

Risk Level Analysis Using The Job Safety Analysis Method In Manufacturing System Laboratory

S Sastrodiharjo¹, Q Sholihah², E L Zedniawan³

{sajiyo_sastro@untag-sby.ac.id¹, qoqom_kunoro@yahoo.co.nz², ekoludvy@gmail.com³}

^{1,3}Industrial Engineering Department, Brawijaya University, Indonesia

²Industrial Engineering Department, 17 Agustus 1945 Surabaya University, Indonesia

Abstract. This research is about prevention in the handling of occupational safety and health in the Brawijaya university environment. In this study the object is a manufacturing system laboratory. The aim is to find out a risk that might occur when practice is carried out by students who take courses related to manufacturing. Practicum in the laboratory is done by machines that can be said to be dangerous including milling machines, lathes, and cutting machines. In this study 30 students were taken randomly from a total of 130 students who took part in the practicum in 2019. In this study the risk parameters were categorized into 3 namely: consequences, exposures, and possibilities. Later the values of the 3 categories can be calculated obtained from the results of the questionnaire given to students who carry out the practicum.

Keywords: Health, Safety, Risk, Laboratory

1. Introduction

The era of globalization can have a negative impact on the global environment, including the business world which is characterized by the intense competition that does not only emphasize the quality and quantity factors of manufactured products[1], but also compliance with occupational safety and health standards. The main problem that always arises in every manufacturing work activity is the emergence of the threat of occupational safety and health.

One of the threats to work safely in a manufacturing work environment is the problem of work accidents that can occur by various factors, for example due to the condition of work tools and equipment or factors of quality of raw materials that are not good and contain elements of danger[2]. Workplace accidents can also be triggered by uncomfortable working conditions such as poor ventilation conditions, lack of lighting, noise, or the temperature of the workspace environment that exceeds the safe threshold value. Besides that, work accidents can occur due to the behavior of humans (workers) who do work unsafe or unsafe action.

Based on data from PT. Jamsostek (Persero) shows the number of work accidents. tends to increase every year, wherein 2012 there were 103,704 cases of workplace accidents, of which 91.21% of victims of accidents recovered and returned to work, 3.8% experienced disability, 2.61% experienced partial disability, total disability (37 cases) and the rest died (2,419 cases). The work accident rate has increased compared to the previous 5 years, wherein 2011 there were 99,491 cases or an average of 414 cases of workplace accidents per day, in 2010 there

were 98,711 cases of workplace accidents, in 2009 (96,314 cases), in 2008 there were 94,736 cases and year In 2007 there were 83,714 cases[3].

Occupational safety and health hazards cannot be avoided in every job. Therefore, control efforts are needed to reduce the loss (loss) that will occur due to danger and risk. One control effort that can be done is to carry out risk management. The main objective of risk management is managing risk to prevent accidents or unwanted events.

Manufacturing system laboratory The engineering industry of the Brawijaya university is a laboratory that functions as a place of practice in carrying out the implementation of courses related to manufacturing. One of the labs in this laboratory is making products made from several machines, namely lathe, milling, cutting. Practicing involves many students who are directly faced with the potential risk of dangerous machinery. Therefore, in this study we want to provide prevention that occurs so that it can be used as an effort to inhibit accidents.



Picture 1. Lathe, milling, and saw Machine

2. Literatur Review

The terminology of occupational safety and health according to Minister of Manpower Decree No. I. Kep. 463 / MEN / 1993 is a safeguard aimed at ensuring that workers and other people in the workplace/company are always safe and sound and that each source of production can be used safely and efficiently.

Occupational safety in the workplace includes various aspects related to conditions and work methods. Work safety requirements according to Law No. 1 of 1970 are as follows:

1. Prevent and reduce accidents. This is related to efforts to prevent accidents from any hazardous work or activities
2. Prevent, reduce fire hazards and extinguish fires. This is related to fire protection systems and fire prevention.
3. Give a chance or a way to save yourself in a fire or other incident. This is related to emergency response systems as well as rescue facilities in the building or workplace (means of escape)
4. Provide assistance in an accident. This concerns aspect of first aid or assistance in the event of an accident including the rescue and help of the victim
5. Providing personal protective equipment for workers. This is related to the provision of appropriate safety equipment (Personal Protective Equipment) for any hazardous work.
6. Prevent and control the rise or spread of temperature, humidity, dust, dirt, smoke, steam, gas, gusts, wind, weather, light, or radiation, sound or vibration. This is related to the safety of the work environment, pollution or industrial waste and occupational health

7. Prevent and control the emergence of disease to work both physically, and psychologically, poisoning, infection, and transmission. This is related to aspects of occupational health and industrial hygiene.
8. Obtain sufficient and appropriate information.
9. Organizing good air refreshment.
10. Maintain cleanliness, health, and order.
11. Obtain harmony between labor, work tools, environment, work methods, and processes.
12. Securing and facilitating the transportation of people, animals, plants or goods
13. Prevent exposure to dangerous electricity.

