

HSE ISSUES IN TEXTILE INDUSTRY

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Abstract : The textile manufacturing sector is excessively fragmented as well as labor intensive. This sector is one of the important division in improving economy of a nation. The textile manufacturing industry involves a wide number of division and process units that are involved in spinning, weaving, printing and a many more processes. Thus there are various health as well as safety matters are associated with the textile division. The content of the presented work contains the health, safety as well as environmental issues in the textile sector. By health and safety issues means the occupational health hazards that include physical hazards, chemical related hazards, biological issues, ergonomical hazards and by environmental aspects means the effect of chemical gases and liquids released by textile plants on environment. All the above mentioned safety issues are presented in the length of the project. The topic of the project comprises of the objective to study the basic of textile plants, its background, its working environmental along with the growth of textile sector with the consideration of safety measures, another objective is to study major work environment issues in textile units along with the analysis of the hazards and associated risk and to study the appropriate measure to control. Along with the above mentioned objective another objective is to determine the various unsafe condition prevailing in the textile units that is done by the consideration of various case studies. All the above stated objectives together achieve the aim of studying as well as determining the health, safety as well as environmental issues in the various units of textile manufacturing industry.

Keywords:

Textile Manufacturing Industry, Health, Safety Issues, Environment, Effluent Treatment, Accidents.

1.) Introduction:

The textile industry is one of the main as well as important production division in improving the economic condition of a country whether it is a developing nation or a well developed nation[1]. The textile industry of our country has achieved greater heights as compared to rest of the textile industries all over the globe with large variety of unmatched fresh material base along with the chain of manufacturing strength. India comes at second position in manufacturing along with exporting of textile[1]. The first position is secured by the world largest populated country China[1].

When it comes at defining a textile it is demarcated as a material which is flexible and that consist a network of fibres that can be natural as well as artificial (yarn as well as thread). The textiles are manufactured by the process of weaving, tatting, felting, knotting, crocheting, braiding and many more process are taken into account. A textile manufacturing industry is basically involved in the manufacturing as well as production of yarn, cloth along with the subsequent designing of the manufactured textile along with its adequate distribution. A textile manufacturing plant is epitomized by a lot of adequate technologies, material as well as techniques[1].

a) Organized Sector:- The sector which is demarcated as organised is represented by organised mills that further include spinning mills as well as composite mills. A composite mill include the process of spinning , weaving as well as processing activities and all these activities under the same roof.

b) Decentralized Sector:- This textile sector is mainly involved in the activity such as weaving that makes it totally depended on the well centralized sector for their need of yarn. This unorganized sector consists of main three parts which are as powerloom, handlooms and the last one is hosiery.

The textile sector is divided into many sub sectors:

a) The first step involves the treatment of raw substance which consists of the activities such as preparation along with the production of a variety of fibres as well as the manufacturing of yarns by the process of spinning[2].

b) The fibres from nature that include cotton, wool as well as silk[2].

c) Artificially made fibres that include fibres of cellulosic that involve viscose, polyester (that is a synthetic fibre), along with the fibres from inorganic sources for example glass[2].

2.) Objective of the study:

The major objectives of the study to fulfil the aim of the work are described as follows:

a. To study the textile manufacturing industry, its background, its work culture as well as growth.

b. To study about the major work environment issue such as sound, warmth, humidity.

c. To evaluate the hazards in the textile plants along with the study of the adequate measures to control them.

d. Identification of the various effects of variety of industrial occupational exposures along with effect of accident on human health.

e. Detect unsafe condition of working in various textile units.

3.) Working Methodology:

We divided our methodology of working to fulfill the main aim into three major steps:

a. Study of textile plants along with its history and growth as well as safety factors.

b. Analysis of the hazards in various units of textile units by studying various data of companies and the type of product that they manufacture. Hazards include:

- Occupational Hazards.
- Environmental Hazards.
- Biological Hazards.
- Other Hazards.

c. Introduction to various case studies of accidents along with the reason of accidents in the field of textile sector.

4.) Review of Literature:

[P Pavithra Anitharajathi et al. 2017] All the major safety and health issue in the textile industry, classification of issue, exposure to cotton dust, exposure to chemicals, exposure to noise, action of effluent from textile industry, measurement of the problem.

[Tiwari meenaxi et al. 2014] What is occupational health, occupational health in textile industry, health hazards in various units, preventive measure used in the textile mill, prevention to be taken in different units.

[Jaiswal Ajeet et al. 2015] Workplace hazards, exposure to cotton dust, exposure to noise ergonomic issues, healthcare and social assistance.

[<http://osha.europa.eu>, European agency safety and health at work] Textile industry in Europe, hazards and risk in the textile sectors musculoskeletal disorder, exposure to chemical agents, exposure to dust and fibres, exposure to biological agents, managing the safety and health of women in the textile sector.

