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Hazards Measuring and Risk Controls in Textile Industry

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ABSTRACT: Inspection and Measurement Study on Health, Safety and Welfare of Textiles to develop the worker safety in Indian textile industries. The hazards and risks involved in the textiles industry are comparable to other industries, with minimal emphasis on textile industry. Many accidents do not come to the legal formalities. Many people are not aware that health and safety workers are unemployed; management has not given importance to promoting safety devices in the textile industry. The main risks are physical, chemical, ergonomics and physiologically, working hours, incorrect ventilation, dust chemical and noise are some of the things that can cause harm. The RPN (Risk priority number) has been finding out for all the hazards in the textile industry and FEA (fault tree analysis) is done for the hazard with highest RPN.

KEYWORDS: Safety, welfare, Textile industry, OHS, Hazards and Risk control.

I. INTRODUCTION

India is the second largest producer of textiles in the world. This industry accounts for almost 24% of the world's spindle capacity and 8% of global rotor capacity. Availability of raw materials such as cotton, wool, silk and jute as well as skilled workforce have made the country a sourcing hub. The textiles industry has made a major contribution to the national economy in terms of direct and indirect employment generation and net foreign exchange earnings. It provides direct employment to over 45 million people.

1.1. Objectives:

- To identify the risks in the textile industry and provide the right solutions for it.
- Measure work environment issues such that noise, temperature lighting humidity.
- Detect unsafe working condition in the Textile industry.
- To develop a framework for understanding the risks textile workers were exposed to due to lack of health and safety standards in the industry.
- To identify areas in which the hazards are involve.
- To identify how to industry can made free from risk.
- To give suggestion for avoiding the hazards.

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II. FACTOR PRODUCTION IN TEXTILE INDUSTRY

2.1. Textile Raw Materials:

A unique material which is related to the production of raw material in the textile industry. It plays a key role in the continuous production and high-quality fabric. Textile raw materials are selected as per the manufacturing policy of the company i.e. whether a composite mill or only a spinning, weaving or dyeing /finishing.

2.2. Types of textile raw materials:

- Fibers
- Fabrics
- Dye stuffs
- Chemical and auxiliaries

2.2.1. Fibers:

It is defined as one of the delicate, hair portions of the tissues of a plant or animal or other substances that are very small in diameter in relation to their length. A fiber is a material which is several hundred times as long as it's thick.

Types of Textile Fibers:

- a) Natural fiber

Example: Silk fiber, wool fiber, cotton fiber, flax fiber, jute fiber and ramie fiber.

- b) Man Made fiber

Example: Polymers, Minerals, rayon fiber.

2.2.2. Textile Fabrics:

A textile fabric is a cloth that has been woven, knitted, tufted, knotted, or bonded together using natural or synthetic threads, yarns, and other materials. Popular fabrics include cotton and leather, but even seaweed and gold have been used to make textiles.

2.2.3. Textile Dyes:

Colour is obtained in textiles and other materials by the use of colorants (Dyes and pigments). A dye can be referred as water soluble colored organic compound that has affinity for the substrate whereas pigments are usually water insoluble.

2.2.4. Auxiliaries & Chemicals:

The various processing operations may be in the functions of preparation, dyeing, printing or finishing. Auxiliaries help by speeding up these processes or carry out the processes in a more efficient manner. This is necessary to obtain the desired effect.

2.3. Labour for Textile Industry: India has gained global appreciation as an attractive outsourcing destination mainly due to its abundant availability of labor force. Indian textile industry is one of the biggest sectors in magnitude, and the second largest in terms of employment generation.

2.4. Energy Issue: Sometimes due to sudden failures machine parts are being destructed. The second and most important problem that arises is that the products are not being prepared in time for delivery which causes customer and production loss as the products are not being produced on time.

