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Original Research Article

Industrial Accidents in Jute Mills of Nepal

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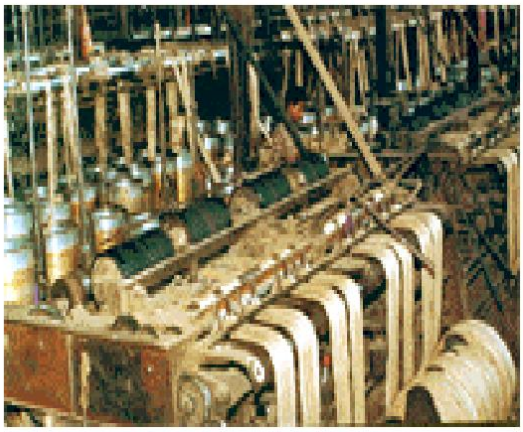
Abstract: Jute Industries are the first industrial setup in Nepal. Many historical and political events of Nepal are linked to the jute mills. Therefore, jute is one of the important sectors. Jute mills are labour oriented industries and more than twelve thousand workers including one thousand six hundred woman workers are directly involved in ten operational jute mills. Almost all the mills are situated only in Eastern Terai, namely Sunsari and Morang districts of Koshi zone.Jute mills are closing year by year may be the scarcity of raw materials, manpower and market demands. Due to hazardous nature of jute mill workers are not willing to work in these industries. The safety and health of the workers and their efficiency are reciprocal entities. Health and Safety measures not only result in reduced rate of industrial accidents but also raise the work productivity. The purpose of the study is to assess the potential accident prevention strategy for Jute Industries. Field based Action research was conducted. Accident due to machineries ,manual material handling ,poor housekeeping ,electricity, lack of maintenance and supervision , lack of Personal Protecting Equipment , fire , occupational stress also due to lack of safety culture were majour issues. Proper training and refresher training programs should be conducted to educate the workers as well as their supervisors particularly on occupational safety and health for ensuring regularly checked and maintained. All the moving drives i.e. belt drives, rollers and gear drivers should be properly guarded or fenced. Proper cable size and connection reduce the fire and electrocution. All machines should properly earth.

Keywords: Cusses of Accidents, operation process, management recommendation.

INTRODUCTION

It has been assuming that the rate of occupational accidents and diseases are very high in industries of Nepal which have been resulting in loss of working periods. Most of the industries do not have the basic personal protecting equipments (PPE) and ignoring the “Safety First” principles. These industries do lack adequately trained personnel and show their reluctance to hire experts of concerned field to enhance the safety measures of poor working condition. The personal protective equipment (PPE) is not available in most of cases and due to low level of awareness among the workers, even available PPE are also not used effectively. Other vulnerabilities like housekeeping and the layout of the work places are not managed effectively. Working postures and working methods are not ergonomically designed or suitable. The International Labour Organization’s (ILO) world-wide research reveals that each year One worker dies in every 15 seconds with 6,300 workers die daily where as Asbestos kills 100,000 people also Other hazardous chemicals and substances kill another 350,000. Similarly Over 2.3 million deaths occur due to occupational accidents or diseases along with 160 million workers suffer from work related diseases and illnesses. More painfully, Around 337 million workers are injured in workplace accidents resulting into 4% of world GDP is lost because of work related deaths, injuries or sickness.



The safety and health of the workers and their efficiency are reciprocal entities. Health and Safety measures not only result in reduced rate of industrial accidents but also raise the work productivity. Occupational injury denotes any personal injury, disease or death resulting from an occupational accident [1]. This has been defined as an occurrence arising out of or in the course of work which results in: (a) fatal occupational injury, or (b) non-fatal occupational injury. Often the term occupational accident is understood as a sudden, external and involuntary event [2]. In this case, Occupational injury means death, any personal injury or disease resulting from an occupational accident. Occupational accidents is an unexpected and unplanned occurrence, including acts of non-consensual violence, arising out of or in connection with work which results in personal injury, disease or death [1]; Occupational accidents and disease remain the most appalling human tragedy of modern industry and one of its most serious forms of economic waste [3].This kind of Industrial accidents causes suffering and distresses not only to involved workers also affecttheir family members and dependents. It also represents an important material loss to industries and to the society. Conceptually, Occupational accidents are different from occupational diseases where accidents are unexpected and unplanned occurrences, but occupational diseases denote the physical and mental conditions which are “contracted as a result of an exposure over a period of time to risk factors arising from work activity”. Similarly, a fatal accident at work is defined as an accident which leads to the death of a victim. Where the accidents involve multiple fatalities, they are often referred to as industrial disasters.

