

A Study on Job Safety Analysis of Sewing Operation in Textile Industries

U. Periyar Selvam¹, G. Senthil Kumar² and M. Maheswaran³

^{1,3}M.E. Industrial Safety Engineering, Bannari Amman Institute of Technology

²Mechanical Engineering, Bannari Amman Institute of Technology

E-mail: ¹periyarpsselvam@gmail.com, ³mahessafety@gmail.com

Abstract—In textile industries, sewing is the important operation for producing the products. Sewing machine operation needs utmost care because it may cause personal injury, occupational health and ergonomic problems to the workers if it is not properly used. It also has a major threat of fire hazard since large quantity of textile goods are handled also the number of people employed are more compared to other stages of operation in the textile industry. In order to overcome the above said hazards in textile industry, proper safety system is to be employed for the workers safe life. The hazards in the sewing machine operation and handling the textile materials have been identified and appropriate prevention or control strategy can be identified. Job Safety Analysis (JSA) is a qualitative technique that helps to identify hazards on each task before it occurs. It also focuses on the relationship between the worker, task, tools and the work environment. Selection of job to carryout JSA in sewing operation is based on the accident frequency, severity, new job or non-routine job and repetitive exposure. By implementing the JSA in sewing operation can reduce the hazards to considerable amount.

Keywords: Job safety analysis, Sewing operation, Textile industry, Accident frequency, Hazards

1. INTRODUCTION

Health and safety legislation holds employers responsible for ensuring the health and safety of their employees. This includes informing employees of workplace hazards, providing the equipment necessary to safeguard health and safety, establishing proper health and safety procedures for practicing and implementing the safety measures to eliminate or mitigate any risks to their employees. Identifying and assessing the hazards and risks is an essential step in textile industries because they are categorized by many unique factors such as personal injury, illness to health and ergonomic factors.

This paper deals with the concept of job safety analysis and practical methods of identifying potential hazards and applicable preventive measures. Job safety analysis (JSA) is a proactive approach to ensure health and safety in the workplace. The JSA process provides a way of identifying the job related hazards and determining preventive measures. This involves carefully analyzing each task of a job, identifying

potential health and safety hazards at each step and determining practical ways of preventing or mitigating such hazards. These preventive measures can then be integrated into an employer's work practices and procedures for the job. This paper is intended for overcoming the hazards that exist in the textile sewing machines.

1.1 Job Safety Analysis

A job safety analysis is a method that emphasizes on job tasks to identify hazards before they occur. JSA should be performed for all jobs. It is an important element of a risk management system. It focuses on the connection between the worker, task, tools and the work environment. However, there are practical constraints on time and resources. Another consideration is that each JSA may require revision when changes occur in equipment, raw materials, processes and the environment. It is the efficient analysis of a job intended to identify potential hazards, assess the degree of risk and evaluate practical measures to control the risk. A JSA should be proactive and should be emphasized to examine the job and not the person who is doing the job.

2. METHODOLOGY

JSA is the systematic approach and the steps involved in it can be depicted in the following flow chart

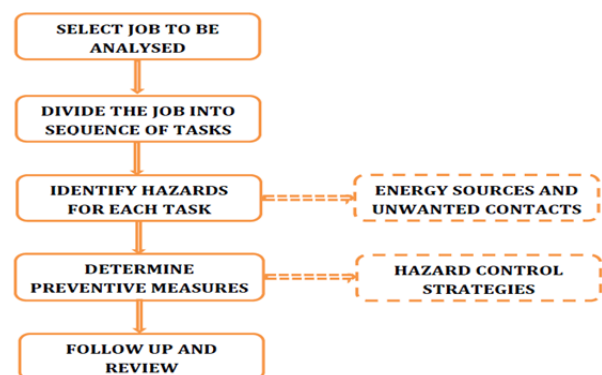


Fig. 1: JSA flow chart

Step 1: Select job to be analyzed

In a sequence of jobs performed in the textile industry, one of the important jobs that involve more people is sewing machine operation. It is commonly used by many women in the families. The hazard existing on this machine cannot be understood by the people during working but coming to industries it is essential to know the hazards of sewing machine. So the textile sewing machine operation is selected to carryout job safety analysis.

