STUDY ON FIRE HAZARD IN TEXTILE INDUSTRIES

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Abstract - *Textile industry in India plays a very wide role in the production and also the employment of very huge strength of peoples both educated and uneducated. From the origin of textile goods manufacturing a lot of technology changes from manual making to fully automated machinery but still, we can find a lot of hazards and health issues still continue from the origin. So technology development produces some more hazards related to the process and the technology what used for manufacturing. To creating awareness on hazards and health issues in the workplace is the important thing. Through this text creating a framework for the industrial workers towards the fire-related hazards and its preventive measures. This was to all the workers from the top management people to the civil labors about the study on fire hazards in the textile industry.*

Key Words: Fire hazard

1. INTRODUCTION

India was in second place of producing cotton and silk products. Textile and garments are producing big supports on the Indian economy and employment of skilled and unskilled labors. In the textile industry major hazard was fire-related hazard it produces a lot of fatal accident and property damage in a wide range. According to NCRB (National Crime Records Bureau) report, 18,450 fire accidents were reported in India in 2015, in this 1193 were injured and 17,700 was a fatal accident due to fire among this report 42.1% was residential accidents other 57.9% was industrial related fire accidents [1]. Fire accident produces a wide range of property damage to the management. So the study on fire hazard and its preventive measures are useful for the industrial workers and management to understand the fire hazards and the importance of giving awareness to the workers. In the textile industry has a lot of occupational and health hazards in the cloth manufacturing process like

1. Preparition of Yarn 2.Spinning 3.Weaving 4.Knitting 5.Finishing 6. Storing 7.Handling 8.Transport etc.
The common occupational health hazards are given below

PHYSICAL HAZARDS:
Heat, cold, lighting, noise, visible ultraviolet radiation, temperature, humidity and ionizing.

CHEMICAL AND MINERAL HAZARDS:
Dust, vapors', fumes, gases, solvent, metal and their compounds.

BIOLOGICAL HAZARDS:
Various, blood-borne disease, sharps/needle sticks, bacteria, molds in health care and other works.

MECHANICAL HAZARDS:
Tripping hazards, traumatic injuries, housekeeping injuries, steps and fault of moving equipment.

ERGONOMIC HAZARDS:
Posture force (pushing/pulling), repetitions, vibration, pressure on the body, work organization (poorly designed work procedure and tasks) are work environment.

PSYCHO-SOCIAL HAZARDS:
Low/high workload demand, pace /work, little and no control over what work to do, no social support, relations harassment, and discrimination or physical or mental threats of violence and no flexibility for time off [3].

2. METHODOLOGY

2.1 WHAT IS FIRE?

Fire is the visible effect of the process of combustion- a special type of chemical reaction. It occurs between oxygen in the air and some shot of fuel. Fire will exist only when fuel, Oxygen, and Heat are present in the correct ratio [5].

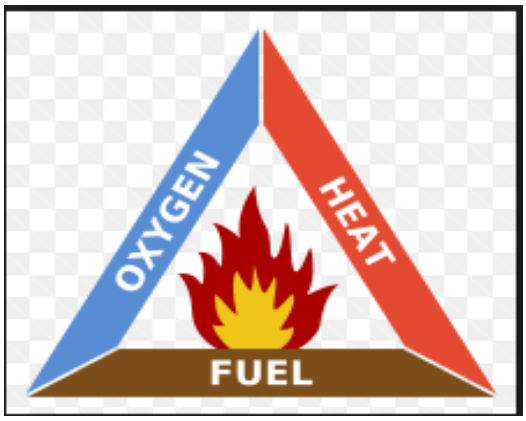

Figure 2.1 Fire triangle

Fig 2.1 shows the Universal Fire triangle. By means of air-fuel in concentration that make combustion at a point of ignition. In the textile industry, almost all materials are flammable [4].

2.2 FIRE AND EXPLOSION ASSESSMENT

Fire and Explosion Analysis (FEA) is used for the engineers to the assessment of fire and Explosion hazard due to release of flammable material and other hazards outcome of the potential for injury, fatality, property or equipment damage, ultimately resulting in a financial and reputation loss for an organization.

The FEA for fire hazard in the textile industry was shown below figure 2.2. Using this diagram we can analysis the fire hazard in a detailed manner and can produce the high efficient fire accident preventive measures and policies [2].

Basic symbols used to make the Event Tree Analysis were given in figure 2.3. By using basic logical symbols like AND, OR gates the event tree was constructed. In this diagram containing all possibility of event and its root causes. By using a detailed collection of data from previous records or safety audit results we can create a highly efficient analysis about the fire accidents and its preventive measures.

Gate Symbol	Name	Causal Relation
	OR	Output event occurs if any one of the input events occurs
	AND	Output event occurs if all input events occur
	BASIC	Basic event for which failure data is available.
	INTERMEDIATE EVENT	System or component event description
	TRANSFER	Indicates that this part of the fault tree is developed in a different part of the diagram or on a different page.