Poverty is common characteristics of Nepalese workers because of which they are under-nutrient, and living in unsanitary living condition, which could lead to intermittent or prolong bouts of illness, which in turn lead to absenteeism from work, and adversely affecting production in enterprises. It has been argued that Nepalese entrepreneurs import machinery and equipment without paying much attention to the quality of the machine. No one makes it a point to see to it whether the machines are compatible to local conditions adversely skill and capacity of worker is frequently questionable.

The Objectives of Study

The main objective of the study is to list out the 3 years data of Industrial Accident in Jute Industries of Nepal for assessing main causes of accidents to overcome the issues of accidents.

During the study the collected data not represent as an actual data because most of the accidents are not recorded by the industries. None of the jute mills have management system for occupational safety and health. The data shows that number of workers is in decreasing from some years ago. The data also shows none of fatal accident happening in jute mills in last 3 years. Only few accidents are major types of accident and almost all accident are minor accidents. Reduction of number of workers, increasing awareness level on safety and health and some automation are the major contributor for decreasing trend of accident in all jute mills. Remarkable improvement in safety and health in jute mill may result the no any fatal accidents in last 3 years in jute mills. Collection of three Fiscal Years Industrial accidents data from 5 Jute Industries which are in operation in Morang and Sunsari districts. International norms and expert opinion is considered for the studies.

LITERATURE REVIEW

Jute Industries status

Jute Industries are the first industrial setup in Nepal. Many historical and political events of Nepal are linked to the jute mills. Therefore, jute is one of the important sectors. Jute mills are labour oriented industries. According to FNCCI, more than twelve thousand workers including one thousand six hundred woman workers were directly involved in nine jute mills. Among these 9 jute mills only 5 are in operation. All the mills are situated in Eastern Terai, namely Sunsari and Morang districts. Jute products are considered as environment friendly products, so it has its own market.

Table-1: Jute Mills in Nepal

Name of Jute Mill	Location	Number of Workers		Remarks
		M	F	
Arihanta Multi Fiber	Sonapur, Sunsari	4000	300	
Baba Jute Mill	Katahari, Morang	453	73	
Chandra Shiv Jute Mill	Nimua, Morang	-	-	Closed
Guheswory Twine Plant	Katahari, Morang	50	-	
Nepal Jute Mill	Bansbari, Morang	-	-	Closed
Pathivara Jute Mill	Itahari, Sunsari	-	-	Closed
Sri Raghupati Jute Mill	Rani, Morang	2100	600	
Swastik Jute Mill	Hathimunda, Morang	800	100	
CM Jute Mills	Katahari, Morang	-	-	Closed

All the jute mills use old technology without any provision to minimize the hazards and their risks. This study has been undertaken to record the accidents in jute mills and their causes and to come up with measures for improvements.

Production Process of Jute Mill

Almost all the Jute mills possess similar technology and process. But the jute goods production varies industry to industry. Some of the mills produce twins; some others produce sacks and twine and some produces the twine, sacks and Hessian. The production processes up-to the spinning are similar in all industries. After spinning some industries have only twisting machine to make twine; some industries have twisting and weaving section to make all products.