[Dixit pankaj et al.2019] Working of the textile industry. Inclusive growth in the industry, corporate social responsibility, cottage industry, unorganized sector.

[Karcioglu Ozgur et al.2012] Work- related injuries in textile industry workers in Turkey, causes of injuries, physical characteristics of injury, prevention in the different units of the industry.

5.) History of Textile Industries:

The industry of the textile business has been mainly involved in the designing, producing and distributing yarn, different varieties of cloth and clothing. It is dependent on the raw material. Which may be natural, or artificial synthetic products on chemical which involves the chemical industry. The basic need of the textile industry is cotton and the cotton is regarded as the most important natural fibre of the world in 2015, the global produce of the cotton was about 40 million tonnes from about 35 million hectares cultivation from more than 55 countries[1].

a) The first unit or stage involves, of course the cultivation and harvesting of the cotton.

b) Once, the cultivation and harvesting is done the preparatory stage starts which means production of the raw material ready to use by the industries.

c) Third unit involves the spinning and yarn unit. In this unit, Spinning of the raw material is done[1].

d) The Fourth unit is that of weaving stage. In this the weaving of the fabric is done.

e) The last stage is of finishing the Making of the fabric and readying it for sale[1].

6.) India and textile sector:

The sector of textile occupies a very unique and specific place in our country india. This textile division is one of the oldest sector in India[3]. Significant contribution has been made by this textile sector in the term of providing employment as well as it is most important pillar of indian economy. The textile sector of our country is at great heights as compared to rest of the world interms of raw material as well base of textile manufacturing division[3]. On an average it is found that around 27% of the earning from the foreign exchange is just from the export of textile as well as clothing from our country to others. The raw textile sector along with the clothing sector together contribute to about 16% in the industrial production and around 6% to the gross domestic goods of the nation[3].

Different divisions of textile sector :-

a) The sector of human made fibres/ yarn along with powerloom sector: This division of textile manufacturing

industry consists of units of fiber as well as of filament yarn. The powerloom sector falls under decentralized sector.

b) The sector of cotton: This division is main source of employment. This sector provides employment to around 50 million people in various activities like cultivation, in processing units as well as in trade of the finished goods.

c) The sector of handloom: It is found that this sector is the second largest division in providing employment after agriculture

d) The sector of wool: This sector is an well organised as well as decentralized sector. This division is mainly rural based. On global basis India is the 7th largest wool producer along with this has 1.8% of share in total production of world.

e) The Sector of handcraft: This division is largely labor based, cottage as well as decentralized sector. Large no. of population is involved in this sector that involves the craft persons in the village areas as well as in semi rural areas, it also generates foreign goods exchange, by maintaining its inner culture[3].

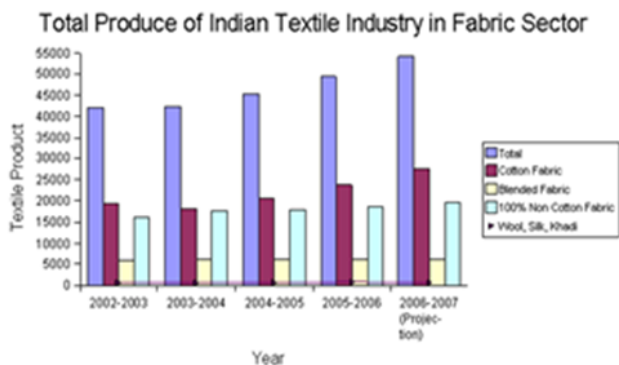


Fig 1: Growth of Indian textile industry [1].

pesticides and the soil various dangerous respiratory problems can also be caused to the textiles workers.

7.1) Risks caused due to the exposure to the chemicals:

The textile industry also includes various chemicals for the different processes of the printing, dyeing, finishing etc. Hence the workers who are engaged in there units are exposed to the problems and hazards that can be caused due to the contact of the highly corrosive acids and other chemicals different chemicals of the nature of benzidine[5]. Optical brighteners, crease- resistance agents, solvents, formaldehydes, fixatives, retardents like the organophosphorus and the organobromine compounds and the agents of antimicrobial nature etc. are used in the processings of the textile operations. The studies shows that the contact with these formaldehyde can cause cancers of the nose, lung and brain as well can cause leukemia which are fatal in nature[5]. These chemicals are also known to cause stomach cancer as well as oesophageal cancer in the textile Industry, the workers can also suffer from the thyroid cancer, testicular or nasal cancer due to these chemicals[5].



Fig 2: Various chemicals used in clothes[2].

