

Occupational Health and Safety Issues in Textile Spinning Industry

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Abstract

The textile industry in India contributes significantly to the growth of the Indian economy and plays a vital role in giving employment to the country's rural and urban populations, it fails to promote education and health as essential aspects of the human development. The study of Occupational Health and Safety in the Spinning Industry focuses about how to increase worker health and safety in India. Yarn spinning is the process of turning fiber materials into yarns used in textile fabrics and industries. Fibers go through a series of procedures in spinning mills before being converted into yarn. Opening, where the bails are opened, is a section of every spinning mill. After that, the fibers are put into machines that go through carding, combining, and lastly twisting to make yarn. The spinning production process are involved in various of safety and health issues. Ergonomics increases a person's health, safety, and comfort at work so, ergonomics consideration is also important in the spinning industry. The goal of this article would be to provide a framework for understanding the hazards that textile employees are facing as a result of a lack of health and safety standards in the industry.

Keywords: Spinning Industry; Occupational Health and Safety (OHS); Hazards; Ergonomics

Introduction

The textile industry in India contributes significantly to the country's economy and employs a large number of people in peri-urban and rural regions. Apart from supplying one of life's most fundamental commodities, clothes, the textile sector accounts for around 14% of the country's industrial production. The industry employs approximately 35 million people, making it the country's second-largest employment after agriculture [1].

Spinning is the process that turns fibers into yarn. These fibers can be natural (cotton) or manmade fibers (polyester). Spinning also includes the creation of synthetic filament yarn (yarn that is not made from fibers). Yarn is the end result of spinning. Spinning

is the foundation process and all the subsequent value additions i.e., Weaving, Knitting, Processing, Garments and Made ups, depend upon it. Any variation in quality of spinning product directly affects the entire value chain. Occupational health issues, including breathing problems and respiratory illnesses caused by cotton dust inhalation, are frequent in the industry. Health must be considered in the context of a worker's regular activities [2].

Occupational hazards can have an adverse effect on human body. Aside from asymptomatic physiological and biochemical changes, adverse consequences might include symptoms of sickness, diagnosed illnesses, and death. There is a definite link between the exposure and the illness for some risk factors. A chemical, physical,

biological, or other agent that may affect an individual at work and is possibly modifiable is referred to as an “occupational risk factor”. Figure 1 shows the selected risk factors along with related health outcomes [3].

Figure 1: Relationship between occupational risk factors and outcomes.

Exposure of cotton disease called byssinosis. Chest tightness, breathing difficulties, asthma, and inflammation of the respiratory tract are some of the symptoms. The study discusses the overcrowding of workers, the inadequate condition of the machine, the worker’s ergonomic problems, dust problems, bad lighting, ventilation, and the lack of personal protection equipment not provided OHS in these industries [4].

Occupational health hazards in the textile industry, such as byssinosis, bronchitis, diffused lung disease, and other breathing problems, are mostly caused by poor machine conditions, ergonomic concerns, and environmental factors such as humidity, lighting, and ventilation. Cotton dust and noise are the major environmental hazards which cause health risk in a spinning mill. Out of these two, the cotton dust and fly, released in the spinning room environment, contribute maximum to the health hazards of the workers. Byssinosis is already recognized as a disease that affects cotton spinning. Shortness of breath, cough, and chest tightness are common symptoms on the first day back today [5].

Spinning milling is a hazardous operation. Fiber dust is a mixture of many substances that may have accumulated with the cotton during the growing, harvesting, and subsequent processing or storage periods, including ground up plant matter, fiber, bacteria, fungi, soil, pesticides, non-cotton plant matter, and other contaminants that may have accumulated with the cotton during the growing, harvesting, and subsequent processing or storage periods. The objective of present investigation was to explore the occupational hazards faced by textile mill workers while handling of fiber and yarn along with their existing clothing practices and safety measures used [6]. The author performed research to determine the effects of cotton dust exposure on oxidant and antioxidant levels in the spinning section, which could result in health risks such as oxidative stress and low immunoglobulin levels (IgG and IgM).

Ergonomics increases a person’s health, safety, and comfort at work by increasing the efficiency and productivity of a production or commercial system. The aim of ergonomics is to establish the best fit between a person and his or her working environment. According to the study, the duties done during bale breaking necessitated personnel receiving frequent training on the correct and safe manual handling of heavy lint in order to avoid back injuries and other musculoskeletal illnesses.