Process Flow Chart

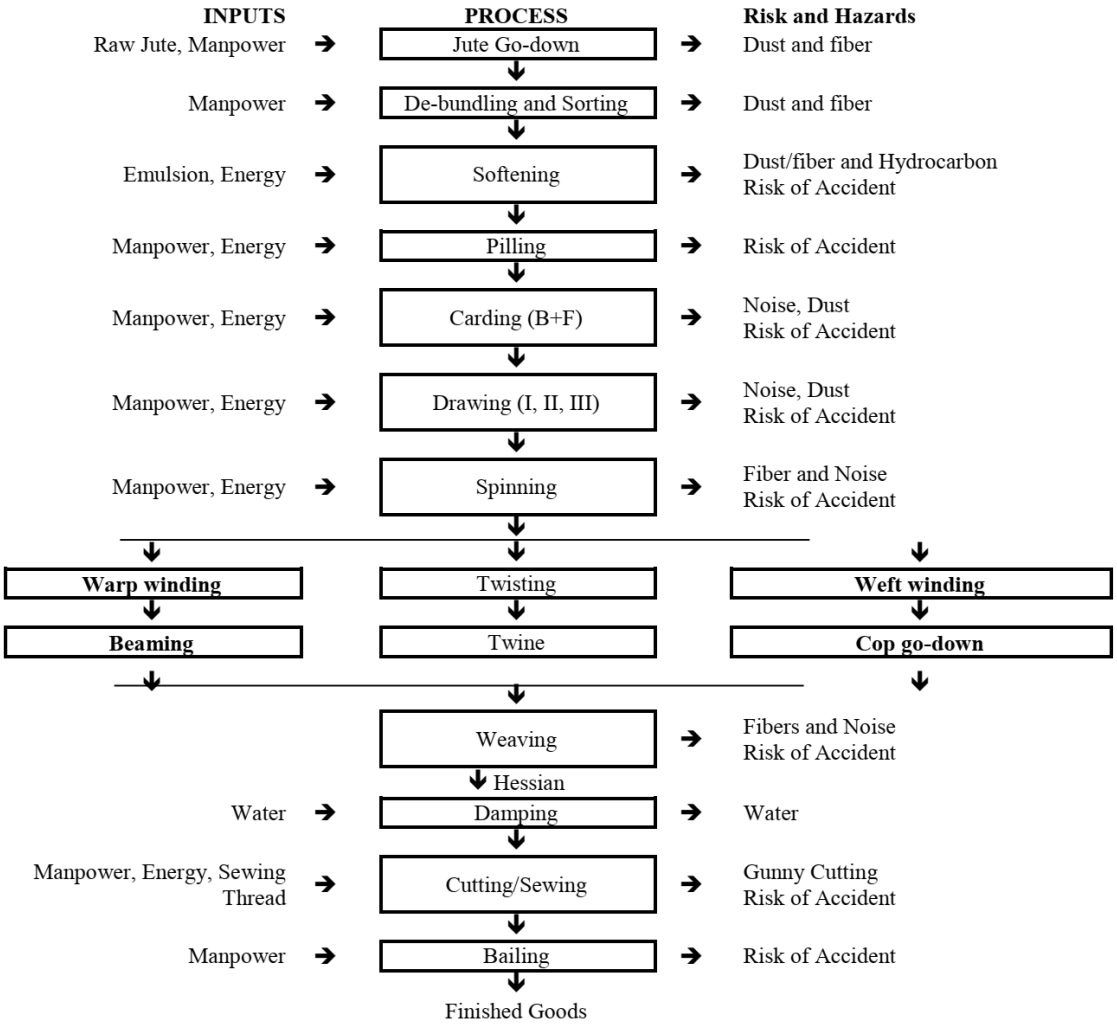


Fig-1

Process Description

Commercially graded jute are received by the mills and are again assorted in the mills according use of yarn such as Hessian Warp, Hessian Weft, Sacking Warp, Sacking Weft etc. and simultaneously mohras are splitted to required size. Jute is a Lignocelluloses bast fiber. Hence, torsinal rigidity is high and spinnability is poor. During softening Jute Morhas are passed through spirally fluted rollers and oil in water emulsion is applied to make them soft and pliable.

Softened Jute is stagged for certain duration for maturity when superficial moisture penetrates inside fiber swells it and "Thermofillic" action takes place which helps to grow bacteria to eat up barky hard portion of the root.Hard roots, if any, are cut clean and then jute is "carded" whereby jute reeds are "splitted" and extraneous matters are also removed. Fibers are formed into ribbon called "Sliver" and then on to rolls.

Breaker rolls are again carded and rolls are mixed (generally 11 Rolls) to make Sliver more regular. Simultaneously rolls are drawn to reduce weight per linear measure.In carded sliver fibers are randomly placed and more or less meshy in appearance, which is not suitable for spinning. During "Drawing" operation fibers are "combed" to make fiber parallel.

It is a process where slivers are elongated further and fibers are "Twisted" to impart strength. Spun yarns are wound on to bobbins. Slivers produced in the Finisher Drawing stages are a bunch of fibers loosely held together having insignificant strength which are practically of no commercial use due to poor strength and bulky in nature.