7.) Major safety and health aspects in textile Industry:

In the textile industry, there are various units Working together for the processing of the textile these units includes the processes like spinning of the yarn, weaving of the wool, dyeing of the clothes, printing and finishing processes etc[4]. All these units are required for converting the fibre into the finished product with all these units, there is an association of several health and safety issues like the risk of problems that can be caused by the over- exposure to the cotton dust or the exposure to the harmful chemicals. Exposure to the noise and other ergonomic issues are also dangerous for the health[4].

Risks related with the exposure to cotton dust many workers are engaged in the processing and the spinning of the cotton and hence are exposed to the varying amount of cotton dust[4]. These dust also includes the particles of the

7.2) Risks associated with the exposure to the noise:

The machinery working in the textile industry work with high noises and hence produce noise pollution high levels of noises have been recorded at the different units of the textile industry[6]. The pollution are not taken so seriously but in the long run, the noise pollution can cause serious damage to the eardrums and can cause hearing problems[6].It can even cause problems like fatigue, anxiety, reduction in efficiency, change in the pulse rate etc. and can even disturb the blood pressure of the body. The noise pollution can even cause sleeping disorders. But still its effect are highly ignored as there is no immediate change that is seen and also there is absence of any pain[6].



Fig 3: Too Loud too long[3].

7.3) Occupational Hazards in the Textile industry:

A study done on the textile units of the surat between the year 2014 to 2016 showed that about 85 accidents in which about 114 died and about 375 were fatality injured[7]. The major causes of these accidental deaths were the reasons like fall from heights, asphyxiation, injuries of mechanical nature, injuries caused due to the material handling and inhalations of the fiber or the cotton dust these fatalities are caused due to the ill- management and careless attitude towards the health safety of the workers[7]. There are various units in the textile industries the injuries units in the textile industries the injuries related to the production and ginning units includes the injuries of the eyes, back, fingers, arms, leg and head injuries the yarn manufacture unit includes machineries of very high rotary and travelling speeds they cause noise pollution which results in headache or 'dizziness'. The areas of the industry workplaces should be regularly cleaned in order to get rid of the hazardous chemicals and cotton dust, the system for ventilation should be put on in order to prevent any leakage of gas etc. All the precautionary methods should be taken in order to stop the fatal accident and injury occurrences among the workers[7].



Fig 4: Occupational health and safety[3].

7.4) Industrial Hazard in the Textile industry:

There are various hazards of the industrial nature related to the textile industry. The foremost nature related to the textile industry[8]. The foremost industrial hazards included the fire. It is the most frequently occurring accident in the industries[8]. The workers suffer from skin burn and other health effects caused by fire. It can also produce toxic flames of chemicals like the acrobin, cyanides, carbon monoxides etc. these chemicals can even the damage the physical structure and affect the service like that of power and instrumentation which can even encourage the fire, the fire can cause widespread explosion which can be heard till faraway places. This can kill people at the faraway places and can damage their properties and livestock. The explosions includes gaseous explosion and the dust explosions. The gas explosions can take place where any flammable type of gas gets oxidised and then gets ignited[8]. All the precautionary methods should be undertaken because these hazards have fatal effects on the workers of the textile industry. While working with the dyes, the workers should be very carefully handle them with slow movements to keep the dust concentrations in limited quantity. The dyes used should be of mild nature so that they may not effect the general health of the workers. All these precautions should be taken against the occupational hazards of textile industry.

7.5) Environmental hazards in the Textile industry:

The growing awareness among the public about the deteriorating impact on the environment by the different industries have forced the textiles industry to implement rules and regulations to decrease the hazards on environment rules and regulations to decrease the hazards on environment as well as to innovate environment friendly products[9]. This is the reason why most of the sections nowadays are focussing on the products that are user friendly as well as environment friendly because most of the studies have shown that to maintain the general health of the earth we need to take solid steps the textile industries should use the raw materials that are eco friendly so that less harmful waste materials are ejected from it[9]. To clean up the pollution and the earth for us[9]. At the first place, we should never increase the pollution by ourselves and should always work to clean our environment and encourage the greenery around us so that the pollution can be reduced and the industries should follow all the norms and rules to decrease the pollution of industrial nature.



Fig 5: Earth and soil contaminated by textiles[4].

8.) Workplace Hazard:

The textile manufacturing industry consists of wide variety of machines as well as related equipment along with correlated units for converting the raw material into a finished good[4]. So as it involves various units so there are many no. of safety as well as health issues are involved in textile divisions. It is true that the work offers a lot of economic as well as other paybacks but there are wide range of work environment hazards that have risk to health and safety of the employee at work.

The foremost health as well as safety subjects in the division of textile can be classified on the basis of exposure to the following:

- a. Exposure to dust of cotton material.
- b. Exposure to hazardous process chemicals
- c. Exposure to noise produce by the working machines.
- d. Ergonomic problems.
- e. Exposure to biological substances.

