Identification of Workplace Accidents at PT XYZ in Sidoarjo Using The Job Safety Analysis (JSA) Method

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Abstract
The rapid development of technology in Indonesia significantly impacts various aspects of life, including the industrial sector. One of the negative impacts on this sector is the occurrence of work accidents that cause injury and death. This is due to the low implementation of Occupational Health and Safety (K3) culture in the industrial world. PT XYZ, a company engaged in the hot rolling coil industry in Sidoarjo, implements a K3 system. However, based on initial observations, there are still obstacles, especially the lack of understanding of human resources regarding Standard Operating Procedures (SOP). This study aims to identify the factors causing work accidents and outline corrective steps to reduce the risk. Using the Job Safety Analysis (JSA) method, this study found that in 2022, there were 43 cases of work accidents, while in 2023, the number decreased to 41 cases. As a result of these accidents, in 2022, there was a loss of 21 working days per 1,000,000 working hours/person, while in 2023, the loss of working days decreased to 18 days for the same period. The accident indicator also showed a decline, from 0.47 in 2022 to 0.38 in 2023. Recommendations to prevent work accidents at PT XYZ include reading the safety board, attending briefings before work, doing work according to the job description, and using personal protective equipment such as safety shoes and work helmets.

***Keywords*:** *Occupational Safety and Health (K3), Job Safety Analysis (JSA), Work Hazard Control.*

Abstrak
Perkembangan teknologi yang pesat di Indonesia membawa dampak signifikan pada berbagai aspek kehidupan, termasuk

sektor industri. Salah satu dampak negatif di sektor ini adalah terjadinya kecelakaan kerja yang menyebabkan cedera hingga kematian. Hal ini disebabkan oleh rendahnya penerapan budaya Kesehatan dan Keselamatan Kerja (K3) di dunia industri. PT XYZ, sebuah perusahaan yang bergerak di bidang industri hot rolled coil di Sidoarjo, menerapkan sistem K3. Namun, berdasarkan observasi awal, masih terdapat kendala, terutama pada kurangnya pemahaman sumber daya manusia terhadap Standar Operasional Prosedur (SOP). Penelitian ini bertujuan untuk mengidentifikasi faktor-faktor penyebab kecelakaan kerja serta merumuskan langkah-langkah perbaikan guna menurunkan risiko kecelakaan. Dengan menggunakan metode Job Safety Analysis (JSA), penelitian ini menemukan bahwa pada tahun 2022 terjadi 43 kasus kecelakaan kerja, sementara pada tahun 2023 jumlahnya menurun menjadi 41 kasus. Akibat kecelakaan tersebut, pada tahun 2022 tercatat kehilangan 21 hari kerja per 1.000.000 jam kerja/orang, sedangkan pada tahun 2023 kehilangan hari kerja turun menjadi 18 hari untuk periode yang sama. Indikator kecelakaan juga menunjukkan penurunan, dari 0,47 pada tahun 2022 menjadi 0,38 pada tahun 2023. Rekomendasi untuk mencegah kecelakaan kerja di PT XYZ meliputi membaca safety board, mengikuti briefing sebelum bekerja, melaksanakan pekerjaan sesuai deskripsi tugas, serta menggunakan alat pelindung diri seperti sepatu keselamatan dan helm kerja.

Keywords**:** *Keselamatan dan Kesehatan Kerja (K3), Job Safety Analysis (JSA), Pengendalian Bahaya Kerja.*

1. Introduction

The rapid development of technology in Indonesia affects various aspects of life, including the industrial sector. The advancement of technology in the industrial industry certainly has positive and negative impacts on Indonesian society. One of the negative impacts in the industrial sector is work accidents. So that it can cause people to be injured or even die, this is because the Occupational Health and Safety (K3) culture in the industrial world is still low (Waluyo, 2011).