Occupational safety and health are important for the company because the impact of accidents and work-related diseases is not only detrimental to employees but also companies both directly and indirectly. Active involvement of company management is very important to create a safe workplace condition.

Occupational accidents according to the Minister of Manpower Regulation (Permenaker) Number: 03 / Men / 1998 is an unintended and unpredictable event that can cause casualties and property damage. Whereas according to the Minister of Manpower Regulation Number 03 / Men / 1994 concerning Jamsostek, mentioning that work accidents are accidents related to work relations, including diseases arising from work relations, including diseases arising from work relations as well as accidents that occur on the journey departing from home to the workplace and go home through normal or impassable roads.

According to Frank E. Bird Jr. in Ramli[4]; an accident is an undesirable event, can cause loss of life and damage to property and usually occurs as a result of contact with a source that exceeds the threshold or structure.

According to H.W Heinrich in Ramli [5]; that the cause of work accidents is divided into two, namely:

1. Unsafe action.
Unsafe action is an action that triggers a work accident. Examples of smoking in places prone to fire, do not comply with K3 regulations and restrictions.
2. Unsafe condition (unsafe condition). Unsafe condition is closely related to the conditions of the work environment both tools, materials or unsafe environments. For example slippery floors, broken stairs, poor lighting or noise that exceeds NAB (Threshold Value). International Labor Organization (ILO), work-related accidents are classified based on four types of classification, namely:
 1. Classification by Type of Accident
 - a. Fall down
 - b. Crushed Object
 - c. Smashed or exposed to objects
 - d. Sandwiched by objects
 - e. Movements exceed abilities
 - f. Effect of high temperatures
 - g. Exposed to electricity
 - h. Contact the danger of hazardous materials or radiation.
 2. Classification According to Causes
 - a. Machines, for example electric power generation machines, sawmills and so on

- b. Transport equipment, for example, land transport, air, and water transport equipment
 - c. Other equipment, for example, kitchen burners and heaters, refrigeration installations, electrical appliances, and so on
 - d. Materials, substances, and radiation, for example, explosives, gases, chemicals, and so on
 - e. Work environment (Outside buildings, inside buildings and underground)
 - f. And other causes
3. Classification according to injuries or abnormalities
- a. Fracture
 - b. Dislocation (Sprains)
 - c. Loose muscles (veins)
 - d. Bruises and wounds in others
 - e. Amputation of surface wounds
 - f. Beating and bruising
 - g. Burns
 - h. Sudden poisoning
 - i. Effect of radiation
4. Classification according to the location of abnormalities
- a. Head
 - b. neck
 - c. Body
 - d. Top member
 - e. Bottom member
 - f. Other places that do not include this classification.

The danger is a potential loss or situation with potential that causes loss. Hazards mean the source of potential damage and situations that have the potential to cause losses. The danger is a source of risk if the risk is interpreted as something negative [4].

OHSAS 18001 [5]; the danger is a source, situation or action that has the potential to injure a worker or cause illness or a combination of both. While the definition of danger is according to the Health and Safety Commission (1992), danger is something that has the potential to cause loss or damage. The form of danger can come from work machines, raw materials, work methods, and things that can pose a big and important risk even though the potential of the country is very small with the right and correct controls, the risk can be reduced so that even greater dangers can be reduced.

In terms of occupational safety and health (K3), hazards are classified into 2 (two), i.e.:

1. Safety Hazard. This is a type of danger that has an impact on the occurrence of accidents that can cause injury (injury) to death and damage to company property. The impact is acute. Types of safety hazards include:
 - a. Mechanical Hazards, caused by machines or mechanical work tools such as cuts, falls, crushed and slipped.
 - b. Electrically dangerous, due to equipment containing electric current
 - c. Fire Hazards, caused by chemical substances that are flammable (already burning)
 - d. Blasting hazards are caused by chemical substances that are explosive in nature.

