International Journal Publishing
INFLUENCE: International Journal of Science Review
Volume 8, No. 2, 2026
https://influence-journal.com/index.php/influence/index

# Occupational Safety and Health Risk Analysis on Slitter Machines Using the HIRADC and Job Safety Analysis Method at PT KYI

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**Abstract**. Increasingly tight competition in the manufacturing industry requires an optimal Occupational Safety and Health (OSH) system to prevent workplace accidents. This study aims to identify hazard potentials, assess risk levels, and formulate risk-control recommendations for the operation of the slitter machine at PT KYI. A descriptive qualitative-quantitative approach was applied at the Carton Department of PT KYI, Purwakarta, from September 2025 to January 2026. Primary data were obtained through direct observation, interviews with operators and supervisors, and company documentation, then analyzed using the Hazard Identification, Risk Assessment and Determining Control (HIRADC) method and Job Safety Analysis (JSA) with a likelihood-severity risk matrix. The results identified seven major hazard potentials in cutting, adjustment, and material-handling activities, five of which fall into the high-risk category and two into the moderate category. A 5M cause analysis (man, machine, method, material, environment) revealed the human factor as the most dominant cause. The proposed controls include engineering measures such as machine-guard installation, administrative controls through SOP enforcement and safety briefings, and mandatory, consistent use of personal protective equipment. Implementing these controls is expected to sustainably reduce the level of accident risk on the slitter machine.

**Keywords:** *Occupational Safety and Health; HIRADC; Job Safety Analysis; Slitter Machine; Work Accident Risk.*

## A. INTRODUCTION

The rapid development of industry and technology in the era of globalization has intensified competition among companies. This condition requires every company, particularly in the manufacturing sector, to enhance operational performance effectively and efficiently through the implementation of a robust Occupational Health and Safety (OHS) management system, thereby creating a safe working environment and minimizing the risk of workplace accidents.

Occupational Health and Safety (OHS) aim to protect workers from potential hazards arising during work processes while ensuring production continuity and operational efficiency. To systematically identify and analyze potential hazards, organizations require methods capable of assessing the level of risk associated with each work activity. Two widely adopted methods are Hazard Identification, Risk Assessment, and Determining Control (HIRADC) and Job Safety Analysis (JSA). HIRADC is employed to identify hazards, assess risks, and determine appropriate control measures, whereas JSA is used to analyze each stage of a job so that potential hazards associated with individual work activities can be controlled more effectively (Purnamasari et al., 2025).

PT KYI is a carton manufacturing company whose production processes involve various work activities requiring the interaction of machinery, equipment, and workers. According to company records, 15 workplace accidents occurred in 2024, including incidents involving workers being caught in machinery, slips and falls, being struck by materials, machine cuts, abrasions from work equipment, and dust exposure. These incidents highlight the need for a comprehensive risk analysis of high-risk work activities, particularly the operation of the slitter machine in the Carton Department.

This study is based on several previous studies, including research on the implementation of OHS for power plant machine operators, which emphasized the zero-accident principle through the provision of complete personal protective equipment (PPE), OHS information boards, and regular safety briefings (Purnamasari et al., 2025). Accordingly, this study aims to identify potential hazards associated with slitter machine operations, assess risk levels using the HIRADC method, analyze work procedures through Job Safety Analysis (JSA), and formulate appropriate risk control measures to reduce the likelihood of workplace accidents involving the slitter machine at PT KYI.

## B. METHOD

The research was conducted at PT KYI, Purwakarta Regency, West Java Province, Indonesia. This study employed a descriptive research design using both qualitative and quantitative approaches. The descriptive approach was used to systematically and objectively describe the existing conditions related to occupational hazards and workplace accident risks associated with slitter machine operations. The qualitative approach provided an in-depth understanding of the underlying causes of workplace hazards through observations and interviews, while the quantitative approach was applied to measure and classify risk levels based on likelihood and severity scores (Aristriyana & Ferdian, 2022).

Primary data were collected through three methods: (1) direct observation of slitter machine operations to examine working conditions, the use of personal protective equipment (PPE), and potential workplace hazards; (2) interviews with machine operators and supervisors to obtain information regarding hazard sources, accident history, and existing risk control measures; and (3) documentation, including workplace accident records, safety procedures, and production activity reports (Taha et al., 2024). Secondary data were obtained through a literature review of books, scientific journals, and academic articles related to Occupational Health and Safety (OHS), Hazard Identification, Risk Assessment, and Determining Control (HIRADC), and Job Safety Analysis (JSA), which served as the theoretical foundation for the study.

Risk analysis was conducted using the Hazard Identification, Risk Assessment, and Determining Control (HIRADC) method through three sequential stages. The first stage, hazard identification, involved identifying all potential hazards associated with material preparation, machine setup, carton cutting, product inspection, and workplace cleaning activities. The second stage, risk assessment, evaluated the level of risk by multiplying the likelihood and severity scores, with the results classified into low, moderate, high, and extreme risk categories. The final stage, determining control, established appropriate control measures based on the hierarchy of risk controls (Hikmi et al., 2020).

Subsequently, the Job Safety Analysis (JSA) method was applied to break each job into detailed work steps, identify potential hazards associated with every step, and determine suitable preventive and corrective control measures (Aristriyana & Ferdian, 2022). In addition, the root causes of potential workplace accidents were analyzed using the 5M approach, Man, Machine, Method, Material, and Environment to identify the underlying factors contributing to each identified hazard.