Occupational Health and Safety (K3) is an effort to provide protection and ensure workers' health and safety. This aligns with Irzal (2016), who states that Occupational Health and Safety (K3) is a means to create a safe and healthy workplace, protecting against work accidents in the industrial sector to enhance work efficiency and productivity. Work accidents can result in losses for companies and victims and disrupt production. Occupational Health and Safety, or K3, positively impacts workers by providing health insurance that is fully covered by the company (Irzal, 2016: 2).

In general, occupational safety and health is an effort to guarantee workers' lives, both physically and mentally, to create a prosperous society. Specifically, it is an effort to prevent

all potential that can cause work accidents (Ismara et al., 2014). Occupational safety and health are paramount to applying to high-risk and low-risk jobs to guarantee the integrity of workers' rights to work safely and comfortably. Occupational safety is a plan workers make as a preventive measure against work-related accidents by identifying things that can cause work accidents. This plan aims to make the workplace comfortable and healthy to minimize the risk of accidents and diseases (Nur et al., 2020). Occupational health is an effort to inform and maintain a level of health consisting of physical, mental, and social health for workers in work activities through disease prevention, K3 risk control, job suitability, and job adaptation (Anwar et al., 2019)

Work hazards are sources of losses or conditions related to workers, work, and the work environment that can potentially cause losses (Ilmansyah, 2020). Workplace hazards arise from interactions between production elements, namely humans, equipment, materials, production processes, and work procedures or systems (Mahawati et al., 2021).

PT XYZ is a company in the hot-rolled coil industry in the Sidoarjo area. Based on initial observations, PT XYZ implements Occupational Health and Safety (K3), but human resources still do not understand the Standard Operating Procedure (SOP). This situation arises from a lack of socialization or training in Occupational Health and Safety (K3). In addition to human resources' limited understanding of occupational health and safety (SOP), it is also due to the tools that have exceeded their service life. Human resources remain negligent in using PPE, even though PPE plays a significant role in Occupational Health and Safety (K3). For example, workers do not wear safety shoes, which can negatively impact them, such as tripping over materials, slipping, and being struck by materials.

In overcoming K3 risks, risk management is carried out to prevent accidents and minimize the risks due to work accidents. Risk management is an activity that manages risks that aims to prevent unwanted work accidents in detail, thoroughly, planned, and structured in a sound system (Mardhotillah, 2020). K3 management is carried out by recording operational weaknesses that have the potential to cause accidents. This is done by investigating the cause of a work accident and finding the right way to deal with it. Some causes usually include incomplete operational standards, wrong decisions, inaccurate calculations, and poorly directed management (Walujodjati, Rahadian, 2021).

In analyzing the risk of work accidents, a qualitative method is often used, namely the Job Safety Analysis (JSA) method. Job Safety Analysis is a simple method for identifying, evaluating, and controlling risks in industrial work activities. The assessment using the JSA method is to record all possible hazards and then provide control solutions by applicable K3 standards (Sulistiyowati et al., 2019). Job safety analysis (JSA) is a method for identifying work steps and potential hazards to be evaluated in determining appropriate controls. JSA can also be interpreted as examining whether a job is running by the SOP set by the company (Abidin, Mahbubah, 2021).

2. Method

This research was conducted at PT XYZ in Sidoarjo. PT XYZ is engaged in the hot-rolled coil and cold-rolled coil industry. PT XYZ started production on March 1, 2012, and stands on 150,000 m² in the Sidoarjo area. PT XYZ always develops in various fields to achieve the best product quality and service for customers.

The data analysis technique used in this study was job safety analysis (JSA). Job Safety Analysis (JSA) is a procedural examination to determine whether the procedures have been running correctly and to examine the attitude aspects of the people carrying out the work in question (Alkon, 2004). Job safety analysis aims to prevent accidents by anticipating, eliminating, and controlling existing hazards (Industrial Dictionary, 2012). JSA is one of the main steps in analyzing hazards and accidents to create work safety. If the risk has been identified, control measures can be taken through physical changes or improvements to work procedures that can reduce work hazards. In its implementation, the work safety analysis procedure requires training, supervision, and writing of work descriptions known as JSA to facilitate the understanding of work procedures for employees.