The cotton-spinning industry in Zimbabwe uses equipment that is both modern and old. The cotton-spinning procedures were comparable in all of the factories examined, and the ergonomic evaluations concentrated on the bale breaking, waste press, ring frame, and winding processes. These are the ergonomic dangers that have been discovered, and remedies have been proposed. Poor postures observed during wire cutting of cotton bales should be avoided, as they cause local mechanical stress on muscles, ligaments, and joints, resulting in neck, back, shoulder, wrist, and other musculoskeletal system issues [7].

Employees in this profession frequently work under difficult conditions, including poor trunk, neck, and upper extremity postures, as well as monotonous repetitive actions, resulting in a significant frequency of musculoskeletal problems, according to the study. According to the findings, appropriate treatments in the form of safe postures are advised. Basic instruction on the benefits of healthy posture and specific types of stretching exercises was given to the personnel.

Hazards in spinning industry

In the blowing room, a spinning machine opened raw cotton bales and cleaned the cotton. After that, the cotton staples are carded into lap. Straighten it up and make it into roving. One of two technologies is presently used to spin the roving: a mule or a ring frame. The yarn can be doubled and spun into thread, or it can be ready to weave. In this machine process various levels are added to convert cotton fiber into yarn to process it further for textile products.

There are Many health issues and safety issues happened to spinning industry

- Noise - High noise level, No Lubrication
- Chemical - Skin allergy, Eye pain
- Electrical - Low light Illumination, old wires, No proper Earthing
- Psychosocial issues – Night shift, Over Time, Polluted water, No employee motivation
- Ergonomic- unsafe work place, unable to Sit.

Working and living condition of worker

Overworked labour force

All workers, whether they want to work or not, are required to work for a total of 12 hours. Overtime is not included in these 12 hours. Some employees say that they are forced to work longer hours. According to section 51 of the Factories Act of 1948, no worker shall work more than 48 hours per week, and extra working days must be compensated [8].

Unprotected working condition

As we all know, inhaling cotton fibre causes BYSONIS. As a result, masks are required in certain working environments, yet no one follows these safety precautions. Women and children are prohibited from working near cotton openers, according to the factories legislation of 1948, chapter -4, section 27.

Types of hazards

Exposure to noise

Most textile manufacturing facilities, particularly those in developing countries, have been shown to high levels of noise. Long-term exposure to excessive noise levels has been associated

to eardrum damage and hearing loss. Continuous noise exposure has also been linked to other issues including as weariness, absenteeism, irritation, anxiety, decreased efficiency, changes in pulse rate and blood pressure, and sleep disturbances. One of the biggest causes of noise pollution in a majority of units is a lack of effective machinery maintenance. Noise exposure is usually ignored by textile units, despite the fact that it has major health consequences. Its effects are not immediately obvious, and there is no discomfort. A survey of 77 textile mill employees in Nagpur was undertaken. According to the findings, 76.6 percent of the employees were at risk for noise-induced hearing loss. According to R. Steinberg, J. Hannak, and K. Balakrishnan's research of Indian textile plants, 21.3 percent of the employees had noise-induced hearing loss [9].

The great majority of material-processing facilities, particularly those in developing countries, have seen very high levels of commotion. The spinning and weaving industries produce a lot of noise, and long periods of exposure to this level of noise can cause hearing damage. Weariness, nonappearance, inconvenient, stress, diminished effectiveness, alterations in heart rate and circulatory strain, and also rest troubles have all been reported as a result of continuous noise production. Noise pollution is caused by a lack of adequate hardware maintenance [10].

Noise is another type of pollution produced by industries, and the spinning sector is no exception. Workers who are subjected to industrial noise of potentially harmful quality and intensity suffer from varying degrees of hearing loss as well as other physiological diseases or stressors, in addition to poor job performance. Long-term exposure to noise levels over 90 decibels can result in hearing loss. The noise level in the spinning section was about 96.5 dBA, which is fairly high, according to studies made in several Bombay mills. The maximum permitted noise levels for an 8-hour exposure have been set at 90 decibels. In a spinning mill, precautions must be made to keep noise levels below the legal limit [5]. Time of exposure limit per day in hours and noise level is indicated in Table 1.

