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An Analysis of Job Safety Analysis (JSA) on Occupational Safety at PT Kilang Pertamina Internasional Unit 6 Balongan

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Abstract –

This study aims to determine the effect of each stage in the Job Safety Analysis (JSA) is namely risk identification, risk assessment, and risk mitigation on workplace safety at PT Kilang Pertamina Internasional Unit 6 Balongan. Using a quantitative approach with multiple linear regression analysis, the research examines the relationship between these three stages and the level of employee safety. The results indicate that the risk identification process has a significant impact on improving workplace safety. In contrast, risk assessment and risk mitigation, when analyzed individually, do not show a significant influence. However, when the three stages are analyzed simultaneously, it is found that the overall JSA process contributes positively to occupational safety within the company. These findings underscore the importance of implementing JSA in a comprehensive and consistent manner to create a safe and controlled work environment in accordance with applicable safety standards.

Keywords – *Occupational Safety, Job Safety Analysis, Risk Identification, Risk Assessment, Risk Mitigation*

I. INTRODUCTION

Occupational safety management is highly important at PT Kilang Pertamina Internasional (PT KPI). PT Kilang Pertamina Internasional is a Subholding of Refining & Petrochemical under PT Pertamina (Persero), which develops businesses and carries out investments related to the processing of oil, natural gas, and other materials into high-value fuel, lubricants, petrochemicals, and pharmaceuticals in accordance with market developments. Pertamina's refining operations are supported by six refineries, namely Refinery Unit (RU) II Dumai, RU III Plaju, RU IV Cilacap, RU V Balikpapan, RU VI Balongan, and RU VII Kasim. PT Pertamina (Persero) Refinery Unit (RU) VI Balongan is the sixth of seven refineries under the Directorate of Processing of PT Pertamina, which has been

operating since 1994. As a relatively new refinery that has implemented the latest technologies, Pertamina RU VI possesses high economic value. With its flagship products such as Premium, Pertamax, Pertamax Plus, Solar, Pertamina DEX, Kerosene, LPG, and Propylene, Pertamina RU VI makes a significant contribution to generating revenue both for PT Pertamina and for the state, while also holding strategic importance in maintaining the stability of fuel supply to DKI Jakarta, Banten, parts of West Java, and surrounding areas, which are central to Indonesia's business and government activities.

As the company continues to grow, the complexity of its activities also increases, leading to a higher level of risks faced by the organization. Therefore, risk management becomes one of the essential elements in conducting business operations. Paradoxically, the true benefits of risk management are often only realized once a risk has already occurred.

One of the most critical risks to be mitigated is the occurrence of workplace accidents. Occupational accidents represent an inherent inevitability within organizations that fail to adequately implement effective safety management practices. Occupational safety constitutes a fundamental aspect that must be systematically addressed and established by the company. Through comprehensive and well-structured safety management, employees are able to work in a secure and comfortable environment. Workers who experience a sense of safety, comfort, and protection in the workplace are more likely to demonstrate improved performance outcomes, while at the same time reducing the likelihood of potential losses incurred by the organization.

Therefore, the primary objective of risk management implementation is to protect the company from potential losses. Job Safety Analysis (JSA) is a method used to identify, evaluate, and control risks associated with specific work activities. Through JSA, each stage of a job is carefully examined in order to identify potential hazards and determine the necessary control measures to prevent accidents or injuries from occurring.

The implementation of Job Safety Analysis (JSA) is of paramount importance in industrial environments, particularly in workplaces with high-risk potential such as oil and gas refineries. PT Kilang Pertamina Internasional Refinery Unit 6 Balongan, as one of the largest oil refineries in Indonesia, conducts a wide range of production processes that involve significant risks to occupational safety and health.

