



WITH YOU ALWAYS

# RE-Konnect

Risk Engineering Bulletin

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Interesting Facts on Textile Industry

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In Focus:

# Textile Industry

## Editor's Note

Textile industry plays a pivotal role in Indian economy through its contribution to industrial output, employment generation, and export earnings. Textile industry, after agriculture, generates second largest employment opportunities in India and is one of the largest contributors to India's exports with more than 11 percent of total exports.

The textile industry has two broad segments - Unorganized sector and Organised sector. Un-organised sector is Labour intensive and have the hand-spun and hand-woven textiles sectors at one end of the spectrum whereas organised sector is Capital intensive and have sophisticated plant and machineries at the other end of spectrum.

Since, almost all the materials being used in the textile manufacturing are flammable to some degree, special considerations are required in order to understand various hazards present and their mitigation. In this issue of RE-Konnect, we provide you a brief overview of Textile industry processes, fire hazards in various sections of a textile mill and measures to prevent such events of fire. We will also briefly discuss on the environment and health impacts of textile industry. The idea is to get you familiar with various aspects related to Textile industry which can be further explored with the help of references provided.

## Did You Know?

- In Japan during the Heian Period (year 795 to 1192) silk fabrics were so valued that they were used as currency.
- India is the largest Cotton Producing (For FY 15-16, estimated production is around 5.7 Million MT) and Second largest Cotton exporting (1.17 Million MT) country in the world.
- Samples of block printed and dyed textiles from Gujarat have been found in the Egyptian tombs, signifying popularity and large trade of Indian textiles to Nile civilization during medieval times.
- The global fashion apparel industry represents nearly 2% of the world GDP. Yet nearly 75% of world's fashion market is concentrated in Europe, USA, China and Japan.
- Cotton constitutes only 2.4% of world's cropland but consumes 10 percent of all agricultural chemicals and 25 of insecticides making it one of the most chemically dependent crop in the world.



# Disaster

## Textile Factory Fire in Dhaka

A major fire broke out in a textile factory on the outskirts of Dhaka in November 2012. More than 100 people were confirmed dead and 200 others suffered injuries, making it the deadliest fire in the Nation's history.

Fire started from the storage area located at ground floor of the building. The probable cause of fire is suspected to be Electrical short circuiting in yarn and fabric store. Due to high stock pile up of yarn and fabrics, fire quickly spread to other floors. The nine stories building had three staircases, but all staircases led through the ground floor. Due to fire in ground floor area, it was extremely dangerous to use the staircases as escape routes. This left many workers trapped inside the factory who unable to get out of it safely.



