Identification of Potential Hazard using Hazard Identification and Risk Assessment

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Abstract. This research was conducted in the paper production’s company. These Paper products will be used as a cigarette paper. Along in the production’s process, Company provides the machines and equipment that operated by workers. During the operations, all workers may potentially injured. It known as a potential hazard. Hazard identification and risk assessment is one part of a safety and health program in the stage of risk management. This is very important as part of efforts to prevent occupational injuries and diseases resulting from work. This research is experiencing a problem that is not the identification of potential hazards and risks that would be faced by workers during the running production process. The purpose of this study was to identify the potential hazards by using hazard identification and risk assessment methods. Risk assessment is done using severity criteria and the probability of an accident. According to the research there are 23 potential hazard that occurs with varying severity and probability. Then made the determination Risk Assessment Code (RAC) for each potential hazard, and gained 3 extreme risks, 10 high risks, 6 medium risks and 3 low risks. We have successfully identified potential hazard using RAC.

1. Introduction

Risk management is now the main thing in conversation, practice, as well as job training. This clearly demonstrates the importance of risk management in the comfort of working at the present time. Management policies in the field of occupational safety and health companies, including Risk Management policies that relate to risk anticipation, risk evaluation and risk management in the workplace.

Protection of labor safety is very important because of many potential hazards in the workplace. Related problems of labor protection, the company implemented a management system that can protect workers from occupational accidents and avoid substantial losses to the company. The implementation of safety management systems and occupational health consists of many programs to protect and welfare workers.

Research in India has been discussed about the potential hazards in the Thermal Power Plant power in 2014 [1]. In addition, the potential danger has also been discussed for workers at the foundry in a company in India [2]. Past research has also discussed the potential hazards to workers in the construction sector [3]. In Indonesia, the research about potential harm has been done in Makassar, Sulawesi [4]. However, potential hazards may occur, especially company that produces cigarette paper...
in North Sumatra have not been discussed before. Companies of cigarettes paper using machinery and equipment that has great possibilities in causing injuries to workers. Accidents that occurred can be caused by the negligence of workers when operating the machinery and equipment or because of the surrounding work environment. Potential hazards that occurred often are defects in the operation, the state of slippery floors and work is less cautious.

The study was conducted using the method of HIRA (Hazard Identification and Risk Assessment) to identify potential hazards found in the workplace. By identifying potential hazards and risks of work, is expected to facilitate the company in the management and control of workplace safety and minimize the chances of accidents.

2. Research Methods
To identify hazards that may occur should move as a whole in a system. The application of hazard identification is done for all components. All potential hazards and incidents that are identified must be stored in some way. Here are some of the methods used in determining the hazard identification, such as data usage and condition of the equipment to see potential hazards, any deviation draft or critical user parameter, operations of routine and non routine like start-up, shutdown, or process upsets and development, also implementation or maintenance activities that can contribute to potential danger or accident.

Some stages are involved in the management of the potential hazards are identifying potential hazards, determining the level of significance, controlling the potential for significant harm through the process of elimination, substitution, isolation or minimization and educating the operator by giving a training based on the collection of potential hazards in which activity in the industry.

The management system contains the potential dangers. They are the systematic process to identify potential hazards in the workplace, the systematic process to identify potential new hazards in the workplace, the systematic process to review potential hazards to determine the level of significance and the level of control and process to ensure that the control options in the workplace is not enough merely adequate but should be in accordance with industry standards.

3. Results and Discussions

3.1. Category of Hazards Resources
Data of Hazards Resources obtained then being categorized by Risk Assessment Approach. The categorism of hazards resources defined by the rank of severity, probability, and probability.

The rank of each category is consist of five ranks. Category of severity is ranked by number, the bigger number the worse, such as 5 is disaster, 4 is big, 3 is medium, 2 is small, and 1 is not meaningful. Results of defining the rank of severity is written in Table 1.
Table 1. Rank of Severity

| No. | Activities                                           | Potential Hazard | Effect                                      | Category of Severity | Explanation                                                                 |
|-----|-----------------------------------------------------|------------------|---------------------------------------------|----------------------|-----------------------------------------------------------------------------|
| 1.  | Removal or appointment of Jumbo Roll using Crane   | Squashed, crushed| Death, broken bones, cuts, bruises          | 5                   | Cause of death, material loss is huge, going 1 events in more than 1 year  |
| 2.  | Displacement jumbo roll using a forklift           | Trampled, crushed| Death, fractures, abrasions, cuts           | 5                   | Cause of death, material loss is very large, one incident occurred in more than 1 year |
| 3.  | Splicing or disconnection of the electric machine   | Fire, shock      | Death, burns                                | 5                   | Cause of death, material loss is very large, one incident occurred in more than 1 year |
| 4.  | Cleaning machines ream cutter                       | Cut blade, dust  | Injuries, respiratory problems              | 4                   | Injury resulting in disability or lost total body function, great material loss, one incident occurred within 1 month |
| 5.  | Transfer of finished products to the warehouse using a forklift | Trampled, crushed | Death, fractures, abrasions, cuts          | 5                   | Causes death, material loss is very large, one incident occurred in more than 1 year |