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III. METHODOLOGY

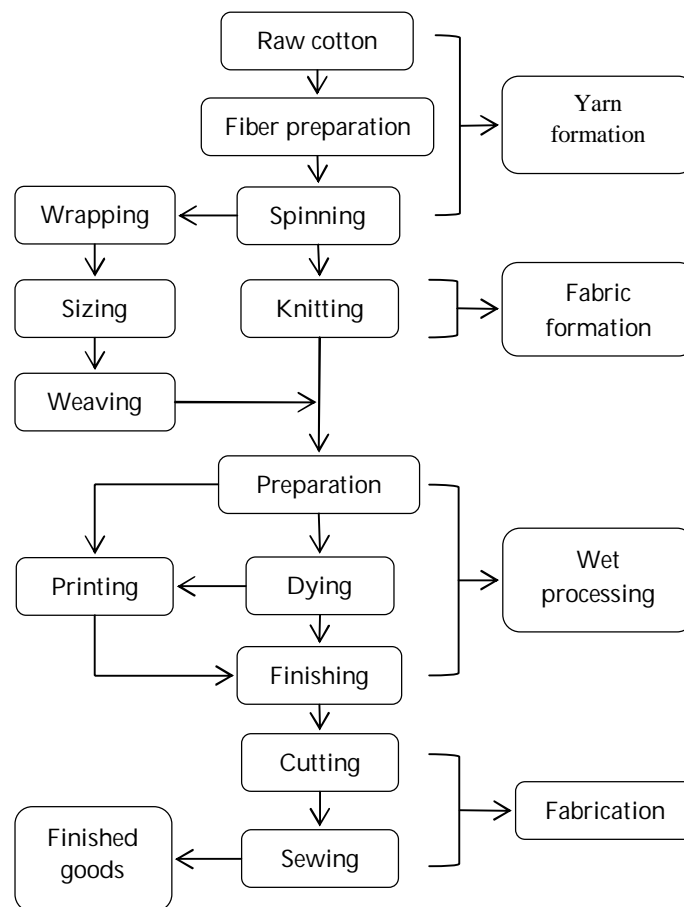


Fig 1.Process flow chart in Textile industry

3.1. Spinning: The manufacturing process for building polymer fibers is spinning. This is a specialized filter that uses a spinning to create multiple continuous filaments. There are four types of spinning: wet, dry, melt, and gel spinning.

3.2. Weaving: There are usually three types of fabric production processes; weaving, knitting and uncut. Weave technology is widely used for fabrication. Weaving is a woven fabric produced from weaving process.

3.3. Knitting: Knitting is a type of fabric manufacturing process, where cloth is produced by searching poles in the middle of the loops created by multiple threads. Knitting fabrics are formed by stitching.

3.4. Textile Finishing Process: Textile finishing usually includes treatments such as scouring, bleaching, and dyeing and/or printing, the final mechanical or chemical finishing operations, which during this stage are carried out on textile products to enhance their basic characteristics like dye penetration, printability, wet ability, colour, hand, and appearance.

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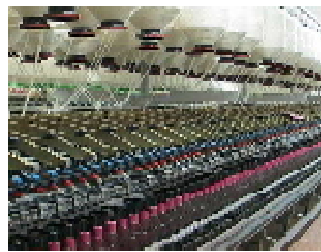
IV. HAZARDS IN TEXTILE INDUSTRY

4.1. Physical Hazard in Textile Industry: The textile industry consists of a number of units engaged in spinning, weaving, dyeing, printing, finishing and a number of other processes that are required to convert fiber into a finished fabric or garment.

Slippery surface:



Noise:



Dust:



Stress:



Fig 2. Physical hazards in textile industry

4.2. Electrical Hazards in Textile Industry: Electrical hazard can be defined as a dangerous condition where a worker could make electrical contact with energized equipment or a conductor, and from which the person may sustain an injury from shock, there is potential for the worker to receive an arc flash burn, thermal burn, or blast injury.

Improper grounding



Exposed electrical parts



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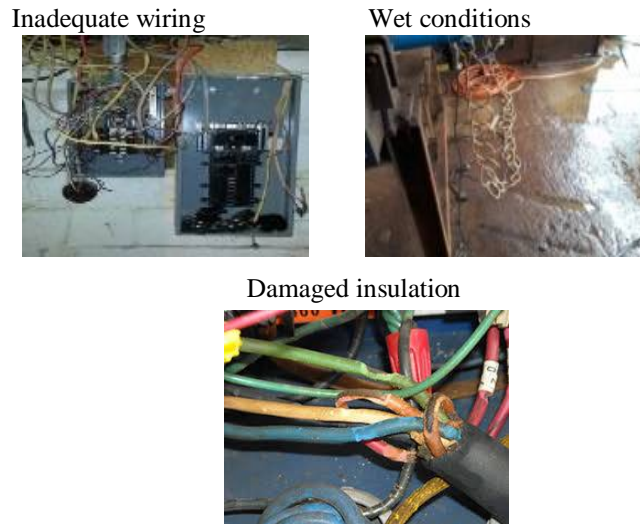


Fig 3. Electrical hazards in Textile Industry

4.3. Fire and Explosion Hazards: The textile industry produces various products out of different natural and artificial fibers. It does not only belong to the oldest, but also to the most important segments of industry. However, the production of cloth holds many risks of fire.