8.1) Exposure to dust of cotton material:

The workers involved in the work of processing as well as spinning of raw cotton are exposed to a great quantity of cotton dust[10]. Along with this they are also bare with elements of pesticides as well as os soil. Due to the exposure of cotton dust as well as other hazardous dust the textile sector workers gets respiratory issues. Because of implementation of this standard the rate of occurrence of the disease namely byssinosis is significantly reduced[10]. According to OSHA's standard of cotton , which states, for an eight -hour day for atmost 200 mg of dust of cotton per cubic meter of air in the manufacturing of yarn, atmost 500 mg for textile waste house, atmost 750 mg for the weaving operation and 1000 mg for the recycling of waste. Also the duty of employer is to measure the amount of respirable dust of raw cotton once in every 6 months or measurement

can also be done whenever there is any frequent change that can affect the level of dust in the air[10].

8.2) Exposure to hazardous process chemical:

Workers in the textile division gets exposure to a variety of chemicals. Mostly those who are involved in the activities of dyeing, printing as well as finishing[11]. Textile manufacturing involve the usage of various chemicals namely chemicals that are based upon benzidine optical which provide brightness , solvents along with fixatives, crease - confrontation substance that produces formaldehyde , flame retarders that consists of compounds of organophosphorous as well as organobromine, antimicrobial agents are also in use in textile plants[11]. Long term as well as frequent exposure to formaldehyde and nasal leads to lung as well as brain cancer as well as leukemia, which can cause fatality too, exposure to the above chemicals can also lead to problem in respiratory system and also cause eczema . If came in contact of the described chemicals or accident inhalation can cause various health disorder[11].

Other problems that are found in workers involved in textile sector are:

- Oral disease
- Throat cancer
- Gastrointestinal tracts

8.3) Exposure to noise produced by working machines:

A very high level of noise has been found to be generated in many of the units of the textile process plants[6] . A long term exposure to noise and that too of very high frequency can lead to damage to eardrum and leading to loss in hearing .Along with this continous exposure to high level noise can lead to severe health effects that include fatigue, absenteeism, annoyance, anxiety issues, work efficiency reduction, disturbance in pulse rate as well as in blood pressure rate along with this sleeping problems[6]. In most of the units failure of regular adequate maintenance is the main cause behind the excessive production of noise by the machines. Although the noise causes very ill effect on health but still the exposure to noise is not taken on serious note because the effect of noise not visible immediately and also there is no pain[6].

8.4) Ergonomic problems:

The ergonomic problems have been found in many of the units of textile based industries in India. Working environment in most of these units is unsafe as well as unhealthy for every worker[12]. Workers involved in these particular division had to face a no. of difficulties which

involve unsuitable furniture, inadequate air ventilation as well as improper lighting, along with this the absence of adequate safety measures in the event of an emergency[12]. Workers involved in these textile units had to face many occupational related hazards[12].

In the textile manufacturing industries, the factor of risk for musculoskeleton discomfort include:

- Awkard gesture of the workers involved in work like spinning, cutting, packaging and many more.
- Repetitive movements of the workers at the time of spinning, cutting, packaging etc.
- Case of fatigue due to improper manual handling, at the time of storage, shipping, treatment and in many more situation.

8.5) Exposure to biological substances:

Workers associated with activities like carding as well as willowing get expose to biological agents such like anthrax, coxiella burnnetti, as well as clostridium tetani[13]. Exposure to them can lead to allergies as well as respiratory issues.

8.6) Measurement of the Textile industry hitches:

For a going on process the risk priority number is demarcated as the sort of risk from the highest level to lower level. The number risk priority is calculated by the mutipilation of the three scroing columns namely severity; occurance as well as detection[4]:

$$RPN = \text{Severity} \times \text{Detection} \times \text{Occurrence.}$$

Type of ear protection	Frequency Hz						
	125	250	500	1000	2000	4000	8000
Cotton staple	4	5	5	9	19	17	14
Shaped inserts	6	6	7	9	21	27	13
Selectone K insert	7	8	6	10	21	31	28
Insert of cotton and wax	8	10	12	16	27	32	31
Feather wool	6	8	11	15	19	26	35
E:A:R: polymer foam inserts	26	27	29	30	33	44	44
Earplug V-51 R inserts	20	19	19	22	27	29	30
Prefomed silicone inserts	18	17	23	21	30	42	39
Malleable inserts	24	25	26	26	35	42	40
Shaped inserts in resilient material	27	27	28	30	35	45	40
Casings (foam seal)	8	14	23	31	32	36	31
Casings (fluid seal)	20	18	23	31	35	38	31
Casings (liquid seal)	19	24	32	41	38	42	32
Anti-noise helmets	15	20	24	33	40	53	50

Fig 6: This represents the numerous types of protection with respect to the different values of frequency[5].

