

ANALYSIS OF THE APPLICATION OF OCCUPATIONAL HEALTH AND SAFETY (K3) IN FABRICATION WORK WITH THE RISK ASSESSMENT METHOD AT PT INDUSTRI KERETA KERETA (INKA) BANYUWANGI

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ABSTRACT

Potential hazards always exist when we are doing daily activities and potential hazards always exist wherever we are, be it in every place of the work environment or outside the work environment. In the industrial business world, occupational safety and health (K3) is very necessary. There will always be a risk of failure (risk failures) in every work activity and when a work accident occurs, so that no matter how small the work accident will result in a loss effect for both the company and the worker. PT. Industri Kereta Api (INKA) Banyuwangi is a state-owned enterprise engaged in manufacturing services located in Ketapang Village, Kalipuro Banyuwangi. PT INKA Banyuwangi is still relatively newly inaugurated and has just started production, it is not surprising that the attitude of workers towards the application of K3 at PT INKA Banyuwangi has not gone well. The purpose of this research is to identify potential hazards and conduct risk assessment of the level of work accidents at PT INKA Banyuwangi.

From the results of the identification that occurred at PT. Industri Kereta Api (INKA) Banyuwangi, 10 potential hazards and risks were found in field workers. The risk level assessment for field workers contained 3 low risks and 5 medium risks. Assessment of risk control in field workers there are 4 mild risks and 4 moderate risks. While the results of the calculation of residual risk or residual risk after control efforts are made there are still 5 hazard risks that require improvement in work accident control at PT. Railway Industry (INKA) Banyuwangi.

Keywords : Potential hazards, risk assessment, work accident

1. INTRODUCTION

Manufacturing companies in Indonesia are experiencing quite rapid development, this is evidenced by the existence of many jobs, both in the manufacturing and service industries. So that in order to continue to compete, it is important for companies to always make innovations and improvements, especially in terms of human resources. The success of human resource management in productivity and performance is used as one of the benchmarks for achieving company success. The success of a company or organization is determined by human resources because humans are living assets that need to be maintained and developed (Daulay, 2021). In this era of global competition, worker productivity is one of the important factors that can affect the success of a company. Productivity is the main indicator for the progress of a company. So that increasing productivity in all parts of the system is a way to increase the rate of economic growth of the company. Companies strive to increase the productivity of all their employees in order to compete with other companies because they can produce goods or services in a more efficient way. Potential hazards always exist when we are doing daily activities and potential hazards always exist wherever we are, be it in every place of the work environment or outside the work environment. In the industrial business world, occupational safety and health (K3) is now indispensable. There will always be a risk of failure (risk failures) in every work activity and when a work accident occurs, so that no matter how small the work accident will result in a loss effect for both the company and the worker (Alfatimah, 2017). That is why prevention and control efforts are needed as an effort to prevent the risk of work accidents. Hazard identification is necessary to ensure the safety of the production process for workers, equipment and the environment from work accidents (Putranto, 2010).

PT. Industri Kereta Api (INKA) Banyuwangi is a state-owned enterprise engaged in manufacturing services located in Ketapang village, Kalipuro Banyuwangi. PT INKA Banyuwangi has 20 field workers, each of whom has a different task, of course, from each of their jobs they are never separated from a potential hazard of

work accidents both from the place where the work is done and the tools used. Work accident is an event that is never planned in advance.

Every accident that occurs can certainly hinder workers in doing work, on the contrary, good health conditions can create good work productivity for all workers. PT INKA Banyuwangi is still relatively newly inaugurated and has just started production, it is not surprising that the attitude of workers towards the application of K3 at PT INKA Banyuwangi has not gone well. This will lead to lower productivity levels. According to the results of direct field observations and interviews conducted with the head of the Production section at PT. INKA Banyuwangi, the following are data on work accidents in the fabrication work process obtained from PT. INKA Banyuwangi for 5 months, starting from January-May 2023 as follows:

Table 1.Type of Accident Details that occurred

Month	Month Accident Type	Quantity
January	Exposure to weld violet light	2
	Scratching the material	1
	Exposed to welding fume dust	2
February	Exposed to welding spatter	2
	Exposed to welding violet light	1
	Exposed to grinding blades	1
March	Scratching the material	2
	Exposure to welding fume dust	2
	Exposure to welding violet light	1
April	Exposure to welding violet light	3
	Exposure to welding fume dust	2
	Scratching the material	1
	Tripping over cables	1
May	Exposed to welding violet light	1
	Exposure to welding fume dust	2
	Scratching the material	2

Source: PT Railway Industry (INKA) Banyuwangi

Seeing from these conditions, it is necessary to analyze and identify risks in each accident. And one of the efforts to minimize the level of work accidents by implementing risk assessment of K3 at PT INKA Banyuwangi. Work accidents that occur include several things such as the machines used and the work environment. Risk management has a big role so that the risks and hazards that occur do not have a major impact on the company's operating processes (Supriyadi et al, 2015).