Next, the types of work accidents will be analyzed based on the results of observations of the work process, and interviews will be conducted with the employees concerned to obtain information on the types of work accidents that occur. After that, the frequency of work accident data will be analyzed. Frequent work accidents are important for planning accident prevention steps and assessing productivity. From this data, it can be seen how many work accidents occur within a certain period. The steps of this research include:

a. Problem Identification is a step researchers take at the beginning of the research. Identify problems by explaining what problems are found and taking measurements for research materials.
b. Data Collection. In searching or collecting data sources, there are two types of data collection, namely:
c. Primary data Primary data is data obtained directly in the field. Simply put, it is an interview with employees through observation or direct observation in the production section.
d. Secondary While secondary data, namely data that has existed for 1 Year Regarding Occupational Accidents and Health
e. Data Processing. For data processing, namely the collection of Work Accident Data that Occurred for 1 Year. Then, the causes of work accidents are analyzed to reduce the number of work accidents at PT XYZ in Sidoarjo.
f. Discussion and Improvement Discussion is done when the required data statement is genuinely there and valid. After getting the data statement needed, the next step is to make improvements.
g. Conclusion and Suggestions. In this conclusion and suggestions section, we will briefly explain the results of the research that has been carried out

3. Result and Discussion

Based on the results of observations and interviews, it can be seen that the implementation of K3 at PT.XYZ has not been carried out optimally because Human Resources does not comply with Standard Operating Procedures (SOP). Thus, this results in frequent work accidents. This can be seen in the work accident data for 2022-2023 in Table 1.

Table 1. Work Accident Data

Year	Accident			Amount
	Died	Weight	Light	
2022	2	15	26	43
2023	0	13	28	41
Total	2	28	54	

Source: Internal Data of PT XYZ

Based on the work accident data table, it can be seen that the number of employees who died was two people: 28 people had serious accidents, and 54 people had minor work accidents. This is due to negligence at work, resulting in minor accidents and death. From the observations that have been carried out, the results of the work accident rate for the period 1 year 2022 to 2023 can be seen, namely as follows.

Year 2022

Total number of working hours = number of workers × working days for 1 year × working hours/day = 558 x 365 x 8 = 1.629.360 hours.

***Frekuensi Rate* (FR)**

$$FR = \frac{Number\ of\ accidents}{Person's\ working\ hours}\ x\ 1.000.000 = \frac{43}{1.629.360}\ x\ 1.000.000 = 26{,}39 = 26$$

So, in 2022, there were 43 work accidents, resulting in 26 employees suffering minor, moderate, or fatal injuries.

Year 2023

Total number of working hours = number of workers × working days for 1 year × working hours/day = 558 x 365 x 8 = 1.629.360 hours

***Frekuensi Rate* (FR)**

$$FR = \frac{Number\ of\ accidents}{Person's\ working\ hours}\ x\ 1.000.000 = \frac{41}{1.629.360}\ x\ 1.000.000 = 25{,}16 = 25$$

So, in 2022, there were 41 work accidents, resulting in 25 employees suffering minor, moderate, or fatal injuries.

Then, the severity rate (injury severity) is calculated, which is the number of days lost for every 1,000,000 working hours divided by the number of working hours per person.

Year 2022

$$SR = \frac{Jumlah\ hilangnya\ jam\ kerja}{Person's\ working\ hours}\ x\ 1.000.000 = \frac{35}{1.629.360}\ x\ 1.000.000 = 21{,}48 = 21$$

So, in 2022, there will be a loss of 21 working days for every 1,000,000 working hours/person.

Year 2023

$$SR = \frac{Jumlah\ hilangnya\ jam\ kerja}{Person's\ working\ hours}\ x\ 1.000.000 = \frac{29}{1.629.360}\ x\ 1.000.000 = 17{,}79 = 18$$

So, in 2023, there will be a loss of 18 working days for every 1,000,000 working hours/person.