9) Suggestion to overcome the problems of the textile manufacturing workers:

It is the duty of the employer of the textile manufacturing units to protect their employees from the exposure of dust from raw cotton and to improve the safety as well as health situation in various textile units[14].

a) Employer must measure the quantity of the dust of cotton in air in every 6 months. or whenever they found any significant increase in the level of the cotton dust, as per the guidelines suggested by the governments department of occupational and health[14].

b) Availability of respirators for the workers when needed.

c) Regular maintenance of the equiped machines to reduce the levels of noise which is generated by the machines.

d) Providing adequate ppe as per work like earplugs, masks as well as gloves.

e) Ensure that the lighting as well as ventilation is adequate in the working area[14].

9.1) Managing the safety as well as health of women workers engaged in textile division:

Safety of the workers at the work place should be planned by taking gender into consideration. As there can different effect of exposure on different gender workers in different way[8]:

Assessment of risk of the particular situation and hazard should be done by taking gender into consideration and not involving any type of assumption along with this considering the real environmental situation at the work place in the risk assessment procedure[8].

The assessment highlights:

- Exposure level to different chemicals, physical as well as biological substances;
- Physical work including the movement as well as the workers gesture.
- Mental as well as physical related fatigue along with the stress level[8].

10) Health hazards in various units:

10.1) Yarn manufacturing unit:

The main process in yarn manufacturing unit involves Inaugural, blending, mixing and scrubbing- carding and combing- drawing and roving- spinning- winding and spooling. Yarn comprises of various strands of material twisted together. Each strand is, in turn, made of fibers, all shorter than the piece of yarn that they form[15].

10.1.1) Health hazards due to yarn:

In cotton textile industry accident will happen due to equipment on all types of cotton textile machinery. Operative guarding of the multiplicity of moving parts offerings many difficulties and needs continuous consideration[15].

10.1.2) Cotton dust inhalation (byssinosis):

The workers which work in the processing and spinning of cotton are visible to pesticides and soil. When the employee are Exposure to cotton dust and other particles it will leads to disorders related to respiratory among the textile workforces[16].



Fig 7: Cotton dust exposer[5].

10.1.3) Hazards due to noise emission:

In Yarn manufacturing Process Noise can be a big problem. Due to the higher rotatry and travelling speeds in machine parts Noise release rises non-linearly. In the long run, exposure to high noise levels has been known to damage the eardrum and cause hearing loss[15].

10.2) Weaving unit:

Weaving is main textile practices for manufacturing materials. Weaving presents only a reasonable employee safety risk. Weaving is a technique of textile manufacture in which two separate sets of yarns or threads are interweaved at right positions to form a fabric or cloth. Other approaches are knitting, crocheting, felting, and braiding or plaiting. The method in which the warp and filling gears intertwine with each other is called the weave[17]. The bulk of woven goods are made.

10.2.1) Health hazards:

10.2.1.1) Falls:

Matters on the base that cause employee falls contain engine parts and oil, lubricant and water spots. Good maintenance is predominantly significant in weaving, since many of the procedure labours spend most of their workday touring the area with eyes directed to the manufacture process rather than toward substances on the base[18].

10.2.1.2) Injury from machinery:

Power spread devices and most other pinch points are typically protected. The engine laid harnesses and other

parts that need be frequently retrieved by weavers, owever, are only moderately bounded and it can be dangerous for workforces[19].

10.2.1.3) Fires and ignition:

Weaving generates a fair quantity of lint, dust and fibre flyings which can signify fire hazards if the fibres are flammable[20].

10.2.1.4) Hazards due to noise emission:

Most weaving gears, working in the numbers originate in a typical manufacture capability; create noise levels that usually surpass 90 dBA. In some carriage and high-speed shuttleless weaving, levels may even exceed 100 dBA which can tempted range damage[21].

10.2.1.5) Fibre dust:

There are a amount of dangerous belongings from contacts to fibre-dust: Powered irritant effects of the eyes, nose and skin, Dermatitis (atopic eczma), Endotoxin encouraged effects, Disruptive lung illness (e.g. asthma, bronchitis), Other chronic effect (cough, dyspnoea, loss of lung function), Interstitial lung disease[16].

10.3) Dyeing, printing and finishing unit:

In Dyeing we include a chemical mixture or a powerful physical affinity among the dye and the fibre of the fabric. An wide variety of dyes and methods is used, dependent on the kind of fabric and the end-product looked-for[22].