As a basis for previous research by Daulay and Nuruddin. (2021): "K3 Analysis at Dwi Jaya Motor Workshop Using HIRA Method Integrated with FTA Method". This research applies the HIRA and FTA methods to identify hazards in the workshop work environment and analyze risks and determine the

necessary controls. Other research was also found by Prasetya et al. (2020): "Risk Analysis on Tank Cleaning of Stockpile Tanks by Hiradc and Fta Methods with Recommendations Using the Bcr Method". This research focuses on the chemical industry and applies a combination of HIRADC and FTA methods to improve process safety in chemical plants. The results show that this approach is effective in identifying potential hazards, analyzing risks, and designing appropriate control measures to reduce the likelihood of accidents or serious incidents. The results show a significant reduction in the incidence of accidents after implementation of the recommended control measures. HIRADC aims to recognize potential hazards as well as recognize various kinds of operational capability issues in each fabrication work process.

2. METHODOLOGY

Data Collection Methods

Type of Data

The type of data used in this study consists of two types with data collection methods, namely:

1. Primary Data

Primary data is qualitative data obtained by conducting direct research or observation through interviews with field workers in the fabrication section at PT INKA Banyuwangi. With this interview, information is obtained which can later be concluded from the answers of the sources, which then the results will be arranged systematically so that a brief conclusion is obtained which contains data.

2. Secondary Data

Secondary data is data obtained from several parties or intermediaries who have conducted previous research such as obtained from journals, books, notes or scientific papers. Secondary data is data obtained directly from the object of research. Such as work accident data at PT. Indutrsi Kereta Api (INKA) Banyuwangi.

Data Collection :

1. Observation

Observation is a process that is preceded by observation and then recording which is systematic, logical, objective, and rational towards various kinds of phenomena in actual situations, or artificial situations. The purpose of observation is in the form of description, giving birth to theories and hypotheses (in qualitative research), or testing theories and hypotheses (in quantitative research). The function of observation in more detail consists of description, filling, and giving. From observations made directly at the work of the fabrication section at PT INKA Banyuwangi, it was found that several work accidents occurred while repairing the salurun such as being scratched by twigs during pipe replacement, exposure to dust, hands scratched by pipes and others.

2. Interview

An interview is an interaction conducted between the interviewer and the interviewee conducted directly. The interviewee will answer the questions given by the interviewer so that data, information, or about a matter will be obtained. In this case the author conducted an interview directly with the head of the workers' supervisory section at PT INKA Banyuwangi about work accidents that often occur and how many accidents occur in each month.

3. Literature Study

Literature study is a data collection activity by reading and studying from literature books or journals as a theoretical basis for a problem to be solved.

3. RESULT AND DISCUSSION

Work Accident and Risk Data

From the data on work accidents at PT. Railway Industry (INKA) Banyuwangi, the following data from January 2023 - May 2023 :

Table 2. Work Accident Data January 2023-May 2023

Month	Category				
	Light	Medium	Heavy	Total	Percentage
January	5	0	0	5	21%
February	3	1	0	4	15%
March	5	0	0	5	18%
April	6	1	0	7	25%
May	5	0	0	5	21%
Total				33	100%

Data Source: Pt. Railway Industry (INKA) Banyuwangi

From the results of interviews that have been conducted at PT. Industri Kereta Api (INKA) Banyuwangi, the results of work accidents that have been divided based on causes and consequences for five (5) months can be seen in table 3 below:

Table 3. Cause of Accident and total

Month	No	Cause of Accident	Result of Accident	Total
January	1	Welding violet light Eye Irritation	Welding violet light Eye Irritation	2
	2	Exposed to welding spatter Skin injury	Exposed to welding spatter Skin injury	2
	3	Exposed to grinding blades Hand Injury	Exposed to grinding blades Hand Injury	1
February	4	Scratch material Hand injury	Scratch material Hand injury	1
	5	Exposed to welding spatter Skin irritation	Exposed to welding spatter Skin irritation	1
	6	Welding violet light Eye irritation	Welding violet light Eye irritation	2
March	7	Exposed to grinding blades Hand injury	Exposed to grinding blades Hand injury	2
	8	Welding violet light Eye irritation	Welding violet light Eye irritation	3
April	9	Violet welding light Eye irritation	Violet welding light Eye irritation	3
	10	Exposed to welding splash Skin irritation	Exposed to welding splash Skin irritation	2
	11	Exposed to grinding blades Hand injury	Exposed to grinding blades Hand injury	1
	12	Exposed to welding spatter Skin irritation	Exposed to welding spatter Skin irritation	1
May	13	Exposed to grinding blades Hand injury	Exposed to grinding blades Hand injury	1
	14	Violet welding light Eye irritation	Violet welding light Eye irritation	2
	15	Scraped material Scratches	Scraped material Scratches	2