Figure 2.3 symbols used in FEA

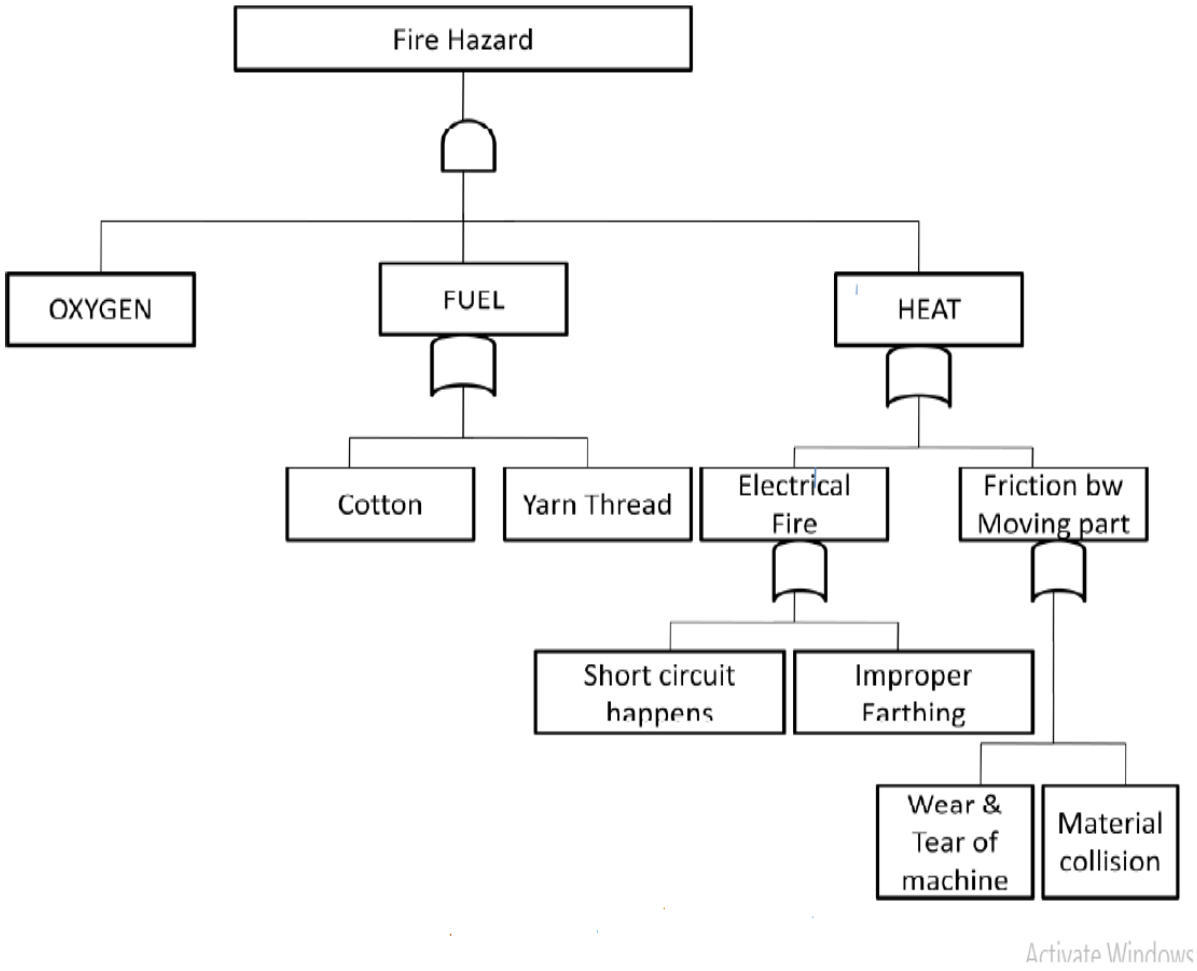

Figure 2.2 FEA for fire hazard

3. ROOT CAUSES FOR FIRE ACCIDENT

Mainly fire hazard happened in the following reasons

1. Electrical short circuit
2. Welding operation
3. Smoking

The fire hazards mainly caused in the priority of electrical fires welding or hot work carried out in the combustible material storage and smoking in the workplace this is the main root causes of fire accident [2].

3.1 IMPROPER STORAGE

Storage of materials is most important in the textile industry because a lot of fire accident happen in the storage area. So by keeping away the combustible materials like cotton and other flammable material from ignition sources like electrical panels, moving or rotating equipment, etc.

Figure 3.1, Figure 3.2 gives some of the unsafe activities common in the textile industry.

Figure 3.1 Stacking flammable material near panel board

Storing the combustible material close with the electrical panel must be avoided to reduce electrical fires. Because panels were producing a spark when the relays operate or any fault occurs there is a flash of spark come out from the electrical panel motor and other electrical apparatus. So we have to provide enough space between the electrical apparatus and the combustible materials.

