

Fire Safety in Textile Industry in Bangladesh

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Abstract

Readymade Garments is one of the major foreign currencies earning source in Bangladesh and over the past decades these industries are playing an important role in Bangladesh's economy. These industries offer massive employment of skilled and unskilled labour. Bangladesh has a long and tragic history of fire related accidents resulting in massive damage across different parts of the country. In the textile industries fire accidents occur very frequently. It results in the deaths of workers as well as significant material and equipment loss. Adaptation of fire safety system is very necessary to save lives and as well as to increase output and improve product quality, which in turn increases earnings and improves the company's reputation. This paper describes about different fire hazards in various sections in textile industry, causes of fire accidents and the way of preventing these hazards and accidents.

Keywords: Combustible fibres, Massive Employment, Skilled and unskilled labour, Housekeeping, Metallic compounds

Introduction

Bangladesh's textile industry is a significant industry. Ready-made garment (RMG) exports account for over 83 percent of Bangladesh's total export income and are the main source of foreign exchange profits for the nation [1]. Owing to its high production and efficiency requirements, a large workforce both highly qualified and unskilled is required. A safe and sustainable working environment is an important factor for the reputation and stability of such an important industrial sector [2]. In the textile industry, the term "fire accident" is well-known. Combustible dust, electrical malfunctions, and inadequate housekeeping are the main causes of industrial fires, according to several studies in the fire engineering literature [3]. It results in the deaths of workers as well as significant material and equipment loss. Adopting a suitable safety system is the only method to increase output and improve product quality, which in turn increases earnings and improves the company's reputation. Even after numerous initiatives were put into place in the past, there are still a lot of fire accidents in our country. Reducing fire incidents is essential to protect employee lives, preventing equipment loss, and boosting business profits.

Causes of fire hazards in various sections in textile industry

The textile industry can be categorized into the following areas: a) spinning; b) weaving and knitting; d) dyeing and finishing; and e) garments. In the textile industry, all materials are flammable. These industries involve the use of a variety of chemicals and mechanical processes to convert fibers into ready-to-wear items, which could provide safety risks. Aside from extreme heat, noise, and temperature, other risks include dust, gasses, metallic compounds, and dust.

Spinning section: For the purpose of creating yarn, the ginning machine in the spinning industry separates the cotton fiber from the cotton seeds in raw cotton. Fire occurrences can be caused by human mistake, electrical issues with the ginning equipment, sparks from the

mill, or cotton that has been exposed to sunlight. Cotton fiber is used to create fabrics in the spinning industry. Compared to other textile industry sectors, spinning mills have increased fire hazards because raw cotton is more prone to catching fire.

Weaving and Knitting section: Weaving and knitting industries create a fair amount of lint, dust and fibre flying which can cause fire hazard in case of combustible fibres, yarns and fabrics.

Dyeing and finishing section: Fire can also be started by other raw materials, such as chemicals, dyes, and bleaching agents in dyeing and finishing sections [4].

A. An electrical spark may result from passing yarn through electrical heating components in yarn singeing devices in order to burn away the projecting fibers.

B. When mixing kerosene with other binders to prepare pigment for printing on fabric, around 70% of it is used. After this proportion of kerosene is added to the printed fabric, it is drained, evaporated and dried. In this process, there is a chance of disastrous explosions and the ensuing fires. Different types of solvents and dyes used in dyeing industry can also cause fire.

C. The use of flammable liquids without taking any preventative measures beforehand, such as using inappropriate storage facilities, poorly designed storerooms, or building a doorway with a raised and ramped sill that allows all of the liquid to flow to the ignition region and starts a large-scale fire.

D. The addition of oxidizing chemicals, such as hydrogen peroxide, can fuel the fire with oxygen, increasing its intensity. Huge fires can also result from the presence of vast amounts of paper and dry materials [5].

E. Serious burn injuries (scalding) may occur when a hot liquor is brought into the kitchen where the worker has been organizing the clothing that will be treated. This generally happens when hot liquor escapes through the common duct or when the valves are inadvertently unlocked.

F. The use of substances that contain gaseous chlorine, such as hypochlorite, as a bleaching solution. Workers who are exposed to dangerously high levels of chlorine have skin irritation, mucous membrane damage, pulmonary tissue destruction, and lung edema as a result.

G. The acid and alkalis used in dyeing process for treatment of cloth with boiling liquor expose the workers are risk to the burns and scalds.

H. Since sulfur dyes are insoluble in water, they must be rendered soluble by adding alkaline substances, such as sodium hydrosulfide or sodium sulfide, which function as reducing agents.

Additionally, oxidizing agents like hydrogen peroxide and sodium dichromate are used. The majority of oxidizing agents utilized are bleaching agents; the chemical reaction of peroxide bleaching needs to be regulated by introducing the agents

continuously as opposed to in one flow, which could cause oxygen evolution as a result of hydrogen peroxide breakdown. Severe vascular failure results when the oxygen level rises above what the relief device can tolerate. As a result, the reducing agents produce additional heat, which causes an explosion. One of the reducing agents is formaldehyde, which can cause cancer if it is exposed to. It also causes respiratory difficulties and eczema patches on skin with bleeding [6].