The management of occupational safety risks at PT Kilang Pertamina Internasional Refinery Unit 6 Balongan is considered to have a highly significant impact on workplace safety within the company. Among these impacts are protecting employees from work-related injuries and illnesses, reducing costs associated with workers' compensation and medical care, enhancing employee productivity as they are able to focus on their tasks without concerns about injuries or safety, strengthening the company's reputation, and ensuring compliance with applicable occupational safety regulations.

A study on Job Safety Analysis (JSA) was conducted by Ikhsan (2022), who identified potential hazards and occupational accident risks within an industrial environment. Ikhsan (2022) found various potential risks, including mechanical, electrical, and ergonomic hazards. The study's findings proposed improvements based on the results of hazard identification, demonstrating that accurate identification can serve as a critical foundation for effectively preventing workplace accidents.

Another study was conducted by Rahmat and Wibisono (2024), who identified potential hazards and occupational risks in the U-Ditch drainage construction project. The findings revealed that through a systematic hazard identification process using JSA, the project team was able to recognize 23 different potential risks and provide control recommendations to minimize workplace accidents.

Palega (2021) carried out a JSA-based study to assess occupational risks among laser cutting machine operators. The research found that risk assessment through JSA was highly effective in identifying and mitigating potential workplace accidents in a manufacturing environment.

Maharani (2024) conducted a safety risk analysis using the Hazard Identification, Risk Assessment, and Determination of Controls (HIRADC) method to evaluate occupational health and safety risks. The results demonstrated that proper hazard identification and risk assessment enabled risks to be classified according to severity and frequency, thereby allowing companies to implement appropriate and effective control measures.

Balili and Yuamita (2022) conducted a JSA study on the mechanical section of the PLTU Ampapa project. Their research provided recommendations such as the use of personal protective equipment (PPE), the establishment of safe work procedures, and stricter work supervision, illustrating that both corrective and preventive actions can significantly reduce the potential for workplace accidents.

From the above perspectives, it can be concluded that risks have a direct impact on workers' safety. Risk management involves identifying potential risks that may arise, assessing these risks, and implementing protective measures so that their impacts can be minimized or even eliminated.

Within this framework, research on Job Safety Analysis (JSA) at PT Kilang Pertamina Internasional Refinery Unit 6 Balongan becomes highly relevant and significant. Through this study, it is expected that a deeper understanding will be gained regarding the effectiveness of JSA implementation as a risk control strategy for occupational safety within this industrial environment.

II. METHOD

The research design used is a quantitative method. Data Collection Techniques are Literature Review and Field Study: Observation, Questionnaire. The population in this study consists of all employees at PT Kilang Pertamina Internasional Unit 6 Balongan, Indramayu, totaling 964 individuals. The sample was determined using the Slovin formula with a margin of error of 10%, resulting in 91 respondents, selected through Purposive Sampling.

Operational Variables :

1. Variable X: Job Safety Analysis: Identification (X₁), Assessment (X₂), and Risk Control (X₃)
2. Variable Y: Occupational Safety

TABLE I. OPERATIONALIZATION VARIABLES

Variables	Dimension	Indicator	Measurement Scale
Job Safety Analysis (X) (Gidwani, 2018)	Identification (X ₁)	X11 = Risk identification is developed by qualified and competent workers	Ordinal
		X12 = Identifying routine and non-routine tasks	
		X13 = Identifying types of risks (physical, chemical, biological, etc.)	
		X14 = Conducted at the initial stage of JSA preparation	
	Assessment (X ₂)	X21 = Assessing risks	Ordinal
		X22 = Assessing frequency level	
		X23 = Assessing potential losses	
Control (X ₃)	X31 = Preventive measures to reduce the likelihood of incidents	Ordinal	
	X32 = Mitigation actions following the hierarchy of controls (elimination, substitution, engineering control, administrative control, and Personal Protective Equipment)		
Occupational Safety (Y) (Mathis and Jackson, 2012)	Physical Condition	Y11 = Physical health condition	Ordinal
	Mental Condition and Emotional Stabilization	Y12 = Mental health condition Y13 = Emotional stabilization	Ordinal
	Human Resources	Y14 = Human resources as the main cause of workplace accidents	Ordinal

Source: Primary data, processed (2025)

Validity and Reliability Test: The validity test was conducted using the Pearson Product Moment method by comparing the results of the Corrected Item-Total Correlation, where a value greater than the critical value indicates that the item is valid. The reliability test was carried out using the Cronbach's Alpha method.