Exposure to cotton dust

Cotton workers are exposed to considerable levels of cotton dust while processing and spinning cotton. They are also exposed

Time of Exposure limit per day in hours	Sound level in dB
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
¾	107
½	110
¼	115

Table 1: Remedial measure.

to pesticide and soil particles. Textile workers have respiratory problems as a result of exposure to cotton dust and other particles. Byssinosis, often known as brown lung, is a deadly illness that affects persons who work in the textile industry due to excessive exposure to cotton dust. Chest tightness, coughing, wheezing, and shortness of breath are all signs of this condition. In the United States in 1938, it was believed that 35000 people had already been infected with the illness, with another 100,000 at danger of developing it. As a result, the Occupational Safety and Health Administration (OSHA) made it mandatory for textile firms to safeguard their workers from excessive exposure to cotton dust and its harmful consequences. The Occupational Safety and Health Administration (OSHA) established requirements that apply to all private businesses in the textile sector in the United States. The Occupational Safety and Health Administration (OSHA) has established a Cotton Dust Standard in order to reduce worker exposure to cotton dust and protect them from the danger of byssinosis. It has established Permissible Exposure Limits (PELs) for cotton dust in several textile activities. This standard has greatly reduced the rate of byssinosis occurrence [9].

Cotton workers are exposed to a lot of dust when they're processing and spinning the cotton. Pesticide and soil particles also come into contact with them. Textile workers have respiratory problems as a result of being exposed to cotton dust and other particles. Byssinosis, often known as darker lung, is a fatal ailment induced by excessive exposure to cotton dust among textile workers.

OSHA Cotton dust standard has established at 200 micrograms per cubic meter of air for 8-hour in the case of yarn manufacture, 500 micrograms in the case of material waste households, 750 micrograms in the case of weaving operations, and 1000 micrograms in the case of waste recycling [11].

Occupational disease

Long-term exposure to cotton dust causes byssinosis, a progressive respiratory disease. The maximum number of cases recorded in 1960s and early 70s for the age group of 51 – 60 years. Long-term byssinosis, in its irreversible third stage, has been linked to chronic lung illness. Only for lower fractions of dust has an association with the prevalence of byssinosis in spinning mills. This corresponds to the maximal dust accumulation in the lungs, which occurs in this range. The mean diameter of dust and the frequency of byssinosis have a strong relationship. The fact that finer dust produces greater byssinosis is self-evident.

Breathability of dust

The part of the dust that tends to stay in the lungs (breathing dust) is hazardous to one's health. The deposits in the lungs are proportional to the particle size, with the highest deposition occurring for dust particles smaller than 4 µm (particulate matter).

Waste in cotton and cotton dust

The trash content of cotton and the airborne dust created by mechanical spinning operations have a strong relationship. As the trash content of raw cotton grows, so does the amount of dust in the air. The ratio of dust to trash content, on the other hand, declines as garbage content increases and approaches a constant value at greater trash levels.

Fine dust

A difference is established between total dust and fine dust when analysing the room air conditions at work for medical reasons (defined as breathable dust and fraction entering the lung). Many fibre elements are present in total dust, but they are not the primary cause of the health danger. To the naked eye, the tiny dust hanging in the room air is undetectable in its intricacies. It only becomes visible as mist at larger quantities. This thin, breathable dust is extremely harmful.

Ergonomic issues

Cotton spinning is a significant process in India's small-scale and village textile businesses. In traditional workshops in these sectors, a large proportion of women employees involved in cotton

spinning processing assume a crouching position. They were monitored and assessed using the Rapid Upper Limb Assessment (RULA) approach (Figure 2), as well as their exposure to Work related Musculoskeletal Disorders (WMSDs).



Figure 1: Relationship between occupational risk factors and outcomes.

Twisting, bending, and reaching are found to be the outcome of poorly built work stations [12]. In India, a considerable portion of the units engaged in material-related activities have ergonomic issues. The majority of ergonomic issues result in worker health and safety being compromised. Workers in these facilities face a variety of challenges, including unacceptably uncomfortable furniture, insufficient ventilation and lighting, and a lack of efficient

safety precautions in the event of a crisis. Workers are at risk of having different occupational disorders. Carpal tunnel syndrome, lower arm tendonitis, back discomfort, shoulder pain, neck pain, and osteoarthritis of the knees are just a few of the musculoskeletal illnesses that have been reported to doctors as a result of poor ergonomic design [10]. This is shown in Table 2.