Spinning bobbins content smaller length of yarn which are again wound on to bigger packages known as "Spool" to be used in making of yarn to form warp portion used during interlacement of weaving. Yarn from spinning bobbins is made into hollow cylindrical package to put inside the Shuttle, which forms the transverse thread during interlacement of weaving.

Warp threads are made of yarn by arranging spools of yarn on creels and size paste is applied on yarn to improve upon strength to facilitate weaving process. Adequate moisture is maintained here.

Weaving is a process of interlacement of two series of threads known as "Warp" and "Weft". In Hessian weaving generally shuttle which contents cops i.e. weft yarn is manually changed. Whereas in sacking weaving Cops are changed mechanically by a device known as "Loader".

Woven fibers do not contain desired moisture all the time. During Damping, moisture is sprayed on running fabric to get desired moisture. This is a process more or less similar to "Ironing" of fabric. Damped fabric passes through pairs of heavy rollers rendering threads in fabric flattened, improves cover and makes the fabric glossy in appearance. Hessian fabrics are folded to the required size to facilitate the Pressing operation in "Bale Press". Calendering sacking fabrics are cut to size for making bags of different dimensions. Sacking cloth cut to sizes is folded and sides are sewing to make a complete bag ready for use.

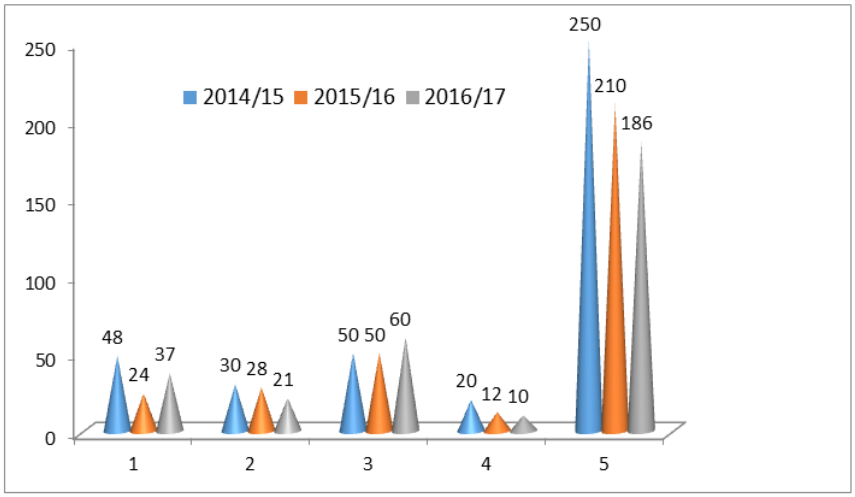
RESULTS AND DISCUSSIONS

Accidentsin Jute Industries

Jute mills are a traditional and old technology used industries in Nepal. Most of the processes of jute mills are completed by machines, but each process also needed the manual work. Jute industries employed large number of workers and most of the unskilled and semi skilled workers. Jute mills considered as an accident prone industries but during the study record of the accident not found in systematic manner in any industries. The most common accident is the squeezing off of a single joint of a finger or the whole finger. Losing half or a whole hand, an arm, etc. in the machinery are also quite common. A great number of maimed and deformed persons are seen in the labour lines, most of them are or were employed in a jute mill - this one has lost an arm or a part of one, that one a foot, the third half a leg - it is like visiting an army just returned from a campaign. Most of the workers in their career have faced accidents at least once. There are workers who have had as many as 200 accidents in his lifetime. The following accident records were given by the jute industries.

Table-2: Accident Records in Jute Mill

Name of the Jute Mill	2014/15			2015/16			2016/17		
	Minor	Major	Fatal	Minor	Major	Fatal	Minor	Major	Fatal
Jute Mill 1	48			24			37	1	
Jute Mill 2	30			28			21	2	
Jute Mill 3	50			50			60		
Jute Mill 4	20			12			10		
Jute Mill 5	250	5		210	1		186		



The above collected data from Table-2 not represent as an actual data because most of the accidents are not recorded by the industries. None of the jute mills have management system for occupational safety and health. These data's were provided by the industries management. Jute mills are closing year by year may be the scarcity of raw materials, manpower and market demands. Due to hazardous nature of jute mill workers are not willing to work in these industries.