Data Analysis Technique Research: The data were analyzed using the Multiple Linear Regression Method.

III. RESULTS AND DISCUSSION

3.1. Validity and Reliability Test

1) Validity Test

The validity test was conducted on the variables of Identification, Assessment, Control, and Occupational Safety. The test was carried out by comparing the value of r-count with r-table. With (n) = 66 and degrees of freedom (df) = n - 2, the r-table value is 0.2425 ($\alpha = 0.05$) or 0.2042 ($\alpha = 0.1$). Based on the calculations performed, the results (Table 4.15) show that all r-count values are greater than the r-table value.

TABLE II. VALIDITY TEST RESULTS

Variables	Item	R count	R table	Information
Identification	X1.1	0,363	0,204	Valid
	X1.2	0,393	0,204	Valid
	X1.3	0,473	0,204	Valid
	X1.4	0,454	0,204	Valid
	X1.5	0,430	0,204	Valid
	X1.6	0,537	0,204	Valid
	X1.7	0,497	0,204	Valid
	X1.8	0,436	0,204	Valid
Assessment	X2.1	0,204	0,204	Valid
	X2.2	0,297	0,204	Valid
	X2.3	0,272	0,204	Valid
	X2.4	0,249	0,204	Valid
	X2.5	0,441	0,204	Valid
	X2.6	0,368	0,204	Valid
	X2.7	0,323	0,204	Valid
	X2.8	0,248	0,204	Valid
Control	X3.1	0,403	0,204	Valid
	X3.2	0,476	0,204	Valid
	X3.3	0,485	0,204	Valid
	X3.4	0,456	0,204	Valid
	X3.5	0,353	0,204	Valid
Occupational Safety	Y1.1	0,508	0,204	Valid
	Y1.2	0,404	0,204	Valid
	Y2.1	0,424	0,204	Valid
	Y2.2	0,383	0,204	Valid
	Y3.1	0,536	0,204	Valid
	Y3.2	0,604	0,204	Valid
	Y4.1	0,417	0,204	Valid
	Y4.2	0,504	0,204	Valid

Source: Primary data, processed (2025)

According to the data presented above, a total of 29 question items in this study are valid to be used in measuring variables X1, X2, X3, and variable Y.

2) Realibility Test

The reliability test was conducted to determine the consistency of respondents in answering the questionnaire items. A research variable is considered reliable if the obtained Cronbach's Alpha value is greater than 0.60 (Sujarweni, 2018). The results show that the Cronbach's Alpha value is 0.941 (Table 4.16). Since Cronbach's Alpha > 0.60, it can be concluded that the questionnaire instrument is reliable as a whole.

TABLE III. REALIBILITY TEST RESULTS

Cronbach's Alpha	N of Items
0,813	29

Source: Primary data, processed (2025)

Furthermore, the overall Cronbach's Alpha values for each item are presented in Table 4.17. Based on the results of the reliability analysis shown in the table, it can be concluded that the research instrument as a whole demonstrates a very high level of internal consistency. The values of Cronbach's Alpha if Item Deleted mostly range from 0.799 to 0.817, indicating that all items contribute positively to the total reliability of the scale. In addition, the values of Scale Variance if Item Deleted and Scale Mean if Item Deleted are relatively consistent across items, suggesting that no single item significantly distorts the overall distribution of the scale.