Step 2: Divide the job into sequence of tasks

A task is a division of an overall machining operation. The completion of each operational task in proper sequence leads to the completion of the job and if any task which is placed out of sequence may cause potential hazards to be missed or introduce hazards. In sewing machining, dividing its operation into tasks requires a thorough knowledge of the job. If the tasks are made too general, specific operations and related hazards may be missed. On the other hand, too many tasks may lead to the application of JSA is impractical. On considering all this in mind sewing machine operation has been divided into sequence of tasks as follows

Task 1: Knowing the operating procedure of sewing machine

Task 2: Connect machine to energy source

Task 3: Turn on the power switch

Task 4: Threading the sewing machine

Task 5: Perform the sewing operation and (Special Cases)

Task 6: Turn off power to stop machine

Task 7: Isolate the energy source

These tasks has been divided after explaining the purpose of the job safety analysis to the employee for their cooperation, then assurance has been given to make the job safer. Most importantly the employee's experience is also involved to make improvement and at last discussed with the employees to ensure all the tasks has been noted.

Step 3: Identify hazards for each task

To identify the potential hazard, Gibson and Haddon approach based on unwanted energy flow and energy barrier is used. The energy-barrier approach was developed by J.J. Gibson in 1961 and structured by W.C. Haddon in 1966. This approach of accident prevention is very popular because it is simple to apply and easy to understand. This approach states that the use of proper form energy can be used to perform work. The controlled energy is essential to accomplish work whereas the uncontrolled energy flow has the potential to cause accident, injury and equipment damage (or) property losses. The procedure of the energy barrier technique is to look at each task and

- Identify the energy sources producing a risk
- Describe the way the energy can come in contact with employee
- Find adequate barriers to eliminate or reduce the chances of this contact

The potential hazards on this machining operation can be identified and it is listed in the Table.1

Table 1: Potential hazard on sewing machine operation

S no	Sequence of task	Potential Hazards
1	Know proper operation of sewing machine	i. Injury – due to improper handling of machine, electrical shocks, electric burns and heat burns ii. Illness to health – inhalation of cotton fibers, eye strain and hearing problem iii. Ergonomics problem due to repeated work and awkward postures
2	Connect machine to energy source	i. Electric shock –using the damaged cords, damaged switches and using wet hands and poor earthing
3	Turn on the power switch	i. Injury – due to contact with machine parts set in motion immediately after power switch is ON ii. Electric shock – unexpected flow of current and contact with conducting parts of the machine body
4	Threading the sewing machine	i. Injury – hitting to the projected parts, sharp edges of the machine and needle piercing in fingers ii. Cut injury by threads iii. Accidental start of the machine
5	Perform the sewing operation	i. Injury – finger contact with needle, revolving parts(V belt ,motor) operating at high speed ii. Loose clothing, Untied hair and Jewellery caught in between the moving parts of the machine iii. Broken needle hitting the worker(eyes, face, body parts) iv. Electric shock – leakage of current to the metal parts of the machine v. Heat burns – hand or body contact with heated parts of the machine vi. Fire Hazard – in the presence of external heat source, fabric exposed with overheated machine parts, damaged electric cables vii. Illness to health – Eye strain, hearing problem, byssinosis (brown lung disease) viii. Ergonomics – repetitive work, over reaching, awkward posture, sitting to machine for a long time

	Special Cases: (i) Threading needle, adjusting thread, thread guide, replacing bobbin (ii) Replacing needles, presser feet, needle plates, feed dogs, needle guards, horns, cloth guides	i. Injury – finger contact with needle, revolving parts, hitting to the projected parts, sharp edges of the machine ii. Cut injury by threads iii. Accidental start of the machine
6	Turn off power to stop machine	i. Electric Shock – damaged switches, using wet hands ii. Electric Spark - in case of poor earthing iii. Injury – contact with moving parts of machine (body parts or cloth) and elevated parts of machine
7	Isolate the energy source	i. Machine is set in motion mistakenly or set in motion by the co worker ii. Machine damage in case of voltage fluctuation, thundering

Step 4: Determine preventive measures

The fourth step in a JSA is determining ways to eliminate or mitigate the hazards identified. The hazard control strategy is used to determine the preventive measures. The following are common hazard control strategies

1. Eliminate the hazard.
2. Substitute the hazard with less hazardous or non-hazardous options.
3. Minimize the risk due to the hazard:
 - Reduces the exposition.
 - Isolate the hazard.
 - Provide personnel protective equipment and clothing.
 - Implement administrative controls.
4. Have an emergency plan in place.
5. Adopt measures to reduce damage following an accident or emergency.