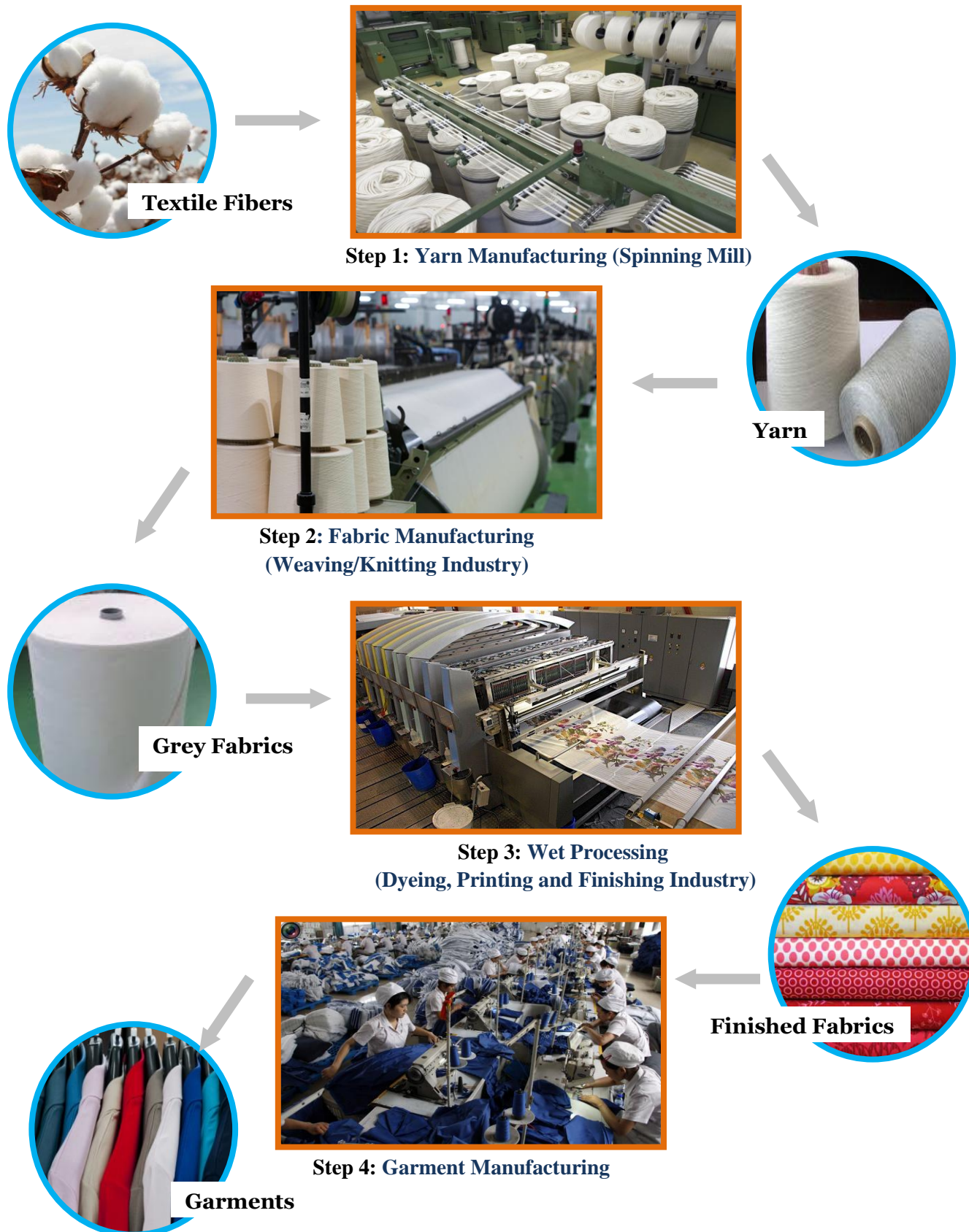
It took more than seventeen hours before the fire fighters were able to successfully extinguish the fire.

Post investigation, it was found that Plant was not provided with adequate fire protection and detection system. Emergency exits were locked at the time of incident and hence emergency escape was rendered impossible. No staircases were provided from outside the building, which could be used in case internal staircases were inaccessible. Poor housekeeping and storage practices were followed in the storage area, which resulted in break-out and spread of the fire.

Investigators found that fire safety certificate expired several months before the incident.

Three supervisors from the factory were arrested on charges of criminal negligence. The owner and managing director of the factory was charged with death by negligence of the victims. Several new set of workplace safety standards were adopted as a result of this disaster. This included, among others, carrying out of factory inspections by two different inspectors having multiple years of experience in the field.

# Process Overview





# The Costs of Fashion

Have you ever paused to think about the environmental as well as financial costs of the apparels while dressing to impress? On an average, making 1 kg of fabrics generates about 23 kg of greenhouse gases. From pesticides poured on cotton fields to the abundant use of dyes and colours in the textile industry, the environmental and health impacts are tremendous. We are now keeping the dresses only half as long as we used to keep 15 years ago, making these inputs go to waste much more quickly. Clothing industry is the second largest polluter in the world, second only to oil industry.



The dye wastewater is often discharged untreated to nearby rivers, where it reaches the sea, eventually spreading across the globe. Dyes are creating chemical havocs in countries like Indonesia, China, India and Bangladesh. The adverse health effects on the people and wildlife living in the river basin are alarming. Fish and other aquatic animals which dwell in waters containing mercury, lead, arsenic and many other toxic chemicals are often consumed by humans, further complicating their health.