Frekuensi Saverity Indicator (FSI)

Year 2022

$$FR = \frac{Frekuensi\ Rate\ x\ \text{Severity Rate}}{1000} = \frac{26\ x\ 21}{1000} = \frac{546}{1000} = 0{,}546 = 0{,}55$$

So, in 2022, there was an accident indicator of 0,54.

Year 2023

$$FR = \frac{Frekuensi\ Rate\ x\ \text{Severity Rate}}{1000} = \frac{25\ x\ 18}{1000} = \frac{450}{1000} = 0{,}45$$

So, in 2023, there was an accident indicator of 0,45.

Risk identification is then carried out in the raw material area based on the various data that have been analyzed. In Table 2, you can see the risks in various areas.

Table 2. Risk Identification

Activity	Potential Hazard	Consequences	Existing Controls
Risk Identification in Raw Material Area (Slab Cutting)			
Pengangkatan Bahan Baku (Slab) menggunakan Crane 16 ton	Falling Material	Injury, death	Safety lane or yellow lane (worker not walking on safety lane)
Cleaning raw materials from cutting machine residue	Hit by Forklift Injury	Injury, death	Safety lane or yellow lane (worker not walking on safety lane)
	Stuck by material to be moved	Injury	PPE (Worker not wearing safety shoes)
Cutting using a cutting machine	Exposure to sparks from plasma cutting machine	Burns	PPE (Rarely used)
	Inhalation of plasma-cutting fumes	Respiratory problems	Mask (Rarely used)
Risk Identification in Hot Rolled Coil (HRC) Production Area			
Coil winding using a machine	Exposed to heat from Hot rolled coil	Burns	PPE (Workers do not wear heat-resistant clothing)

Activity	Potential Hazard	Consequences	Existing Controls
Replacing the roll on the Press coil machine using a 20-ton Crane	Crashed by the roll when lifting using a crane	Death	Safe path or Yellow path (worker does not walk on the safe path
Risk Identification in HCL and Cold Rolled Coil (CRC) Area			
Coil Washing using hydrochloric acid (HCL)	Inhalation of hydrochloric acid (HCL)	Shortness of breath	Mask (workers do not wear masks when in the HCL area)
	Contact with human body parts	Blisters, burns	Workers are not careful in the HCL Area
	Hydrochloric acid fumes in eyes	Sore, Itchy Eyes	Safety glasses (workers do not wear glasses in the HCL area)
Coil connection using a welding machine when washing the coil in the HCL Area	Eyes exposed to welding rays	Red eyes, eye damage	Welding glasses (Workers do not use standard welding glasses)
Risk Identification in Slitting Area			
Coil Cutting Into 3 Parts	Hand Exposed to Sharp Edge of Coil Cut	Lace Wound	PPE (Worker Not Wearing Gloves)
Moving Slitting Coil Results to FGWH (Finished Good Warehouse) Using a 10-ton Crane	The coil hit when lifting using a crane	Disability, Death	Workers are less careful when working
Risk Identification in Crane Mechanical Area			
Welding	Eyes Exposed to Welding Rays	Eye Pain	Welding Glasses (Rarely Used)
	Welding Sparks Exposure	Burns	Welding Gloves (Not Used)
Iron Cutting Blender	Skin Exposure to Sparks Blander	Burns	Combination Gloves (Not Used)
	Eyes Exposed to Iron Cutting Rays	Eye Pain	Special Iron Cutting Glasses (Rarely Used)
Assembling Crane Panels and Electrical	Electric Shock	Injuries, Burns	Careless Workers
	Electrical Short Circuit or Fire	Burns	Electrical components that are no longer suitable for use

Then, an evaluation was carried out based on the results of the achievement of the implementation of K3 Communication at PT.XYZ, as seen in Table 3.