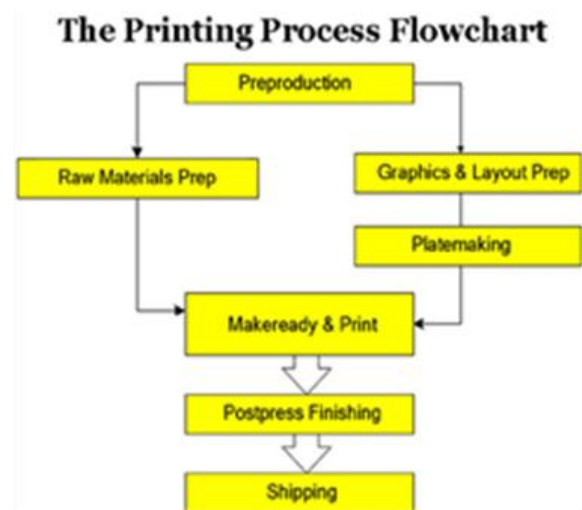


Fig 8: Flow process of printing unit[4].

10.3.1) Hazards in dyeing:

10.3.1.1) Fire and explosion:

The fire dangers create in a dye works are the combustible solvents used in the procedures and certain combustible dyestuffs. Safe packing services should be delivered[22].

10.3.1.2) Chemical hazards:

Hypochlorite solution are used in many plants for the bleaching purpose; in others, the bleaching instrument is gassy chlorine or bleaching powder which discharges chlorine when it is released into the tank. Allergic responses to reactive dyes as well as eczema, urticaria and asthma have remained conveyed in textile-dyeing labours[16].

10.3.1.3) Accidents:

When the hot liquor unintentionally kier to a palce where worker is working or arranging the cloth severe scalding coincidence will happen and that should be treated[23]

10.4) Printing:

For the thickness of dye or pigment with the help of starch or complete into emulsion which, and the organic solvent are used for the case of the pigment colours.they are prepared with the help of organic solvent. This adhesive or emulsion is occupied up by the engraved breakers which will design the material[24].

10.4.1) Hazards in printing:

10.4.1.1) Flammability:

The thickening systems comprise up to 40% solvents and they are highly flammable[25].

10.4.1.2) Air emissions:

Diluents in this print arrangement will be rushed off from the oven throughout drying and curing process[26].

10.4.1.3) Sludge:

It will have environmental difficulties with the ground and groundwater pollution. Formaldehyde (put on to the aqueous-based manufacture schemes) is a sensitizer and an frustration that may create responses, rarely violent, in labours who are exposed to it either by breathe in the air in all places the printing machine as it is working or by forthcoming into interaction with the available fabric[27].

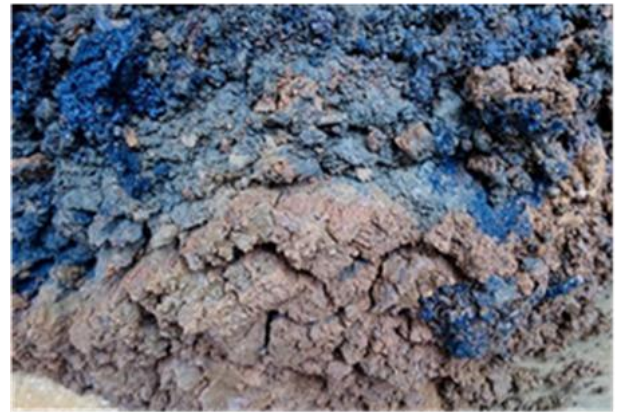


Fig 9: Textile sludge[5].

11.) Wastewater Treatment of the textile manufacturing industries:

It is found that the textile manufacturing industry is the world's most environment pollution creating unit. It involves a huge amount of chemicals and water at each unit for convering raw material into a finished good[28]. Water is used to mix the chemicals into the particular fabric , along with this to wash it at the beginning step as well as at the end stage. So the water becomes contaminated with the chemicals then is discarded as wastewater that is a very harmful pollutant for the environment. So the resulting effluent is very hazardous so there is a huge need to extract the color as well as residual matter from the wastewater[29]. The textile manufactures are looking for a budget friendly solution to decolorised around 200 billion litres of the colored effluent waste which is produced annually. Industries are spending a lot of money on research to significantly reduce the pollution due to waste effluent and also on effluent treatment units. Effluent treatment units can be broadly divided as physical, chemical, as well as biological procedures. It has been found that treatment by just one method is insufficient in removing the color as well as other waste chemicals from textile manufactured wawewater[29]. As well as there are many dyes that are so thick to biodegrade also the particular hydrolyzed reactive , acidic dyes are also not able to absorb by the technique of active sludge. . The main role of water treatment unit is to generate the demineralised water as well as boiler feed water. The effluent treatment comes in offsite and utility department of a industry[29].

11.1) Description of effluent treatment plant:

Effluent treatment is described as the procedure of removing the hazardous impurities from the wastewater that is generated from the industries from various process units[30]. This treatment involves physical, chemical as well as biological method to eliminate physical, chemical as well as biological toxins[30] . The objective of this treatment plant is to yield an environmentally safe waste fluid (also called treated waste effluent) and also a solid waste (also

called treated waste sludge) that is suitable for the disposal or it can be reuse again[30].