2. Health Hazard. This is a type of language that affects health, causes interference. occupational health and disease. The impact is chronic. Types of health hazards include:
 - a. Physical hazards, including noise, vibration, radiation, ion and non-ionizing, extreme temperatures and lighting
 - b. Chemical hazards, including those related to materials or materials such as antiseptics, aerosols, insecticides, dust, gas.
 - c. Biological hazards, among others, relate to living things that are in the work environment, namely bacteria, viruses, protozoa and fungi (fungi) that are pathogenic.
 - d. Ergonomic hazards, including representative movement, posture statistics, manual handling, and awkward postures.

Psychological hazards, including too heavy workloads, relationships and uncomfortable working conditions.

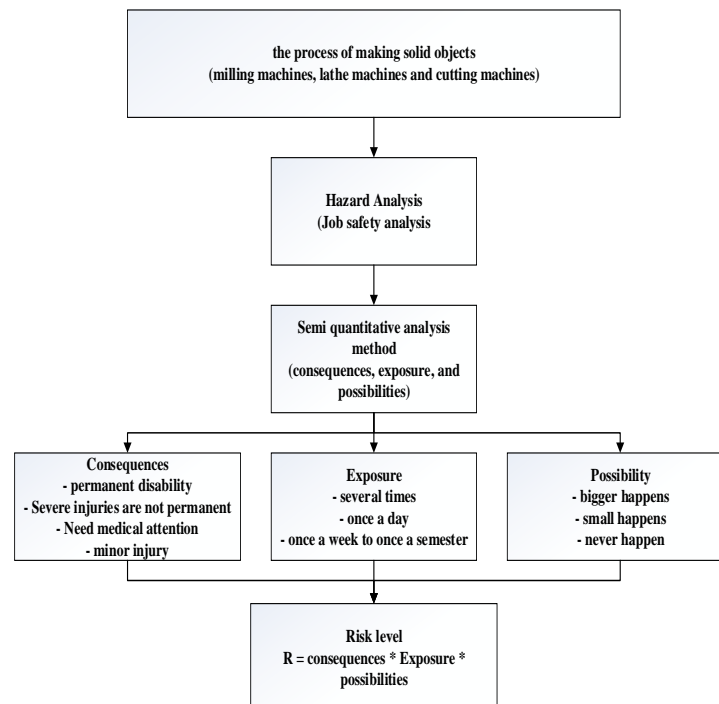
3. Method

This research was conducted by using questionnaires and interviews in the field with the object, namely the manufacturing system engineering laboratory of the Brawijaya university industry. The data obtained were analyzed using AS / NZS 4360: 2004 risk management standards, so the results of this study can be classified in descriptive research. There are objects that are considered are lathes, milling machines, and cutting machines.

This study uses tools in the form of AS / NZS 4360: 2004 risk management standards and calculation of risk using the W.T Fine formula. The research activity also uses a questionnaire to collect data and information about the conditions of workers and workers' perceptions of occupational safety and health in the manufacturing work environment.

The stage of this research is to identify occupational hazards and occupational safety and health risks in the process of making solid objects using Job Safety Analysis (JSA) tools, then carry out an analysis of the risks identified by determining the probability, exposure and consequence values. Furthermore, the calculation of the value of the risk of workplace accidents uses the formula W.T Fine, namely

Consequence * Exposure * Probability and comparing it with the value of work risk, there is a table of occupational risk classification.



Picture 2. Research flow diagram

4. Result

The manufacturing system laboratory is a practical laboratory carried out by the Brawijaya university Industrial Engineering students in implementing the results of the manufacturing courses conducted.

The process of making solid objects uses 3 machines, namely: lathes, milling machines, and cutting machines. In making solid objects a risk analysis will be carried out using the Job safety analysis method. So that after the risk analysis can be calculated the risk value obtained from the categories of consequences, exposures, and possibilities. The table that shows the results of the analysis can be done can be seen in the appendix.

5. Conclusion

Based on the results of hazard identification and work risk analysis in computer laboratories carried out by students in the implementation of solid object manufacturing activities, it can be concluded as follows:

1. There are 3 stages of work carried out, namely:
 - a. Milling machines
 - b. Lathe machine
 - c. Cutting machines
2. In the process of making solid objects, the possible risks are clipped finger, splintered eyes, hair entering the machine, inhaled fume or debris.

3. The level of risk that occurs in the process of making solid objects is very high as many as 6, for as much as 9, and for acceptable as many as 1.

6. Suggestion

Based on the research that has been done. Suggestions that can be given include:

1. Develop a written Standard Operating Procedure (SOP) to prevent accidents due to unsafe behavior
2. Supervise students who are taking practicum
3. Enforce laboratory regulations for those who do not use personal protective equipment when the practicum takes place.

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