Data Source: Pt. Railway Industry (INKA) Banyuwangi

Discussion

Identification results

The results of hazard identification carried out during the study based on the work section, namely in the Welding, grinding to blander cutting section are presented in table 4

Table 4. Hazard Identification Results

Stage of Work	Potential Hazards	Risks
Welding work	Exposure to welding light Violet welding light can cause eye burns, heat and even eye irritation.	Exposure to welding light Violet welding light can cause eye burns, heat and even eye irritation.
	Exposure to welding sparks Hand injuries, even burns	Exposure to welding sparks Hand injuries, even burns
	on the skin due to welding sparks	on the skin due to welding sparks
Grinding work	Exposure to dust and gas in welding fumes makes the nose feel sore and hot	Exposure to dust and gas in welding fumes makes the nose feel sore and hot
	Cut by materials that are torn and injured hand skin	Cut by materials that are torn and injured hand skin
	Makes the nose feel sore and hot	Makes the nose feel sore and hot
Cutting work with blander	Exposed to dust and gas Hand and skin injuries	Exposed to dust and gas Hand and skin injuries
	Exposed to sharp materials Torn and injured hand skin	Exposed to sharp materials Torn and injured hand skin
	Exposed to sparks Sparks can cause serious injuries and burns.	Exposed to sparks Sparks can cause serious injuries and burns.

Sumber : PT. Industri Kereta Api (INKA) Banyuwangi

Penilaian Tingkat Risiko

From the results of observations that have been made at the PT Kereta Api Industri (INKA) Banyuwangi field work site, potential hazards and risks are obtained. The following is a ranking category based on the results of multiplying the probability times the severity:

- a. Green color, has a score of 1-6, which means low risk and generally acceptable risk.
- b. Yellow color, has a score of 7-14. This means the risk is moderate and can be tolerated.
- c. Red color, has a score of 15-25. This means the risk rating is high and unacceptable.

Determination of risk level according to (Wicaksono, 2017) is with the equation

$$\text{Risk} = \text{Likelihood} \times \text{Severity}$$

Calculation Example 1:

$$\text{Risk} = \text{Likelihood} \times \text{Severity}$$

$$= 4 \times 2$$

$$= 8$$

Description:

L = Likelihood.

S = Severity.

Table 5. Risk Assessment Results

no	Stage of work	Potential hazards	Risk	Risk Assessment		Risk assessment	Prioritization
				L	S		
1	Welding Work	Exposure to welding light Violet welding light can cause eye burns	Exposure to welding light Violet welding light can cause eye burns	5	1	8	low
		Exposure to welding spatter Hand injuries, even burns to the skin due to welding spatter	Exposure to welding spatter Hand injuries, even burns to the skin due to welding spatter	4	2	8	medium
		Exposure to dust and gas in welding fumes makes the nose feel sore and hot	Exposure to dust and gas in welding fumes makes the nose feel sore and hot	4	2	8	medium
2	Cutting work with blander	Exposure to sparks Sparks can cause severe injuries to the skin and even burns.	Exposure to sparks Sparks can cause severe injuries to the skin and even burns.	2	4	8	medium
		burns	burns	1	4	4	low
3	Grinding Work	Tripping over a falling cable and getting hurt or bruised	Tripping over a falling cable and getting hurt or bruised	2	4	8	medium
		bruises	bruises	4	2	8	medium
		Electric shock Pain and high fever	Electric shock Pain and high fever	3	2	6	low



Figure 1 Graph of Risk Assessment Results

Risk Control Level Assessment Results

The level of risk control is risk control by determining the control rating. The ranking category is based on the results of multiplying the control hierarchy with the control strategy, namely:

- Light Green color has a score of 1-10, the existing risk control rating is the last choice
- Orange color has 11-20, medium control rating means that the risk control options are good enough
- Brown color has a score of 21-30, a good control rating which means that the existing risk control is the best choice.

How to find the value of risk control according to (Ramli, 2010) is:

Risk Control = Control Hierarchy x Control Strategy

Calculation Example 1:

Risk Control = Hierarchy of Control x Control Strategy

= 5 x 3

= 15

Tabel 6. Risk Control Level Assessment

Stage of work	Potential hazards	Control Hierarchy	Control Strategy	Risk assessment	Prioritization
Pekerjaan Pengelasan	Exposed to welding light	1	1	1	low
	Exposed to welding spatter	5	3	15	Medium
	Exposure to dust and gas in welding fumes	2	3	6	Low
Pekerjaan Pemotongan dengan blander	Exposure to sparks	4	4	16	Medium
	Tripping over cables	2	3	6	low
Pekerjaan Menggerinda	Electrocuted	5	3	15	medium
	Exposed to grinding blades	4	3	12	medium
	Exposed to sharp materials	2	3	6	low



Figure 2 Risk Control Level Assessment

after implementing the recommended controls. The grading levels are as follows :

- Gray color has a score ≤ 1 , meaning that the recommended control is appropriate.
- Blue color has a score > 1 , meaning that the control cannot reduce the risk completely and still needs to be considered.