The preventive measures for the potential hazards of sewing machine operation is analyzed based on the hazard control strategies which are mentioned in Table 2 is as follows

Table 2: Preventive measures for identified potential hazards

S No	Preventive Measures
1	i. Know the operating procedure for the sewing machine ii. Use appropriate personal protective equipment iii. Check for machine guards in place prior to working iv. Provide training to overcome the various ergonomic issues
2	i. Damaged cords and switches to be replaced immediately ii. Approach to electrical devices with dry hands iii. Earthing to be checked periodically by the electrician iv. Ensure that power switch OFF while connecting to power source

3	i. Locate turn ON power from a safe location to avoid contact to the machine parts accidentally ii. All the sewing machine to be grounded
4	i. Know the step by step threading procedure ii. Aware of the injuries caused by the parts of the machine iii. Threading to be done slowly and carefully iv. Turn OFF the power switch while threading the machine
5	i. Keep your work place and machine clean whenever you start working ii. Train worker to be aware of the hazards that exist while working and warning signs displayed on the machine iii. Monitor work environment (temperature, lighting) to ensure the comfortable work area iv. Provide rubber mats to machine paddle for avoiding the electric shock v. Guard against the revolving parts of the machine (V belt, motor) and heated parts vi. Avoid loose clothing, full sleeve while working on or nearer to the machine vii. Hair (ladies) to be tied and hair cover to be used while working. Avoid wearing bangles, rings, ropes on wrist while working viii. Materials to be stored in such a way to avoid fire hazard. No heat sources to be allowed in the work area ix. Install Firefighting equipments and periodical checking x. Provide training to operate firefighting equipment's xi. Finger guard to be set in place while working (use goggle to protect the eyes which is recommended for additional safety) xii. Ear plug should be used whenever the noise exceeds acceptable range xiii. Provide face mask and it should be used xiv. Provide training, time to time break to overcome ergonomic issues
	i. Turn OFF power switch in each cases ii. Know the procedures for the each cases iii. Use appropriate Personal Protective Equipment
6	i. Standard switches to be used ii. Approach electrical devices with dry hands iii. Earthing to be checked periodically iv. Locate turn OFF power to a safe location v. Ensure that supporting equipment are set in a safe position
7	i. Unplug the machine if not in use or while leaving the work place ii. Never leave the machine unattended unless it is isolated from the energy source

Step 5: Follow up and review

It is essential to establish a follow-up and review process for monitoring the effectiveness of the preventive measures implemented and also to

- Ensure new hazards have not been created
- Ensure employees are following the procedures and practices
- Implement continuous improvement

3. CONCLUSION

It concludes that preventive measures selected must be communicated to all the employees who are all or will be performing the sewing machine operation. The side-by-side format used in JSA worksheets is not an ideal one for instructional purposes. Better results are achieved by using the results of JSA to develop work procedure in a narrative-style format.

It is important to review the job hazard analysis if an illness or injury occurs on a specific job. Based on the circumstances the job procedure can be modified to prevent similar incidents in the future.

REFERENCE

- [1] U.S. Department of Labor, "Occupational Safety and Health Administration", OSHA 3071, 2002 (Revised)
- [2] Wuorinen, V. "Job Hazard Analysis (CCOHS Publication 87-1E). Hamilton", Ontario: Canadian Centre for Occupational Health and Safety, 1987
- [3] S.M.S.Nandhakumar, M.Gnanasekaran, "Job Safety Analysis in Material Handling", International Journal of Scientific Engineering and Technology Research, volume 3, issue no 8, page no 1408-1410, 2014
- [4] D.S Padmini, "Unsafe Work Environment in Garments Industries", Journal of Environment Research and Development, volume 7, issue no 1A, 2012
- [5] Naziamalik, "Role of Hazard Control Measure in Occupational Health and Safety in the Textile Industry of Pakistan", pakj.agri, volume 47, issue no 1, page no 72-76, 2010
- [6] Praveen Kumar M, Mugundhan.K, Visagavel.K, "Occupational Health & Safety in Textile Industry", International Journal of Research in Engineering and Technology, volume 3, issue no 11, page no 168-172, 2014
- [7] SumananandaSaramon, "A study on exposure related health problems in textile industry", 3rd International Conference and Exhibition on Occupational Health & Safety, volume 2, issue no 3, page no 67-72, 2014