The above data shows none of fatal accident happening in jute mills in last 3 years. Only few accidents are major types of accident and almost all accident are minor accidents. The above data also represents the rate of accident decreasing year by year. Reduction of number of workers, increasing awareness level on safety and health and some automation are the major contributor for decreasing trend of accident in all jute mills. Remarkable improvement in safety and health in jute mill may result the no any fatal accidents in last 3 years in jute mills.

Jute mill are also fire sensitive industries. Many small fires happened in last 3 years in all jute mills but no any fire disasters wereseen. All jute mills have fire hydrant system.

Causes of Accident in Jute Industries

In the Jute mills, accident rate is high and most of them seen a minor. Only few accidents are seen major and fatal accidents. Accidents don't "just happen" it always have causes but accidents always can be prevented. There are two primary causes of accidents:

- Unsafe Conditions And
- Unsafe Acts

Domino theory of accidents explain that 88% of all accidents are caused by unsafe acts, unsafe conditions cause only about 10% of workplace accidents which can be eliminate engineering most unsafe conditions and 2% accidents are due to acts of God.

Unsafe Act

Worker behaviors, attitude, discipline and their skills are the causes of many accidents in jute mill. Ignorance and horseplay are also the major causes to create unsafe act in industries.

Workers working in jute industries were not seen as a prime objective of them, most of them worked mainly due to near to home, lack of other opportunity, coming with friends, easily job opportunity, weekly or daily payment system and not skilled required. Most of the workers not encourage making their carrier in jute mill. High Noise and dust exposure are other factors to make workers annoying and uncomfortable. Most of the workers were seen as working in stress. While anybody working in stress may do the wrong decision in many times, so risk of accident is very high.

The workers attitude towards various types of stresses is a new concept in the studies of the working class. The employer and sometimes the worker consider the stress as a part of work and day-to-day life. The individual worker has been asked to give his opinion about various problems faced in the work place which are causing different kind of physical discomforts (i.e. stresses). The workers generally relate the discomforts and the causes behind them.

Personal Protecting Equipments (PPE) is the last control techniques for the prevention of accident. Jute industries are the labor intensive industries. Most of the workers in this industry coming from agriculture and most of them are unskilled and semiskilled. Very limited workers were only sustaining for longer years in jute mill mainly due to hazardous in nature. Most of the jute industries are facing the problem of unavailability of workers. During the study it was found that some workers were very new to the jute industries.

No any working dress introduced to the jute industries resulting female were working with wearing of sarees and loose clothes and male also wears loose clothes. Many minor and major accidents were happened due to trapping of loose clothes in moving drives. No any scientific based PPE seen in any jute industries. Lack of proper and suitable PPE many accidents were happening.

Although jute industries are old and first industrial setup in Nepal, safety culture practice not yet develops in these industries. Lack of strong legislative provision and implementation of OSH provisions and lack of management willingness for safety and productivity, safety culture not developed in this sector. Uneducated, unskilled and agriculture based workers are other causes to not develop safety culture. Many accidents are happening due to lack of safety culture practices.

Other than above cause's factors like carelessness, over-activeness and more exposure to machinery may be responsible for the accidents. One of the major contributing factors for the injuries was lack of proper training for the workers. Percentage of unskilled workers in the industries and injured among them is high. The risk factor for accident is significantly higher in unskilled and semi-skilled workers belonged to laborer group.

Continuous work increases the risk of accident. This may be due to lethargy or to extreme fatigue thus leading to less concentration. Inadequate safety precautions, ignorance, and human errors have been reported to significantly contribute to injuries. The health status of the workers was never considered in the time of recruitment in most industries. There have been legal provisions for regular health services, health insurance and compensation for the victims in developed countries.

Unsafe Condition

Most of the machines and technology were seen very old. Lots of maintenance activities always going on in the all jute industries. Moving drives like gear and belt drives were not properly guarded in all machines. Some of the major accidents recorded due to traps clothes in moving drives.

Layout of the jute mills very congested in all jute mills of Nepal. Jute mills are not fully automized industries. Every processneeds to feed the materials manually. During the internal transportation and handling risk of accident is high. Uneven surface congested working place and manual works are also causes of accident.

Housekeeping of the all jute mills can be say unmanaged and haphazard. Good housekeeping practice culture not adopted by many jute mills. Due to bad housekeeping practices risk of fire very high in these industries. Maintenance department needs to practice good housekeeping. Workers were interviewed regarding housekeeping most of them replied they don't have any knowledge how to manage scientifically. Yellow line demarcation principal are not seen any jute industries. Bad housekeeping plays also role in accident due to obstacle, entanglement and congestion.