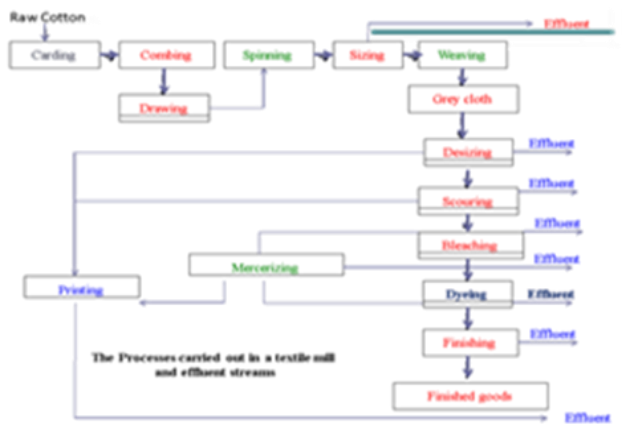


Fig 10: Effluent streams from different units[1].

ETP basically involves three different stages which are Primary, Secondary and the third one is Tertiary treatment.

a) Primary Treatment: In this primary stage of sedimentation, the effluent flows through a very large tanks that are commonly termed by various names such as pre-settling basins, primary sedimentation tanks, or also called as primary clarifiers. In this tank the sludge is settled down but the grease as well as oils rise present in wastewater comes to the surface and are then skimmed off. This tank is generally equipped with the scrapers that are mechanically driven which on continuous basis drive the sludge that is collected from the wastewater treatment facilities[31].

b) Secondary Treatment: Its purpose is to remove the dissolved as well as suspended substance that is biological. It is designed with the purpose to substantially degrade the biological substance present in the waste effluent which are given off by human waste, food remains, soaps, detergents and a lot more. Many of the municipal plants use the procedure of aerobic biological to treat the substance i.e liquor that is settled. To act effectively the requirement of the biota is that both the oxygen as well as food to live[31].

c) Tertiary Treatment: It is the treatment of waste water that comes out of secondary treatment, it is more than the primary as well as secondary treatment. The water which gets treated is disinfected chemically as well as physically before discharging it into the streams, bay, rivers, lagoons, as well as in wetlands, the water which comes out after tertiary treatment can be also be used for the purpose of irrigation of the golf ground[31].

12.) Protection from event of fire as well as explosion in the textile manufacturing industry:

As defined that textile making industry produces a wide range of products from different natural as well as artificial fibres. It is just not oldest but a very important among all the other field of industry. But the production of the clothes involves a lot of risk of fire. The event of spark, as well as glowing embers along with the overlimit heated particles can get engendered along the whole production chain and can very easily lead to the fire event in the particular area[32].

12.1) Risk in the textile manufacturing industry:

Sparks as well as glowing embers can be cause by the overheating of the involved equipment, mechanical damage. If the production of the spark take place within the machine then it can lead to a great damage by the event of fire at that particular spot. The spark detection arrangement can inductee the diversion and as well as the stopping of the process[33].

12.2) Danger zones in the textile manufacturing industry:

Fire or the event of explosion in the textile division can lead to damage of the raw material as well as linked machines and equipment, and can lead to loss of money as well as fatality[33].

12.3) Consequences of the event of fire as well as explosion:

The event of fire as well as explosion can lead to adverse effect on the industry some effects are listed as:

- Injury as well as loss to life of involved employees.
- Damage to the equipped machines, transport system
- Interruption in the rate of production[33].
- Loss of source of income.
- Loss of raw stuff.

12.4) Solution for the protection of different units of textile manufacturing industry:

- Installation of the fast, reliable, effective spark detection as well automatic extinguishing system.
- The adequate detection of sparks along with the glowing particles in the different areas at risk.
- The instantaneous automatic deviation of the spark as well as glowing particles out of the arrangement of conveying or by the CO2 extinguishment in the machines[34].

13.) Preventive measures used in the textile industries:

The major fault seen in the textile industry is that there is lack of proper emergency medical services facility in the workshops hence, whenever there is any kind of injury or accident, the victim has to go to any medical facility which can be deadly at times. Hence, there should be proper medical facility provided to the workers who are in the contact of hazardous materials or work with equipments that have high risk potential[35].