Table 1 shows the rank of severity from activities that cause potential hazards and give effect to workers.

On the other hand, category of probability is ranked by letter, such as, A is almost certainly will happened, B is tends to occur, C is may occur, D is less likely, and E is rarely disaster. The rank of probability is written in Table 2.
Table 2. Rank of Probability

| No. | Activities                                           | Potential Hazard                  | Effect                        | Category of Probability | Explanation                                                                 |
|-----|-----------------------------------------------------|-----------------------------------|-------------------------------|-------------------------|-----------------------------------------------------------------------------|
| 1   | The working process associated slitter machine bobbin | The noise, the room temperature increased | Fatigue, lack of concentration, impaired hearing | A                       | No injuries, material losses are very small, occur in nearly all circumstances, happen one time in a week |
| 2   | Splicing of paper                                   | Cut, exposed to heat dryer        | Blisters, burns               | B                       | Lost workdays, require medical care, loss of material large enough, happened 1 time in 1 month |
| 3   | Cleaning and checking the machine bobbin slitter     | Cut, crushed                     | Blisters, sores               | B                       | Minor injuries, requiring treatment P3K, can be handled directly at the scene, the material loss was, happened 1 time in 1 month |
| 4   | The process of cutting paper ream                   | Cut by knife                     | wound                         | B                       | Injury resulting in disability or lost total body function, great material loss, one incident occurred within 1 month |
| 5   | Cleaning machines ream cutter                       | Cut blade, dust                  | Injuries, respiratory problems | B                       | Injury resulting in disability or lost total body function, great material loss, one incident occurred within 1 month |

Table 2 shows the rank of probability from activities that cause potential hazards and give effect to workers.

3.2. Determining Risk Assessment Code (RAC)

Having obtained a value for the category of severity and probability, made the determination Risk Assessment Code (RAC) for each source of hazard. RAC consist of five, such as E is extremely risk, H is high risk, M is moderate risk, and L is low risk. Determining the value of RAC using Qualitative Risk Analysis Matrix is shown in Table 3.
Table 3. Risk Values for Each Source of Danger

| No. | Activities                                      | Potential of Hazard                  | Category of Severity | Category of Probability | RAC |
|-----|------------------------------------------------|-------------------------------------|----------------------|-------------------------|-----|
| 1.  | Removal or appointment of Jumbo Roll using Crane | Squashed, crushed                   | 5                    | E                       | H   |
| 2.  | Installation of cores on a bobbin               | Crushed, pinched, hit               | 3                    | D                       | M   |
| 3.  | Installation or setting bobbin slitter          | Cut, crushed                        | 2                    | D                       | L   |
| 4.  | splicing of paper                               | Cut, exposed to heat dryer          | 3                    | B                       | H   |
| 5.  | Cleaning and checking the machine bobbin slitter| Cut, crushed                        | 2                    | B                       | H   |
| 6.  | The working process associated slitter bobbin machine | The noise, the room temperature increased | 1            | A                       | H   |
| 7.  | Rolling the paper on a bobbin slitter machine   | Clothing entangled operator         | 2                    | E                       | L   |
| 8.  | Transfer of the results to the bobbin pallet    | Crushed, knocked                    | 3                    | D                       | M   |
| 9.  | Displacement jumbo roll using a forklift        | Trampled, crushed                   | 5                    | E                       | H   |
| 10. | Bobbin removal using a hand truck               | Trampled, crushed                   | 3                    | E                       | M   |
| 11. | Installation of jumbo roll to be cut            | Havin equipment                     | 3                    | D                       | M   |
| 12. | Installation or setting ream cutter             | Crushed equipment, cut by knife     | 4                    | C                       | E   |
| 13. | Entry process into the path of the paper ream   | struck down                         | 4                    | D                       | H   |
| 14. | The process of cutting paper ream               | cut by knife                        | 4                    | B                       | E   |
| 15. | Push or shift the cutting table                 | Error body position                 | 3                    | D                       | M   |
| 16. | Splicing or disconnection of the electric machine| Fire, shock                        | 5                    | E                       | H   |
| 17. | Cleaning machines ream cutter                   | Cut by knife, dust                  | 4                    | B                       | E   |
| 18. | Loading tide of brake plate                     | exposed to heat                     | 4                    | D                       | H   |
| 19. | Transfer of the results ream to the sorting area using a hand truck | hit                              | 3                    | E                       | M   |
| 20. | Ream of paper packaging results                 | Havin equipment                     | 2                    | C                       | M   |
| 21. | Preparation of the results of the paper ream to the pallet | struck down       | 2                    | D                       | L   |
| 22. | Transfer of finished products to the warehouse using a forklift | Trampled, crushed | 5                    | E                       | H   |
| 23. | Broke cores cut using a knife cutter            | Cut                                 | 2                    | B                       | H   |