Short circuit and electrocution are the major effect of electrical hazards in any workplace. Jute industries are considered as many motors and lighting based industries. Electrical distribution and installation seems unmanaged in many jute mills. Cable size plays vital role for the cable heating and ignition of fire but during the study none of the industries have the drawing and design of cabling system. Loose connections are seen in many places of the all industries. Damaged lighting fixtures can be seen in all industries. Earthling (grounding) needed to all machineries and whole factory for the protection of lightening and leakage but not fully installed in all jute mills.

Many and large machineries lines can be seen in jute industries. Most of the accident reported and investigated in jute mills may create lack of maintenance of machines on time. Jute mill only applied the breakdown maintenance because of the continuous and 24 hours production system. Lack of spare line for production most of the machines continuously run and not time spares for its schedule maintenance.

Jute is highly combustible materials it easily catches the fire. Sparks from electricity connection, cable heating, smoking and frictions are the major causes of fire in jute mill. Many fire incidents are happening in jute mills every year in all industries. Some industries have the fire hydrant system to extinguish the fire. Fire prevention plan and strategy not seen in written statements. Workers were not fully aware regarding fire safety. Emergency Preparedness System not implemented by the any industries. Jute mills claimed that none of the human causality happened due to fire in jute mill. Most of the fires were recorded in jute go-down.

Pace also characterized the work in piece-rated departments like weaving or sack-sewing where the worker's earnings depended on how much they weaved and hence, how rapidly, they can produce. Accidents are generally due to obsoleteness and continuous running of the machinery, the laxity of factory rules (e.g. about overcrowding, safety measures against moving parts of machines etc. and the workers' incomprehension of the principles of the machineries. The work between machinery gives rise to multitudes of accidents of more or less serious nature, which have for the operative the secondary effect of unfitting him for his work more or less completely. These accidents are generally very loosely classified under "minor" and 'serious' accidents.

Recommendation for Prevention and Control of Accident in Jute Industries

Approaches for Prevention and Control of Accident

Good health is fundamentally important for human life. Basically two approaches apply to achieve the better safety in the workplace.

Reactive Approach

Reactive approach considered as a least effected approach to achieve better safety in workplace. Legislative provisions and scientific research based study are considered tools for the reactive approach. Safety provisions in Labour Act 2017 covers most safety and health issues. The Labor Act has incorporated mandatory provisions for the health and safety of workers including:

- Declaration of Safety and Health Policy at Factory Level
- Responsibility of Employer to provide safe and healthy working environment to all Employees
- Responsibility of Employer to provide safe and healthy working environment to all non-workers
- Duties of Employees to participate and follow in all safety and health activities
- Formation of Safety and Health Committee and registered in authority
- Provision of Stoppage of work in case of immediate danger
- Special provisions of Occupational Safety and Health
    - Eyes Safety
    - Chemical Safety
    - Boiler Operation Safety
    - Machine Guarding
    - Weight Lifting
- Provision of communicable Diseases Control Management
- Provision of Occupational Diseases Treatment
- Provision of penalty upto 2 yrs of prison

So, strictly implementation of Labour Act provisions will improve safety and health of the jute mill workers.

Proactive Approach

This approach is not mandatory for any industries it's voluntary. The management should not take safety as expenses it's always considered as an investment in this approach. The management who thought safety and productivity is interlinked should consider proactive approach. For the improvement of safety implementation of management system i.e. ISO 45001 should milestone for safety and health of the workers. This system encourages the management and workers to work together for safety.

Techniques for Prevention and Control of Accidents

Risk and Hazards prevention techniques describe the hierarchy of techniques. These techniques are:

- Elimination
- Substitution
- Engineering Control
- Administrative Control
- Personal Protecting Equipments (PPE).

Among these techniques Elimination is most effective and PPE is a least effective techniques. When selecting the options/remedies for the accident prevention hierarchy should consider.