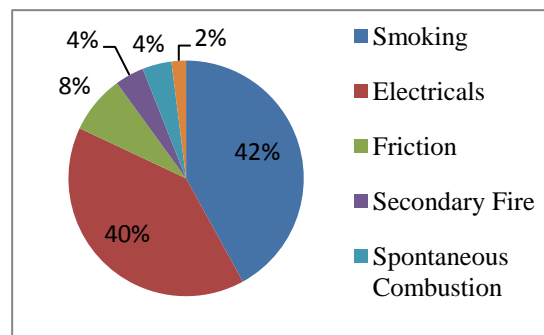


Some of the brands are starting to implement changes to reduce such impacts, but the industry and government as a whole have to come up with stricter rules and regulation to significantly reduce the devastating impact on the environment. Cutting back on the use of chemicals and water, developing materials and processes that reduce inputs, using renewable energy, more durable clothing etc. are some of the ways to reduce the impact. Not only the leading and affordable textile brands can help by adopting these changes, but the consumers can also help by being more aware and being selective in where they shop and what they buy.

# Loss Exposure & Prevention

A study on textile mill fire losses in India by Loss Prevention Association (LPA) has come out with the analysis that majority of the fires in textile industry occur in process area followed closely by storage area.

Smoking is the single largest cause of fire, which resulted in around 42% of all the fire incidents. Next major cause was electrical arching which contributed to almost 40% of all the fires under study. Other causes like frictional heat, incendiary sparks, spontaneous combustion and miscellaneous causes contributed to the remaining fires.



Below we explore various hazards present in the most susceptible areas and their respective loss control measures.

## 1. Storage Areas

Various raw materials used in the textile mills are natural fibers like cotton and synthetic materials like polyester or viscose. These are combustible in nature and presence of huge stocks adds to fire load of plant. Normally, cotton is stored in bale form and secured by iron hoops. Fire in Cotton bales godown may be caused due to following reasons:

- Sparks at the time of stacking the bales if the iron hoops collide with each other.
- Once the bales are stacked in the godown, due to heat, the hoops expand and collide against each other causing sparks.
- Inadequate ventilation and improper stacking of the bales in close vicinity of electrical wiring.
- Electrostatic discharges resulting in spontaneous heat and combustion.
- Human negligence – such as throwing cigarettes etc.

### Loss Prevention Measures

- To avoid spark due to collision of Iron hoops, anti-static plastic hoops should be used.
- Limit the number of bales in a single pile to 700 bales, and up to 500 bales where practical.
- A minimum clear distance of one meter should be maintained between stacks of fully pressed bales and the godowns walls.
- The maximum height of storage of cotton bales should not exceed six meters or up to a level which is one meter below the roof, whichever is less.
- Passageways should be provided between stacks of bales or goods. These passageways shall be not less than two meters wide and not more than ten meters apart. The passages should be always kept clear of bales by night fall.
- Once a fire gets inside a bale it burns slowly, accompanied by dense smoke and is very persistent, hence heat and smoke venting system should be provided.
- Provide automatically actuated sprinkler protection in the godown.

## 2. Blow and Mixing Rooms

Fires in these departments are very frequent and losses could be substantial due to large quantity of combustible materials involved.

- Cotton bales contain a number of impurities like trash, broken seeds, rivets and at times iron particles. When cotton is fed into a bales opener, in spite of the magnetic sieves provided in the machines, many a time, the iron particles give rise to a spark due to mechanical friction.
- Blow rooms invariably have cellars underneath these machines where fluff and dirt is collected and at times the spark from the above machines passes into the cellar causing fire.
- Electrical panels used for Blow Room machines are normally found without dust proof enclosure.
- Storage of loose cotton or laps near electrical switchgears may also lead to fire in the Blow Room.
- In a modern Aero or chute feed machines, a fire in a bale opener may spread not only to Blow Room but also to a number of cards connected with the opener machine through the ducts.

