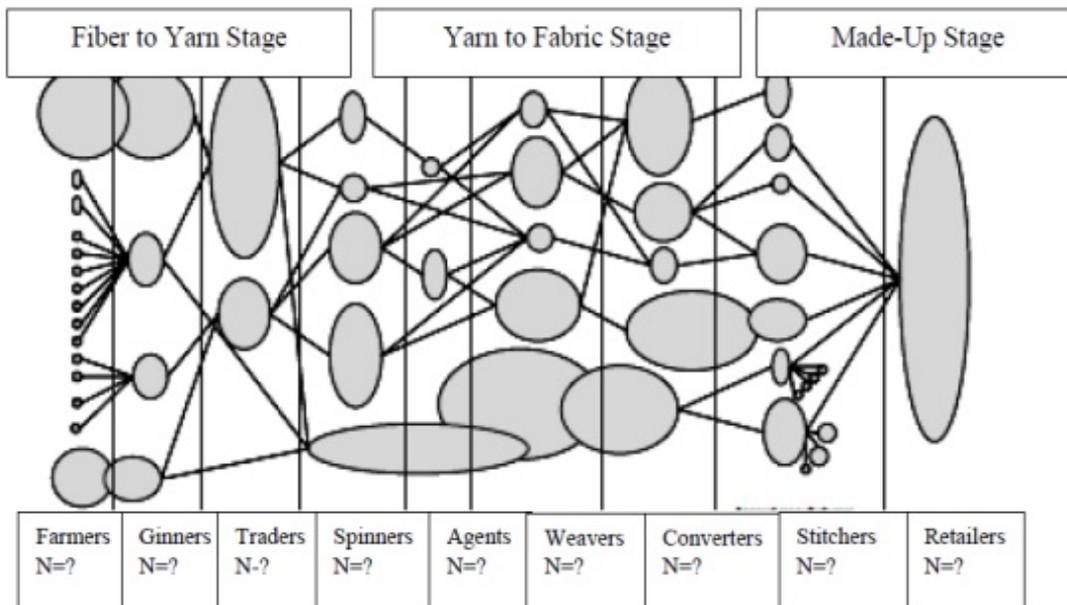


Figure 2: Textile Value Chain Illustrating Typical Business Relations

Obstacles in Information Exchange Across Stakeholder Chain

The common theme found among all stakeholders is efficient use of chemical information found or not found in products for the evaluation and assurance of user safety. The common practice of provision of the negative-content list does not address this situation. A revised strategy is needed to provide a positive-content list which will directly address the exchange of chemical in product information (Soytas, 2006). Historically, legislations and regulations have been devised to monitor, control and minimise chemicals of concern in products (Agency, 2013). The desire for consumer safety depends on the proper exchange of information, but the nature of information needed, and the manner of its presentation varies widely. In short, the throbbing query to be addressed is what information exchange mechanism is most effective? The diversity of textile activities renders this information exchange a complex issue. This remains a major obstacle in solving this issue through standardised practices (Kevin, et al 2014).

Conclusion and Recommendations

Progress in the textile sector demands that it must become able ensure the validity of the claim of safer products by establishing a mutually agreed upon information exchange mechanism. Already established mechanisms of negative-content lists or chemical oriented eco-labels are just assurances of the absence of unwanted chemicals. The delicacy of the issue requires the formulation of a legislative base to ensure user safety throughout textile production to maintain product quality along with worker health. The current practices of chemical information exchange are diverse in terms of scope, method, design and criterion. Through legislation, all



companies putting product in the market are held responsible for product safety. Hence different stakeholders of the textile production chain should mobilize to compile, extract and pass on required information throughout the supply chain. All such practices will ensure enhanced product safety. In today's world the chemicals of concern are all such substances which have negative effects on human health in some manner or damage the environment. A chemical content confirmation system will enable designers and active manufacturers to make wiser and more informed decisions regarding textile products to control and reduce the hazards associated with the presence of chemicals in consumer products. Such efforts require an accurate set of measures, including supervisory, oversight and validity systems.

Such efforts will enable stakeholders to exercise improved management of the textile chemicals present in products. These mutual measures are needed to ensure the availability, appropriateness, and accessibility of needed information.



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