These hazardous material can include the chemical or dyeing units and cement dust used while construction. Some of the measures that can be used are -:

a) Proper training should be imparted to the employees and regular training conduction should be done so that the employees and workers are aware of the potential hazards which they are working with[36].

b) Annually, free medical checkup should be done of the employees to check their medical condition. These checkups should include the breathing test and if any worker shows severe symptoms, he should be provided with further medical treatment[37].

c) Dust control system equipment and ventilation should be put up to check the dust control and should be regularly checked and cleaned[12].

d) Dumping of the cotton dust should be done properly and handling of the cotton or cotton waste should be done skillfully[26].

e) Proper disposal of the waste material should be done and it should be implemented in the better way[38].

f) Vacuum cleaner should be used to clean the floor and to check the dust spreading[39].

g) Noise reducing system should be used whenever there is any repairment or replacement of the equipments is done. Also if necessary the employees should be provided with earplugs.

h) Proper lighting should be there in the work spaces in order to avoid any dust stain[40].

i) Respirators should be made necessary for the employees and should also be taught how to use them and instructed to clean and maintain it[40].

j) If any flammable solvents are brought into use in any of the units, then it should be made clear that no one smokes in the unit[40].

14.) Result and Discussion:

The presented analysis has been done to evaluate the hazard and the associated risk in different units of a textile manufacturing industry and the effect of effluent, waste water released from the textile plants on the environment. Textile in India has started from the small houses and now it has converted into main stream large scale industry and now it is important part of Indian economy. As seen textile manufacturing unit consists of various units for the conversion of raw material into the finished goods, so various hazards are analysed in different units based on type of equipment and the work which is performed there.

For the review of the safety aspect in textile manufacturing industries it was analysed there are various hazards associated in different unit. The hazards can be classified as the accident hazards, like hand figure injuries, burns due to chemicals or fire, physical hazards like exposure to noise, light, inadequate ventilation, exposure to raw cotton dust, exposure to chemical dyes, these were some of the hazards that were analysed in textile units. The analysis showed that the accidents occurred in various units of textile because of lack of safety in textile manufacturing industries. Though textile units involve many interlinked units and a lot of unskilled worked along with the usage of very complex chemicals, but still no importance is given to adequate safety in textile sectors. The reason of the accidents in textile units include inadequate housekeeping, ergonomics issue due to awkward work gesture, heavy manual material handling, absence of adequate ppe, absence of fire detectors, and sprinkler system, failure of regular maintenance, no training to the unskilled workers in unorganised sector of textile, no regular mock drill, in some case poor plant layout. It was also found that the workers involved in textile units deals with breathing apparatus that were long term due to inhalation of cotton dust.

15.) Conclusion:

Safety as well as health is one of the most important aspect for an industry working in any field whether it is oil and gas, chemical based, pharmaceutical, textiles, cement, construction, FMGC etc. In the presented work the analysis was conducted on the hse issues in various units of textile manufacturing industries. The analysis showed that the textile manufacturing industries involve various interlinked units for the conversion of raw good into the finished product. Each unit is further equipped with various equipment and machines. So there are various safety concerns in the textile manufacturing companies. It is analysed that no. of hazards and the associated risk of the particular hazard is more in textile manufacturing industries as compared to other industrial sectors but still no or very little importance is given to safety in textile manufacturing industries and no safety precaution is made available in unorganised sectors of the textile division. The textile manufacturing industries involve various units such as

spinning, weaving, dyeing etc and various hazards are interlinked in each units. The various workplace hazard which is associated in the textile division include, workers direct or indirect exposure to the dust, exposure to hazardous chemicals, noise produced by various machines, ergonomic issues, frequent exposure to the biological substances, effluents etc. It was also analysed that the event of fire was due to spark, static electricity, fault in the equipped machinery, overheating of the machine and its parts, due to damaged parts etc. According to the analysis it was found that in some cases the plant layout was not adequate as speed room division which has the highest possibility of fire contaminants was situated very close to the labs which work on checking of quality of cotton and the speed room was also very close to the rest room for the workers, so any false activity by the workers like smoking in these zones along with inadequate disposal of trash can lead to fire in the units. It is also found that the textile division include the usage of various chemicals for dyeing and finishing activities these chemicals are very hard and composed of various complex chemicals, dyes that are non biodegradable in nature . So direct disposal of waste to the environment is highly not safe and also not recommended so for this the textile manufacturing units are equipped with the effluent treatment plants that purify the waste water into DM water that can be used again and can be disposed to the environmental water bodies without causing much harm. The analysis has also presented that not only environmental safety is needed but inplant safety is also important so for that some safety related procedure include- adequate plant layout before installation of the plant, adequate evacuation plan, proper and regular maintenance of the machines and its parts, workers should be trained with the working procedures and also the safety needed in various units, regular mock drill for practising the employees to how to react in any emergency, availability of adequate PPE needed in various units, installation of fire and spark detectors along with the fire alarms and automatic fire sprinkler system to break the fire chain and getting it spread. Its the responsibility of the management and the safety team to provide the workers safe environment to work . And the workers duty is to follow all the safety instruction and work according to it for the healthy work environment and the growth of industry with adequate safety of each concern employed.

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