### Loss Prevention Measures

Below loss prevention measures should be taken to minimize the losses in the blow room area:

- Loose rivets and short ends of bale iron of each bale should be carefully collected and accounted for before the next bale is opened as otherwise they are likely to find their way into the blow lines.
- Cotton bales storage in mixing and blow room should be restricted to the requirement of one shift only and the bales shall be stored at a distance of not less than three meters from the blow lines.
- Blow room cellars and all roof and structural members of manufacturing buildings should be cleaned at least twice in a month to avoid fluff accumulation.
- In order to minimize fluff accumulation it is advisable to install dust extraction system in departments housing spinning and processes preparatory to spinning.
- All light fittings and structural members should be cleaned of fluff once in a fortnight.
- Use of polythene canopies over the machines and jute/hessian/curtains on window/door and north lights should be prohibited.
- All fire doors should be kept closed during non-working hours and should be cleaned and oiled regularly.
- Modern Aero feed machine should be protected with special type fire detection and protection system. All blow room machines should be protected with Spark and heat detectors. Moreover, provide interlocking system in such a way that post detection of fire, Transfer fan and Carding machines should be stopped automatically.
- Blow room and mixing room along with cellars should be protected with Automatic Sprinkler System.

### 3. Carding and Spinning Department

Even though the quantity of material available for fire spreading is limited compared to blow room, the machinery used here can create mechanical sparks due to friction between various rotating parts. Electric sparks in the electrical drives and wirings cannot be ruled out. Fluff accumulation on machines, electrical panels and false ceiling is another cause for spread of fire.

Below are the probable cause of fire in Carding and Spinning department:

- Hot pedestal bearings in the line shaft drive (if group drive is installed) which would ignite the accumulated fluff.
- Hot licker-in side-bearing pedestals.
- Friction between cylinders and doffers.
- Friction between licker-in and under-casing.
- Friction between metallic belts, strap and pulley.
- Electric spark due to a broken flexible, faulty starter, switch or stop motor mechanism and static charges.

#### Loss prevention measures

- The main cause of fires is due to mechanical friction. Hence a high degree of maintenance of machines can eliminate fire hazard.
- Maintain a good level of Housekeeping standard.
- Electrical lighting and power wiring must be carried out by using armored cables or conduits. All the electrical equipments/ fittings must have dust proof enclosure.
- Proper electrical bonding and earthing must be provided for all equipments to eliminate accumulation of electrostatic charge.

### 4. Weaving

Weaving process is comparatively less hazardous. However, fire is not uncommon due to bad housekeeping and electric short circuits. The main cause of fire in looms is found to be electrical faults. Most of these faults are from vibrations causing breakdowns at connections in the wiring. Fluff is another major hazard in the Weaving section and hence good cleanliness is important in weave rooms to control the fluff and dust that are accumulated in the vicinity of the looms and their electrical equipment.

Below are the probable causes of loss in weaving section:

- Healds or reeds, which are used in the drawing in frame, are composed of varnished cords and hence are combustible.
- Due to humidity in the Weaving section, very heavy accumulation of fluff is quite common.

#### Loss Prevention measures

- Use of metal healds is recommended.
- Regular cleaning of fluff in a Weaving Shed is strongly recommended.



# Guidelines

Following codes and standards should be referred for lightning protection:

- **IS 3079:1990:** *Code of practice for fire Safety of Industrial buildings: Cotton Textile Mills*
- **IS: 3594-1991:** *Codes of practice for fire safety of industrial buildings: General Storage and Warehousing*
- **IS: 732-1989:** *Codes of practice for electrical wire installations*
- **NFPA 13:** *Standard for Installation of Sprinkler System*

## Engage

Answer the following questions to win Amazon coupons worth Rs 500 each. Send the answers to [editor.bulletin@tata-aig.com](mailto:editor.bulletin@tata-aig.com). 5 prizes will be given and winners will be announced in next issue.

**Q1.** Majority of fire in Textile industry are caused by

- a) Electrical arching    b) Friction    c) Smoking

**Q2.** Which process is involved in converting textile fibers in to yarn?

- a) Weaving & Knitting    b) Spinning    c) Wet processing

**Q3.** Which of the following measures could have significantly reduced the loss exposure and death toll in 2012 Dhaka factory fire?

- a) Factory inspections by experienced professionals  
b) Provision of external staircases  
c) Improved housekeeping and storage practices  
d) All of the above

**Winners of the previous issue are as follows:**

- **Anant Kulkarni**, Petronet LNG – Kochi
- **Vishal Purohit**, Tata AIG – Delhi

**Answers to previous questions:** 1. B 2. From the car seat 3. Using a grounded dip rod

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