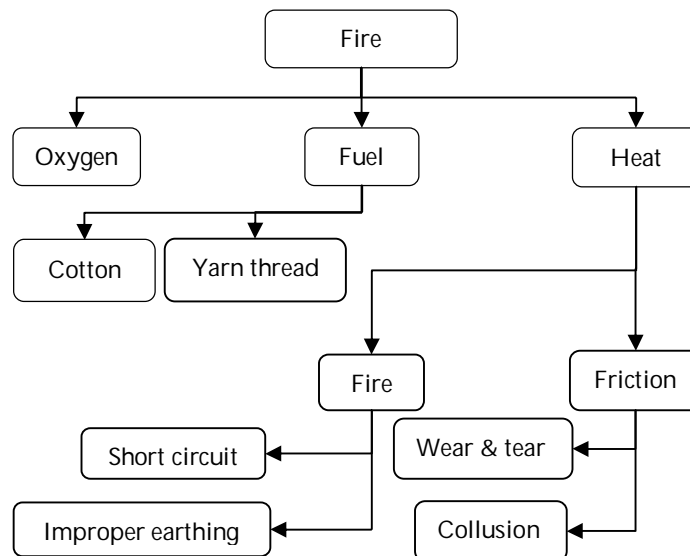


Fig 4.FEA for Fire Hazard in Textile Industry

4.4. Safety, Health and Welfare of Women's: Occupational safety and health should be managed in a gender exposure of sensitive way, being aware that there may be differences in the exposure of women to risk compared to men.

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V. HAZARD MEASURING AND RISK CONTROLS

5.1. Measuring Parameters:

Parameters	Location of the reading	Range	Mean
Lighting(lux)	Blow room	78-109	93.5
	Spinning area	51-60	55.5
	Ginning area	88-92	90
	Dyeing area	100-115	107.5
	Weaving area	90-95	92.5
Noise (dBA)	Spinning area	90-95	92.5
	Auto corner (off end & rear end)	86-89	87.5
	Weaving area	90-93	91.5
	Finishing area	85-90	87.5
Temperature(°c)	Preparatory unit	24 -30	27
	Spinning room	28-35	31.5
	Weaving room	25-33	29
	Dyeing room	32-37	34.5
	Fabric finishing room	30-34	32
Humidity (%)	Preparatory unit	-----	51.61
	Spinning room	-----	56.41
	Weaving room	-----	55.44
	Dyeing room	-----	57.83

Table 1. Measuring Parameters

5.2. Risk Priority Number:

The hazards are prioritized by the based on the RPN number. The RPN number is calculated by the multiplication of severity, occurrence and detectability.

$$\text{RPN} = \text{Severity} \times \text{occurrence} \times \text{Detectability.}$$

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RPN is calculated for all the hazards involved which are involved in the textile industry. The maximum value of risk priority number is 1000.

Rank	Severity	Occurrence	Detection
1	None	Almost Never	Almost Certain
2	Very Minor	Remote	Very High
3	Minor	Very Slight	High
4	Very Low	Slight	Moderately High
5	Low	Low	Moderate
6	Moderate	Medium	Low
7	High	Moderately High	Very Low
8	Very High	High	Remote
9	Serious	Very High	Very Remote
10	Hazardous	Almost Certain	Almost Impossible

Tabel 2. Risk Priority Number

S. NO	HAZARDS	RPN NO = Severity x detect ability x Occurrence.
1	Physical hazards:	
	a)Noise	7x6x8 = 336
	b)Dust	8X8X9=576
	c)Light	5x5x4 = 100

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2	Fire Hazards:	
	a)Electrical short circuit happens	7x4x6 =168
3	Electrical hazards:	
	a)Improper Earthing	6x7x7 =294
	b)Improper isolation	6x6x6 =216
	c)Motor high speed rotating Due to high voltage	6x6x7=252
	d)Input power cable exceeds More output	6x6x7=252
	e)Electrical Maintenance	7x6x7=294
4	Ergonomically Hazards:	
	a) Uncomfortable work station and height.	7x7x6=294
	b) Repetitive strain injuries	8x7x6=336
5	Physiological hazards:	
	a) Not interested to work	7x7x6=294
	b) Production target	6x6x6=216

Tabel 3. Risk priority number in textile industry

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5.3. Assesment Result:

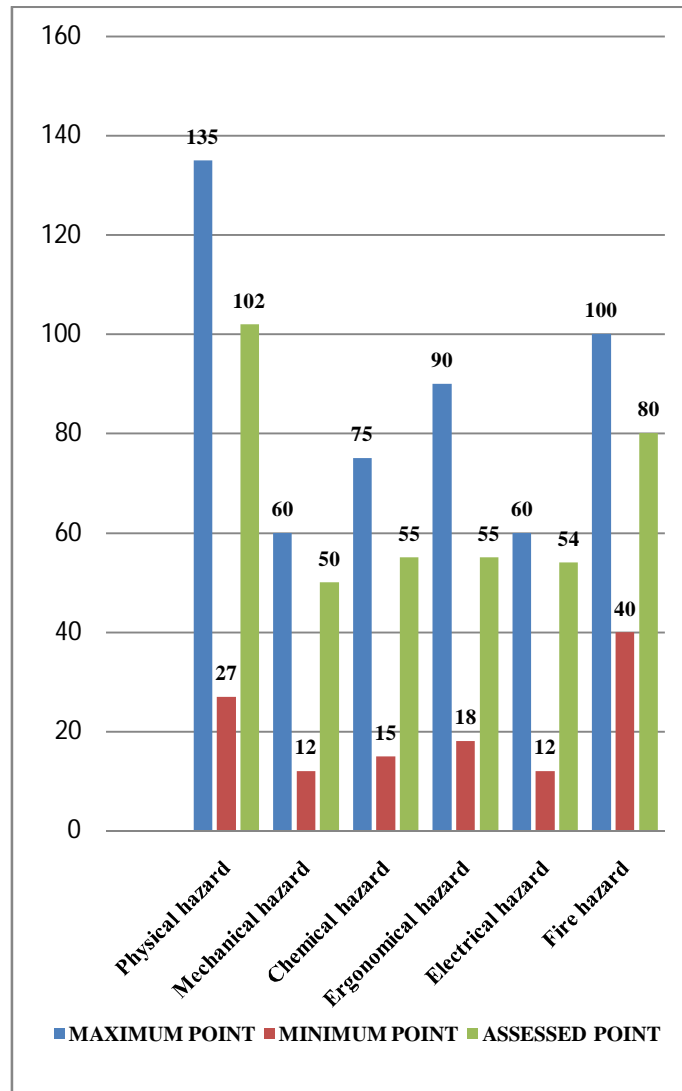


Fig 5. Assesment chart

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5.4. Remedial Measures:

S.NO	HAZARDS	CAUSE	EFFECT	REMEDIAL MEASURES
PHYSICAL HAZARDS				
1	Noise	<ul style="list-style-type: none"> Simple gear, Continuous gear train, Chain drive, Bevel drive, Worm and worm wheel Variable drive. 	<ul style="list-style-type: none"> Sound levels cause trauma to the cochlear structure in the inner ear. It will cause high blood pressure. It affects sleep and work performance 	<ul style="list-style-type: none"> Isolation of the machine and Silencer must be kept. Inverted drive control noise in ring frame. Proper maintenance lubricating control noise.
2	Dust	<ul style="list-style-type: none"> Cotton Fiber particles 	<ul style="list-style-type: none"> Causes respiratory problems and causes Byssinosis 	<ul style="list-style-type: none"> Dust collector, Proper Housekeeping Necessary PPE should were by worker.
3	Lighting	<ul style="list-style-type: none"> High beam and Low beam of light 	<ul style="list-style-type: none"> Eye strain Glaring and Irritation of eye 	<ul style="list-style-type: none"> Proper lightning condition Provide safety goggles for reduce eye strain for improper lighting condition.
FIRE HAZARDS				
1	Welding operation	<ul style="list-style-type: none"> Welding sparks 	<ul style="list-style-type: none"> Spark ignition is very dangerous. 	<ul style="list-style-type: none"> Restrict unauthorized person to do welding
2	Electrical short circuit happens	<ul style="list-style-type: none"> Improper earthing and Insulations 	<ul style="list-style-type: none"> If no trip occurs its get sparks and get fire. 	<ul style="list-style-type: none"> ACB (Air circuit breaker), MCB (motor circuit breaker).
3	Smoking	<ul style="list-style-type: none"> Easily ignitable materials 	<ul style="list-style-type: none"> Easily gets fire 	<ul style="list-style-type: none"> Safety signs & workers must aware of not using any ignition product
4	Flammable dyestuffs	<ul style="list-style-type: none"> Dyes 	<ul style="list-style-type: none"> It may be easily ignited 	<ul style="list-style-type: none"> To store the dye stuffs in safe place. To maintain properly.
ELECTRICAL HAZARDS				
1	Improper Earthing and Moisture	<ul style="list-style-type: none"> Poor house keeping Improper circuit connections 	<ul style="list-style-type: none"> Trip occurs Electric shock 	<ul style="list-style-type: none"> Avoid improper earthing and loose connection, All circuits to be enclosed in a proper circuit. Proper housekeeping.
3	Input power cable exceeds More output	<ul style="list-style-type: none"> Using low quality cables. 	<ul style="list-style-type: none"> Cable melting & switch becomes heat 	<ul style="list-style-type: none"> Input wire must be more power than output wire.
4	Looping in the running line.	<ul style="list-style-type: none"> Improper looping system 	<ul style="list-style-type: none"> Electronics PCB 	<ul style="list-style-type: none"> Avoid looping ECB board Check the connection