Specific Recommendations for Accident Prevention

The following specific recommendation may helps to reduce the rate of accident in jute industries:

- Proper training and refresher training programs should be conducted to educate the workers as well as their supervisors particularly on occupational safety and health.
- The machinery should be regularly checked and maintained.
- All the moving drives i.e. belt drives, rollers and gear drivers should be properly guarded or fenced.
- Immediate repair of damaged floors should prevent many accidents.
- Adoption of good housekeeping practices by marking with yellow line will improve a lot in jute industries.
- Proper cable size and connection reduce the fire and electrocution.
- All machines should properly earthed.
- Introduction of scheduled and preventive maintenance will reduce many accidents.
- Introduction of tight working dress for all workers and banned to wear loose clothes will reduce the many major and fatal accidents.
- Proper and suitable PPE should provide to the workers.
- Fire prevention plan and fire extinguishing system should be compulsory to the all jute mill.

- Workers should provide the stress management program. Management should listen and solve the workers views and problem.
- All jute mills should make No Smoking zone for whole premises.
- Compulsorily introduce induction training for all new workers.
- Emergency preparedness system should introduce in all jute mills.
- Regular health check-ups and health awareness programs should be conducted for the workers.
- Appropriate work schedules should be developed and the workers should be assured of their job.
- Health and accidental insurance for the workers should be provided.
- Provision of first aid must be compulsory in all industries.
- Treatment in the hospitals must be efficient.
- The working condition in the industries should be made more scientific and concerned government authorities should regularly check the standard.
- There should be a provision of occupational and vocational rehabilitation for the injured workers.
- More extensive studies on the different aspects of industrial hazards should be conducted.

Strategy for Implementation of Recommendation

All the stakeholders of Jute Industries are responsible for the existing safety and health situation. Without cooperation of all stakeholders cannot achieve the better safety. Maintaining the safety and health in jute industries is not only the matter of concern of the victims but also the concern of other stakeholders. Disability and poor health of industrial workers brings many problems in the society as a whole. Thus, bear the role by the government, management and trade unions will achieve better safety and health in jute industries.

Role of Government

The government, as an actor of industrial relations system, can play crucial role in reducing of industrial accidents and in resolving the problem of occupational health by formulating appropriate OSH laws. Government is only that actor in industrial relations system, which controls relationship between other two actors, employers and employees and maintains harmonious industrial relations in the country. The government renders the task of regulating standard of health and safety measures in enterprises by using the authority mentioned in the concerned laws formulated as guided along by the constitution, ILO conventions and recommendations, labor policies and labor movements.

The role of government should formulate the all required standards and guidelines for the workplace improvement. The effective inspection system will help to implement the legal provisions in jute mills. Government system should implement better inspection strategy plan in this sector. Besides above awareness creation and conduction of training related to industrial safety also the prime role of government.

Role of Management

The sound health and safety measures not only result in reduced rate of industrial accident, absenteeism, and labourturnover, physical and mental, strain of workers and wastage of resources but also raise efficiency in production, boost moral team spirit and the sense of belongingness among the employees. The poor health and hazardous work cause suffering and distress to workers and their families. They also represent an important mental loss to the industry in particular and society in general. Hence, it is a prime responsibility of every management to ensure about good health and safe environment in the industry.

Modern management always focuses to implement the management system. So, implementation of ISO 45001 in jute industries will cover the all safety issues. Hazards identification and risk assessment of jute mill necessary for all jute mills. Management should perform yearly basis and report to the Labour Office make better co-operation to achieve better safety. Every accident should be notifiable to Labour Office so, management compulsorily keep the accident data within industry and also send to the Labour Office.

Role of Trade Union

As the source protection of the rights and interests of the members, trade unions can help enterprise for effective implementation of the legal provisions made for the prevention, promotion and development of health and safety measures for workers at workplace. Unions can pressurize government for the enactment of health and safety friendly labor laws and management to implement it effectively.

In the Jute mills, accident rate is high. The reasons are of various natures. Sometimes the obsolete machineries are blamed. Lack of training of the workers, lack of efficiency, the lack of facilities inside the work place etc. are regarded as reasons behind the various types of accidents. The technology of jute mill operation is almost a century old.

During the study the collected data not represent as an actual data because most of the accidents are not recorded by the industries. None of the jute mills have management system for occupational safety and health. The data shows that number of

workers is in decreasing from some years ago. The data also shows none of fatal accident happening in jute mills in last 3 years. Only few accidents are major types of accident and almost all accident are minor accidents. Reduction of number of workers, increasing awareness level on safety and health and some automation are the major contributor for decreasing trend of accident in all jute mills. Remarkable improvement in safety and health in jute mill may result the no any fatal accidents in last 3 years in jute mills.

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