The calculation of Residual Risk according to (Ramli, 2010) is:

$$\text{Residual Risk} = \text{Risk Level} - \text{Control Value}$$

Example of Calculation 1:

$$\begin{aligned} \text{Residual Risk} &= \text{Risk Level} - \text{Control Value} \\ &= 8 - 12 \\ &= -4 \end{aligned}$$

For the calculation results can be seen in table 7. below

Table 7. Residual Risk assessment results

Work	Potential Hazard	Risk Level	Risk Control	Residual Risk
Welding work	Exposed to welding light	5	1	4
	Exposed to weld spatter	8	15	-7
	Exposure to dust and	8	6	2
Cutting	gases in welding fumes	8	16	-8
	Exposed to sparks	4	6	-2
	gan with blander	8	15	-7
	Electrocuted	8	12	-4

Exposed to grinding blades	6	6	0
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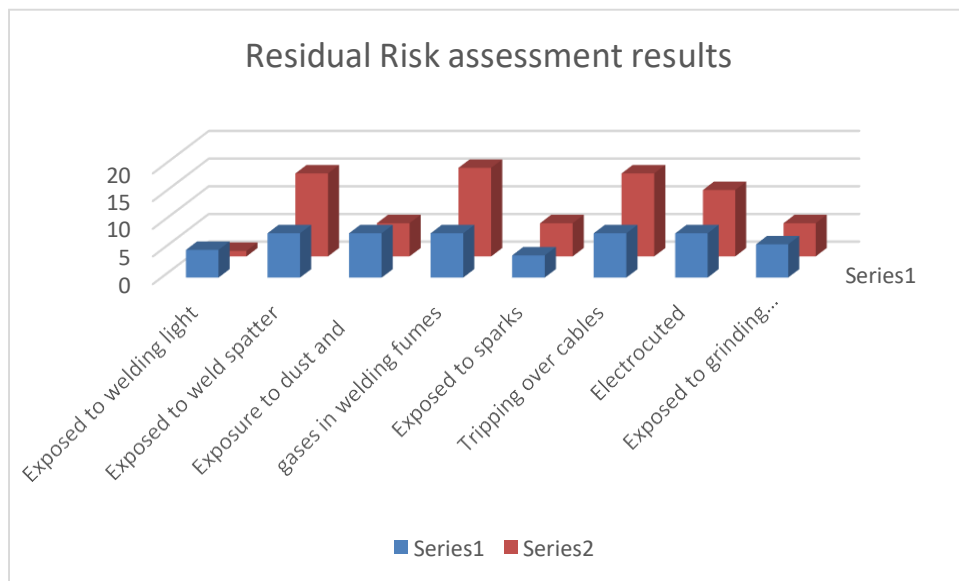


Figure 3 Residual Risk assessment results

Based on the results of the residual risk assessment, 3 hazard risks are grayed out, which means that the recommended controls are in accordance with the level of risk and the remaining 5 risks are blue, which means that the controls carried out still need to be considered again.

Control efforts that need to be done:

a. Exposed to welding sparks

Use fire-resistant and thick gloves during welding work, if welding splashes are not controlled, also use glasses and face shields to protect the eyes from irritation so that welding activities can run smoothly.

b. Exposure to dust and gas in fumes

Use a face shield when welding, if the dust is too much use protective glasses to protect the eyes from irritation.

c. Exposed to sharp materials

Use gloves made from special materials to avoid being cut by sharp materials.

d. Exposed to grinding eyes

Use safety gloves, apron and shoes when working. menggerinda supaya mencegah terjadinya goresan yang diakibatkan oleh mata gerinda.

4. CONCLUSION

Based on the results of research that has been carried out at PT. Industri Kereta Api (INKA) Banyuwangi, several conclusions can be drawn, namely:

1. From the results of the identification that occurred at PT. Industri Kereta Api (INKA) Banyuwangi, 10 potential hazards and risks were found in field workers.

2. Risk level assessment for field workers there are 3 low risks and 5 medium risks. Assessment of risk control in field workers there are 4 mild risks and 4 moderate risks.

3. The results of the calculation of residual risk or residual risk after control efforts are made there are still 5 hazard risks that require improvement in work accident control at PT. Railway Industry (INKA) Banyuwangi.

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