Table 3 indicate the risk value of each source of danger. It gives the code for risk assessment from low risk (L) to extremely risk (E).

Recapitulation of the risk value based on the results of data processing can be seen in Table 4.

Table 4. Recapitulation of the Risk Activity Value

| No. | Risk Value      | Number of Activities |
|-----|-----------------|----------------------|
| 1   | extreme risk    | 3                    |
| 2   | high risk       | 10                   |
| 3   | moderate risk   | 7                    |
| 4   | low risk        | 3                    |
The results obtained showed that the category H (high risk) is the risk category of the most commonly found in the production process at the factory. Based on these results, it is known that there are a lot of activities at high risk for occupational safety and health. So the company needs a variety of control measures to avoid potential hazards such as training health and safety, ensuring that all employees use personal protective equipment and make scheduling corrective actions as soon as possible.

4. Conclusions
Value risk potential occupational hazards dominant in converting work station is a high risk category to overcome required training by management and scheduling improvement. The causes of potential hazards of work are workers who perform activities less cautious, noisy engine, narrow road conditions, high temperatures, and the negligence of workers in the use of protective self-equipment. Action of controlling performed to avoid potential hazards is by implementing the use of personal protective equipment such as gloves, safety shoes and ear plug, the machine checks periodically, a warning sign making, increase ventilation and operator training on a regular basis and the implementation of 5S concept.

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References
[1] Ruchi S, Praveen P 2014 Hazards Identification and Risk Assessment in Thermal Power Plant
[2] SheikAllavudeen.S, Sankar.S.P 2015 Hazard Identification, Risk Assessment and Risk Control in Foundry
[3] Ummu Salmah, Anwar Mallongi, Atjo Wahyu 2013 Potential Risks Of Manganese Through Shallow Well Water Consumption Due To The Landfill Leachate Among Community In Tamangapa Disposal Site, Makassar Indonesia
[4] “Guide to managing risks associated with foundry work” access on http://www.safeworkaustralia.gov.au/sites/SWA/about/Publications/Documents/770/Guide-ManagingRisks-Associated-Foundry-Work1.pdf (accessed on 20th October, 2016)
[5] “The Manufacture, Storage And Import Of Hazardous Chemicals (Amendment) Rules, 2000”
[6] J.H.T.H. Andriessen 2002 Safety behavior and safety motivation
[7] Duijm, N. J., 2001 Hazard analysis of technologies for disposing explosive waste, Journal of Hazardous Materials, A90, pp. 123–135
[8] Jeong, K., Lee, D., Lee, K. and Lim H., A qualitative identification and analysis of hazards, risks and operating procedures for a decommissioning safety assessment of a nuclear research reactor, Annals of Nuclear Energy 35, 2008, pp.1954–1962
[9] “Occupational Health and Safety Council” access on http://www.oshc.org.hk (accessed on 20th October, 2016)
[10] “Hazard identification and risk assessment of industries processing” http://www.uws.edu.au/data/assets/pdf/0020/12917/Hazard Identification Risk Assessment and control Procedure 2008.pdf (accessed on 20th October, 2016)
[11] “Material Safety Data Sheet (MSDS)” http://en.wikipedia.org/wiki/Material_safety_data_sheet access on http://www.sciencelab.com/ (accessed on 20th October, 2016)
[12] “Personal Protective Equipment” with IS Standards http://en.wikipedia.org/wiki/Personal_protective_equipment (accessed on 20th October, 2016)
[13] ANZ. 1999. Risk Management AS/NZS 4360:1999. Strathfield : Standard Association of Australia.