Garments section: Besides cotton fibre other fibers are also processed in textile industry like silk, wool, linen, jute, hemp, etc. Various types of products are produced from natural and synthetic fibres. The combustible fibers may be the risk of fire. Of all industries, the spinning sector has seen the highest number of fires caused by electrical failures. A problematic installation might easily create a serious fire by igniting cotton fluff. High pressure power is needed to power modern machinery, which is powered by electricity. The exothermic oxidation reactions that finally result in fire spots are suddenly accelerated by the buildup of heat in the layer of lint and dust. These hot spots have the ability to move through a layer of dust and start flames when they come into contact with combustible materials.

Other causes of fire accidents in textile industry: In textile industry fire hazard happens frequently. The root causes are: a) Electrical short circuit, b) Welding operation, c) Smoking. The primary causes of workplace fire accidents are smoking and electrical fires, which are primarily caused by hot work or welding done in areas where flammable materials are stored (Kumar M et al., 2014). Other causes are:

A. Sparks from industrial processes end up in dust collector systems. They enter the collector system through the duct and hoods.

B. When fireproof construction is not used, the nature of the cotton textile industry's architecture may present a fire hazard. This is primarily dependent on the design of a building's exterior walls and roof.

C. Explosions and subsequent factory breakouts might happen as a result of coal in the coal yard spontaneously combusting and too much heat in the factory boiler. Oil is heated, circulating, recovered, and then recirculated in a thermal fluid heater. Additionally, there is a risk of explosion and consequent fire with this method.

D. Electrical circuit malfunctions have the ability to quickly ignite cotton fluff, which can result in a dangerous fire. Fire can result from heat produced during the functioning of machinery and electrical installations.

E. Proper material storage is essential in the textile industry since storage spaces commonly experience fire incidents. As a result, the risk can be decreased by keeping combustible materials and flammable products like cotton away from ignition sources like electrical panels, rotating or moving machinery, etc. It's important to keep flammable objects away from electrical panels in order

to prevent electrical fires. The electrical panels were producing sparks when the relays functioned or a fault occurred, which is why a flash of spark appears from the electrical panel motor and other electrical devices. As a result, there must be enough room between the electrical equipment and the combustible objects. It is best to store flammable materials away from spinning or revolving items to minimize the risk of fire produced by material collisions and friction.

F. The primary reason for electrical fires is incorrect or mishandled power. List of some typical electrical risks are: a) Loose connection, b) Temporary connection c) Overloading of electrical apparatus, d) Shot circuit, and e) Poor maintenance are the major risk factors that causes fires in industrial settings.

G. Sparks from everyday welding and other hot activities, such as grinding, will put the textile industry at danger for fire. Instead of restricting skilled persons, we must limit semi-skilled labor to avoid this kind of fire incident. These employees must also be informed about any operational risks and the safety measures put in place to mitigate them.

H. It is crucial to increase employee awareness of smoking in the workplace through education, sanctions, smoking area limitations, and smoke detection devices in order to lower the risks connected with smoking.

I. All employees should be knowledgeable about the use and maintenance of extinguishers, firefighting pumps, fire hydrants, and other firefighting equipment. Every fire extinguisher should be positioned in an easily accessible area and should not have any obstructions in its path.

J. The most important factor is to maintain all firefighting equipment by developing and following a routine maintenance schedule for the equipment.

K. Research shows that during industrial fire incidents, blocked exits and inadequate compartmentation significantly increase mortality [7].

Prevention of fire accidents in textile industry

It is essential to prevent fire source from ware houses through personnel management and fire protection technology. In case of fire accidents, owner, management, government and employees are responsible for controlling the same.

A. Frequent cleaning and waste management are crucial because textile mills produce lint and fine fibers, which are extremely flammable materials [3].

B. Standard criteria must be met by electrical equipment, and regular maintenance and inspections are necessary. Electrical ignition risk is decreased by certified installations, load balancing, and routine inspections [8].

C. Separated, well-ventilated chemical storage is emphasized in industrial fire safety textbooks as a way to reduce the risk of fire and explosion [8].

D. Overheating and sparks, two important sources of ignition in the textile industry, are avoided by routine lubrication, planned maintenance, and temperature control [9].

E. Installing an automatic fire detection and alarm system is recommended. In high-risk industrial settings, heat and smoke detection systems greatly speed up reaction times [9].

F. Industrial fire safety requires hydrant systems, sprinklers, and extinguishers suitable for the type of material [3].

G. Building arrangement plays an important role in preventing fire. The risk of fire can be minimized by proper ventilation, compartmentation, multiple unobstructed exits, fire resistant materials avoiding materials like wooden partitions, roof lining and false ceiling [8]. Cold storages should be kept away from the surrounding and boiler houses must be segregated from the adjacent blocks.

H. Temperature and humidity should be controlled by thermometer and hygrometer. The temperature should be below 308K and humidity should be below 70% for preventing the possibilities of spontaneous heat and combustion and storing hazard chemicals away from non-hazardous chemicals.

I. The transportation vehicles, equipment in ware houses must be enclosed with flame proof enclosure or choke to ensure no sparks.

Conclusion

It is known that "prevention is better than cure". It is one of the vital role of the management of any textile industry to adopt fire safety devices and techniques so that fire hazard and risk is minimized. If this is maintained, fire accidents can be prevented which can save lives, minimize equipment loss and increase productivity and profit.

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