## C. RESULT AND DISCUSSION

### 1. Identify Potential Hazards

Hazard identification was conducted through direct observation and interviews of all slitter machine operating activities in the Cardboard Department of PT KYI. The identification results showed that the most frequently encountered potential hazards were hands being hit by the cutting blade, hands being caught in moving machine parts, exposure to cardboard dust,

machine noise, and the risk of slipping due to poorly organized work areas (Marwah et al., 2024).

### 2. Risk Assessment with the HIRADC Method

Risk assessment is carried out by multiplying the likelihood (L) and severity (S) values for each potential hazard, as presented in Table 1.

**Table 1. Occupational Accident Risk Assessment on Slitter Machines**

| No. | Risk | Likelihood (L) | Severity (S) | Risk Level (R) |
|---|---|---|---|---|
| 1 | Hand caught in the corrugator machine | 3 | 4 | H |
| 2 | Finger cut by the slitter blade | 2 | 4 | H |
| 3 | Hand scratched by sharp carton edges | 5 | 2 | H |
| 4 | Eye irritation caused by carton dust | 4 | 2 | H |
| 5 | Hand exposed to adhesive during production | 3 | 2 | M |
| 6 | Hand caught during carton stacking | 3 | 2 | M |
| 7 | Muscle fatigue due to repetitive work activities | 4 | 3 | H |

Source: Data Proceed

The assessment results in Table 1 show that five of the seven potential hazards are categorized as high risk (High), namely the risk of being caught in the corrugator machine, fingers cut by the slitter knife, hands scratched by the edge of the cardboard, eye irritation due to dust, and muscle fatigue due to repetitive activities, while the other two potential hazards are categorized as moderate (Moderate). High risks generally occur in activities directly related to the cardboard cutting process and moving machine parts because they have a high possibility of injury if the operator does not use complete personal protective equipment.

### 3. Job Analysis with JSA Method

Using the JSA method, the operator's work is outlined chronologically, from material preparation and machine setup, to cardboard cutting, inspection of the cut results, and cleaning the work area. This analysis shows that each work stage has specific risk characteristics, with the most critical potential for accidents occurring when the operator manually adjusts the blade and when hands are near the rotating roller area.

### 4. Root Cause Analysis (5M)

Root cause analysis shows that the potential for work accidents on slitter machines is a combination of human, machine, method, material and environmental factors as summarized in Table 2.

**Table 2. Potential Cause Analysis Based on the 5M Approach**

| Factor | Potential Causes |
|---|---|
| Man | Lack of discipline in wearing PPE, rushing, lack of understanding of SOPs, and low vigilance. |
| Machine | Rollers and knives are constantly moving, machine guards are suboptimal, and emergency stops are difficult to reach. |
| Method | Adjustments are made while the machine is running, pre-production inspections are not routine, and briefings are inconsistent. |
| Material | The size/weight of cartons poses a risk to manual handling; improper placement restricts movement. |
| Environment | Confined areas, poor lighting, high noise levels, and slippery floors due to carton dust. |

Source: Data Proceed, 2026

The human factor is the most dominant cause because it is directly related to compliance with work procedures, discipline in using PPE, and the level of operator alertness while working.

### 5. Risk Control

Risk control is formulated based on the OHS hierarchy of control, namely elimination, substitution, engineering, administrative control, and personal protective equipment (PPE). Engineering measures include installing machine guards on rotating cutting blades and transmission components, and ensuring regular machine maintenance. Administrative controls are implemented through strict implementation of standard operating procedures (SOPs), conducting pre-work safety briefings, and installing hazard warning signs around the machine area (Ramadhania et al., 2021). Furthermore, the company requires the consistent use of standard PPE, including cut-resistant gloves, dust masks, earplugs, and safety shoes, to reduce the risk of injury and exposure to hazards in the production area.

Other proposed improvements include increased daily monitoring of PPE compliance, the implementation of a 5S/5R program to organize cardboard materials and maintain a clean work area, and regular safety training for operators on safe work procedures and emergency response. Implementation of these recommendations is expected to reduce the risk of workplace accidents and increase the productivity and efficiency of the production process at PT KYI.

## D. CONCLUSION

Hazard identification in the operation of the slitter machine at PT KYI revealed mechanical, ergonomic, work environment, and health hazards that could potentially lead to workplace accidents. The HIRADC risk assessment revealed that five of the seven potential hazards were categorized as high risk, predominantly found in the cardboard cutting and adjustment of moving machine components. The JSA analysis successfully mapped the risk characteristics at each work stage, with the critical point being manual knife adjustment. Root cause analysis revealed human factors as the most dominant cause, followed by machine factors, work methods, materials, and the work environment. The proposed risk control measures included engineering measures such as the installation of machine guards, administrative controls through the implementation of SOPs and safety briefings, and the mandatory consistent use of PPE. The implementation of these controls is expected to create a safer work environment and reduce the risk of workplace accidents on the slitter machine at PT KYI in a sustainable manner.

## ACKNOWLEDGEMNT

The author would like to express his gratitude to the Industrial Engineering Study Program, Wastukancana Purwakarta College of Technology, as well as the management and operators of PT KYI who have provided permission and data support during the research process.

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