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5	Electrical Maintenance	<ul style="list-style-type: none"> Improper electrical maintenance 	<ul style="list-style-type: none"> Easily get fire with the friction of motors 	<ul style="list-style-type: none"> Needs preventive maintenance Grease the motor frequently.
CHEMICAL HAZARDS				
1	Bleaching	<ul style="list-style-type: none"> Chlorine powders 	<ul style="list-style-type: none"> Exposed to dangerous levels of chlorine, a skin and eye irritant Dangerous pulmonary Tissue irritant causing delayed lung oedema. 	<ul style="list-style-type: none"> Suitable PPE, including eye-protective equipment Use personal protective equipment
2	Corrosion	<ul style="list-style-type: none"> Alkalis and acids 	<ul style="list-style-type: none"> Expose the workers to the risk of burns and scalds 	<ul style="list-style-type: none"> Protective clothing should be cleaned at regular intervals
ERGONOMICS HAZARDS				
1	Uncomfortable work station and height.	<ul style="list-style-type: none"> Improper height 	<ul style="list-style-type: none"> Pain in hand and legs. 	<ul style="list-style-type: none"> Importance to ergonomics Practicing shifts Provide height adjustable chairs so individual operator can work at their preferred work height
2	Repetitive strain injuries	<ul style="list-style-type: none"> Repeating of work 	<ul style="list-style-type: none"> Wrist, Neck, Shoulder, Neck, Knee, Angle. 	<ul style="list-style-type: none"> Proper working procedure Raised platforms to help operators reach badly located controls Proper orientation of machine to prevent squatting posture
PSYCHOLOGICAL HAZARDS				
1	Not interested to work	<ul style="list-style-type: none"> Physiological problem 	<ul style="list-style-type: none"> Trauma Anxiety disorder Bipolar and Related disorder Neurodevelopment disorder. 	<ul style="list-style-type: none"> Give counseling.
2	Production target	<ul style="list-style-type: none"> Stress to the worker 	<ul style="list-style-type: none"> High blood pressure Nervousness and tensions Uncooperative attitude Digestive problem 	<ul style="list-style-type: none"> Set achievable Target.

Table 4. Remedial Measures

The following suggestions can be made to improve the safety and health conditions in textile units:

- The seats of the workers and the tables should be well aligned in height so that there is no musculoskeletal strain.
- There should be proper lighting at the place of work so that eye strain can be avoided.
- Machinery should be well maintained in order to reduce the level of noise. If necessary, certain parts of machines can be replaced.

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- In case the noise level cannot be controlled, workers should be provided with earplugs so that exposure to noise can be reduced.
- Workers can be rotated within jobs so that they are not faced with continuous noise exposure for a long period of time.
- There should be proper ventilation at the place of work.
- In order to reduce the exposure to dust, workers should be provided with masks.
- Trained medical personnel and first aid facilities as well as safety equipments such as fire extinguishers and fire alarms should be available at the place of work.
- In units where there is heavy exposure to dangerous chemicals, workers should be provided with safety gloves.
- Proper dust control equipment should be set up and maintained to reduce the workers exposure to cotton dust.

V. CONCLUSION

The Project was done with an intention to study and measure the hazardous effects over people working in the Textile industry. Big risks are physical, electrical, chemical ergonomics and physiological hazards. Some of these complications produce more work time, noise, dust, chemical and improper ventilation. These problems are controlled by using checklists, give recommendation and suggestions also give proper remedial measures. The proper design of human body capabilities and equipment only works in accordance with the environment. With the aim of continuous improvement, the workforce will focus on realizing their health and safety in the workplace.

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