Condition	Exposure
Musculoskeletal disorders	
Carpal tunnel syndrome, forearm tendinitis, De Quervain’s tenosynovitis, epicondylitis, bicipital tendinitis, rotator cuff tears and tendinitis, trapezius spasm, cervical radiculopathy, low-back syndrome, sciatica, disc herniation, osteoarthritis of the knees	Force Repetition Lifting Non-neutral postures, Prolonged sitting
Asthma	Formaldehyde Other fabric treatments Heated plastics Dust
Hearing Loss	Noise

Table 2: Occupational diseases in spinning industry [9].

Operators in these locations stand for long periods of time, which might result in back injuries and leg issues. Because the working height is not adjustable, particularly during the winding process, tall employees are forced to work with bent backs and necks, causing back and neck discomfort. Workers pull and push knee-high trolleys housing tubes onto which yarn is spun, which requires a lot of human manipulation. The trolleys at some spinning factories had wheels, whereas in others they didn’t, making them more difficult to push and pull. Because the trolleys in certain industries are knee height, workers are forced to bend most of the time when pushing and pulling. Workers should be permitted to sit for short periods of time to allow their legs to relax. Trolleys should be equipped with wheels to make them simpler to push and pull. The handles on the trolleys should be at waist height to ensure that they can be handled in an upright position.

Ergonomically Hazards and details of working environment in spinning industries [8] are shown in Table 3 and 4.

Sl. No	Hazard	Issues	Remedial Action
1	Uncomfortable work station and height.	Pain in hand and legs.	Importance to ergonomics
2	Repetitive strain injuries	Wrist, Neck, Shoulder, Neck, Knee, Angle.	Proper working procedure
Physiological hazards			
1	Not interested to work	Physiological problem	Give counselling
2	Production target	Stress to the worker	Set achievable Target.

Table 3: Ergonomically hazards.

Parameters	Reading of the location	Range
Lighting (lux)	Blow room	78-109
	Spinning area	51-60
Noise (dBA)	Spinning area	90-95
	Auto corner (off end & rear end)	86-89
Temperature (*c)	Preparatory unit	24-30
	Spinning room	28-35

Table 4: Details of working environment in spinning industries.

Accidents

Accidents in traditional spinning mills were formerly a common occurrence. Workers were exposed to the potential of mishaps beginning with the opening of bales and continuing through material handling and machine operation. Accidents have, however, decreased as a result of the introduction of new machinery, material handling systems, equipment, and tools. All sections of the hazardous devices, in particular, are carefully protected. They’ve also got the essential fasteners and bolts on the doors and coverings. Also included are appropriate safety stop gestures.

Fire

Cotton is a flammable substance, making it prone to fire. It is particularly prone to fire in the blow room and on the cards; any spark created in these areas might not only start a fire, but also spread it to other machines via the cotton conveying system.

Conclusion

In any industry, safety and health procedures are critical. Workers must be aware of the different occupational hazards that present in the industry. At the same time, management must take the necessary measures to safeguard employees from potentially hazardous conditions.

The following suggestions can be made to improve the safety and health conditions in spinning industry:

- In order to reduce noise levels, machinery should be adequately maintained. Certain machine parts can be replaced if necessary.
- Workers should be given with earplugs if the noise level cannot be controlled. This will decrease their exposure to noise.
- Workers can be rotated among their jobs so that they are not forced to constant noise for long periods of time.
- At the workplace, there should be proper ventilation is required.
- Workers should be provided with masks to decrease direct exposure to dust.
- To prevent worker exposure to cotton dust, proper dust control equipment should be installed and maintained.
- Evaluate all manual handling operations and hazards that might result in musculoskeletal problems.
- Examine current injury records related to manual handling, such as days lost due to back strain, fatigue, and handling injuries, as well as the cost to the company.
- Train employees both during induction and on a regular basis, and highlight the risk of back injury through the use of posters, films, and other means of making people aware.
- To avoid the spread of fire in spinning, several contemporary devices are available, such as smoke alarms and CO₂ flooding.
- Using safe machine guards and personal protective equipment to avoid accidents. Accidents have also been reduced because of automation in material transportation and in hazardous areas.
- Employers should conduct medical examinations for their employees on a regular basis. Management should take necessary steps if serious occupational health issues are identified.

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