Figure 3.2 Stacking material near moving machinery

Storing the combustible materials near to the rotating and moving object also should be avoided to minimize the fire due to friction and collision of material.

3.2 FIRE ACCIDENT DUE TO ELECTRICITY

Mishandling or improper handling of electricity is the main cause of electricity-related fires.

Some of the common electrical hazards are given below.

1. Loose connection, 2.Temporary connection 3.overloading of electrical apparatus, 4.Shot circuit, 5. Lack of maintenance, these are the major electrical risks which producing fire hazard in the industries.

Figure 3.3 Improper wiring

3.3 FIRE HAZARD DUE TO WELDING AND OTHER HOT OPERATIONS

Welding and other hot operations like grinding are producing sparks in the normal operation so it will create a fire hazard in the textile industry. To avoid this kind of fire accident we have to restrict the semi-skilled workers instead of skilled worker and he should know the all hazards related to the operation and preventive measures taken to avoid an accident.

Figure 3.4 Hot operation

3.4 SMOKING IN THE WORKPLACE

To creating awareness on smoking in the workplace by Educating the workers, Punishment, Restrict the smoking area, Smoke detection system in some ways to control the hazards due to smoking.

Figure 3.5 Smoking

3.4 LACK OF KNOWLEDGE ON FIRE FIGHTING equipment

All employees should know about the operation and operating procedure of fire fighting equipment like extinguishers, fire fighting pump, fire hydrants, etc.

All fire extinguishers should be available at easily accessible areas there are no obstructions around the extinguisher. Some of the equipment was placed in the unaccessible area as shown below.

Figure 4.1 Extinguisher in unaccessible area

Figure 4.2 Extinguisher in unaccessible area

Figure 4.1, Figure 4.2 shows the fire extinguishers were not placed in an accessible area. So there is no use of this equipment and it was failed in its purpose what it was kept there. When there is an emergency we can't use the equipment.

3.5 LACK OF MAINTENANCE

Maintenance of all fire fighting types of equipment is the most important factor. By making a good maintenance schedule for the fire fighting equipment and following it periodical basis.

Figure 4.5 Improper maintenance

4 RESULTS AND DISCUSSION

4.1 ELECTRICAL FIRE

1. To keep away the combustible materials from the electrical panel

2. Providing flame retardant materials to interiors

3. Selection of proper electrical apparatus according to the workplace needs and hazards related to it.

4. Follow the standard operating procedures

5. Temporary connections should be avoided

6. Allocating authorized persons for the electrical works

7. Providing protective devices like ELCB, MCB, etc.

8. The proper maintenance schedule for the electrical equipment

4.2 WELDING:

1. Avoiding welding, grinding operations near combustible materials.

2. Restrict the unauthorized persons to welding

4.3 SMOKING:

1.To creating awareness to workers not using ignition sources

2. Install smoke detection system

3. Punishment or restrict the smoking zone [6].

4.4 OTHER COMMON PREVENTIVE MEASURES

1. Provide adequate space for escape root

2. Outline clear pathways to exit door

3. Conduct fire drills in periodically

4. Make your office accessible to firefighters

5. Drafting ONSITE, OFFSITE emergency plan and make to reach to all employees

6. Make the building plan handy

7. Construction should be in national building code standards

8. Promoting good safety practice among the workers

9. Periodical safety audit and continuous inspection on workplace [6].

5. CONCLUSION

Self-protection is the first and important factor in safety. By creating awareness on fire hazard and its preventive measures to all peoples who all are working in the industry from top management people to the civil workers. It is the ultimate aim of protecting workers from fire hazard then only the onsite and offsite emergency plan and fire rescue on the emergency situation was easy and effective. So the management should take ultimately responsible for Plan, Do, Check, and Act on the fire accident awareness and prevention techniques to be effective in action.

6 REFERENCES

[1]Amit Jha Sumeet Gupta ZakiHaidar Zaidi Ankit Gupta Sridhar Ramaswamy Bhawana Sharma *with inputs from* Pinkerton Global Risk Group "India risk survey 2017" Page no 5.

[2] Praveen Kumar, Mugundhan, Visagavel OCCUPATIONAL HEALTH & SAFETY IN TEXTILE INDUSTRY "International Journal of Research in Engineering and Technology (IJRET)eISSN: 2319-1163 | pISSN: 2321-7308 Page no 2.

[3] SUDHA BABEL ANDMEENAXITIWARI Occupational health hazards in textiles industry "Asian journal of home science" volume 9 June 2004 267-271

[4] K.P. Karupannan, M. Arularasuand S.R. Devadasan Study on Safety Training Programme in Textile Industries I J C T A, 10(20), 2017, pp. 221-230 ISSN: 0974-5572

7. WIBLIOGRAPHY

[5]https://www.sciencelearn.org.nz/resources/747-what-is-fire

[6]10 Measures to Assess Fire Safety" https://www.linkedin.com/pulse/10-measures-assess-fire-safety-fp-dessin/