Table 3. Results of Achievement of K3 Communication Implementation at PT.XYZ

Category	Available	Not Available
Safety Promotion		
1. K3 Poster	√	-
2. K3 Magazine or Bulletin	-	√
3. K3 Publicity	-	√
4. K3 Training	-	√

Category	Available	Not Available
Safety Information		
1. K3 Hazard Information System	√	-
2. K3 Signs and Labels	√	-
3. Safety Handbook	-	√
4. Procedure for leaving the workplace	-	√
Other forms of Consultation and Communication		
1. Safety, Health, and Environment Briefing	√	-
2. K3 Communication Board	-	√
Emergency Response Procedure		
1. Mobilization Route	√	-
2. Emergency Action Procedure	-	√
Subtotal	5	7
Total Form of K3 Communication Implementation	12	
Total Achievement	5	
Percentage of Achievement	42%	

Determination of the implementation level of the Occupational Safety and Health (K3) program at PT. XYZ during 2022-2023 can be seen in Table 4, which explains the level of implementation (loss rate). The table shows the level of implementation of the K3 program at PT. XYZ is at level 4 (Red, Vulnerable).

Table 4. Grouping of Work Accidents in 2022-2023

Types of Work Accidents	Frequency Year 2022	Frequency Year 2023
Hit by material	3	1
Caught by material	4	3
Electric shock	5	6
Hit by slitting knife	9	8
Slipped	8	7
Fell from building	2	0
Hit by cutting machine sparks	6	7
Exposed to welding beam	6	9
Total	43	41
Success Rate - Loss Rate	Red	

To determine the level of K3 implementation, the relationship between the K3 implementation and the accident rate is used. From the calculation of the level of achievement of K3 implementation, it is in the red category, while the work accident rate is also in the red category, as seen in Figure 1. From the calculation explanation, it is concluded that the accident rate based on the traffic light system is in the red category or very dangerous, so improvements are needed in several assessment indicators.

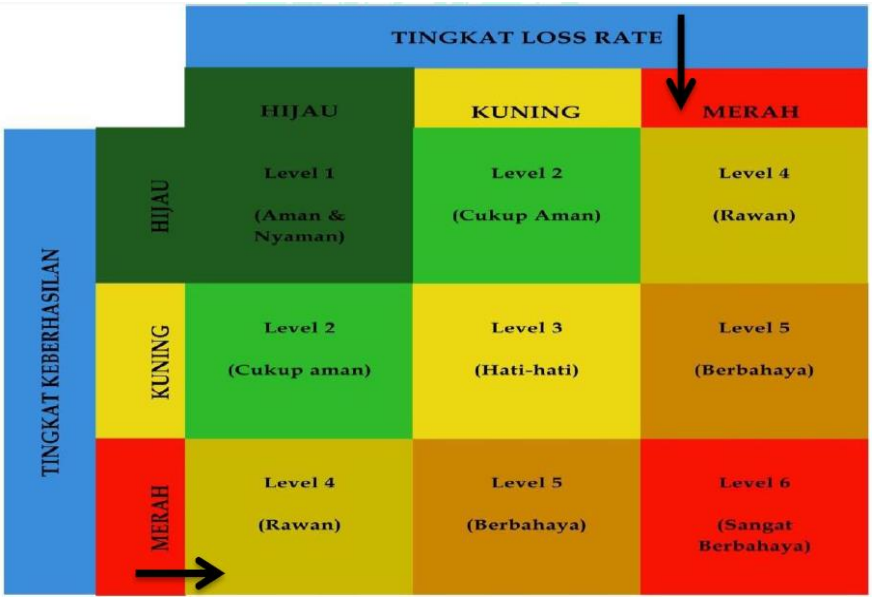

Figure 1. Success Rate Mapping – Lose Rate

4. Conclusion

Based on the results of research conducted on work accidents at PT. XYZ, it can be concluded that the personal protective equipment used by workers at PT. XYZ has met the Occupational Safety and Health (K3) standards, but work accidents often occur because workers are less disciplined and usually do not use Personal Protective Equipment (PPE) correctly. From the calculation of accidents in 2022-2023, it can be concluded that the implementation of K3 at PT. XYZ is quite good, so there has been a decrease in work accidents. Based on the analysis results, the implementation of the K3 program is at Level 4 (red, vulnerable). This explains that the implementation of K3 and the implementation of K3 have been carried out quite well, but the implementation of K3 needs to be improved again.

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