3.2. Multiple Linear Regression Analysis

Multiple regression is employed to analyze regression models that involve the relationship between two or more independent variables. The results of the multiple linear regression analysis are presented as follows:

TABLE IV. MULTIPLE LINEAR REGRESSION ANALYSIS RESULTS

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.377	5.445		-.069	.945		
	X1	.716	.116	.608	6.173	.000	.915	1.093
	X2	.184	.210	.105	.874	.386	.613	1.632
	X3	.150	.245	.075	.614	.542	.595	1.679

a. Dependent Variable: Y

Source: Primary data, processed (2025)

The regression equation obtained in this study involves the independent variables Identification (X1), Assessment (X2), and Control (X3). Based on the results of the analysis in Table 4.24, the regression equation is as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$$

$$Y = Y = - 0.377 + 0.716X_1 + 0.184X_2 + 0.150X_3 + e$$

3.3. Hypothesis Testing

Hypothesis Testing used t-Test. If the significance value (sig) is less than 0.05, or the calculated t value is greater than the t table value, it indicates that the independent variable (X) has a significant effect on the dependent variable (Y). Conversely, if the significance value (sig) is greater than 0.05, or the calculated t value is smaller than the t table value, it indicates that the independent variable (X) does not have a significant effect on the dependent variable (Y).

TABLE V. T-TEST RESULTS

Coefficients ^a								
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-.377	5.445		-.069	.945		
	X1	.716	.116	.608	6.173	.000	.915	1.093
	X2	.184	.210	.105	.874	.386	.613	1.632
	X3	.150	.245	.075	.614	.542	.595	1.679

a. Dependent Variable: Y

Source: Primary data, processed (2025)

3.4. Research Discussion

1) The Effect of Identification on Occupational Safety

H11 $X_1 \neq 0$ (there is an effect of variable X1 on variable Y)

Based on the results presented in the table, the significance value of X1 on Y is $0.000 < 0.05$, with a t-calculated value of 5.286. The critical t-table value is obtained using the formula $t(\alpha/2 : n - k - 1) = t(0.025; 66 - 3 - 1) = 2.000$, where $6, 173 > 2.000$. Since the significance level is less than 0.05 and the t-calculated is > 2000 , H0 is rejected and the first hypothesis is accepted.

Therefore, it can be concluded that the variable X1 (Identification) has a significant effect on variable Y (Occupational Safety) at PT Kilang Pertamina Internasional Unit 6 Balongan. This finding is consistent with the initial hypothesis, which stated that risk identification influences occupational safety.

2) The Effect of Risk Assessment on Occupational Safety

H02 $X_2 = 0$ (there is no effect of variable X2 on variable Y)

The significance test for the effect of X2 on Y shows a significance value of $0.386 > 0.05$ and a t-calculated value of $0.874 < t$ -table value of 2.000. Therefore, H0₂ is accepted, and the second hypothesis is rejected.

It can be concluded that variable X2 (Risk Assessment) does not have a significant effect on variable Y (Occupational Safety) at PT Kilang Pertamina Internasional Unit 6 Balongan. This result is not consistent with the initial hypothesis, which proposed that risk assessment significantly influences occupational safety.

3) The Effect of Control Measures on Occupational Safety

H13 $X_3 \neq 0$ (there is an effect of variable X3 on variable Y)

The significance test for the effect of X3 on Y shows a significance value of $0.542 > 0.05$ and a t-calculated value of $0.614 < t$ -table value of 2.000. Therefore, H0₃ is accepted and the third hypothesis is rejected.

This indicates that variable X3 (Control Measures) does not have a significant effect on variable Y (Occupational Safety) at PT Kilang Pertamina Internasional Unit 6 Balongan. This finding is not consistent with the initial hypothesis, which stated that control measures have a significant effect on occupational safety.

4) The Effect of Job Safety Analysis on Occupational Safety

H14 $X \neq 0$ (there is an effect of variable X on variable Y)

An F-test was conducted to examine the simultaneous effect of the independent variables, namely Identification (X1), Risk Assessment (X2), and Control Measures (X3), on the dependent variable, Occupational Safety, at PT Kilang Pertamina Internasional Unit 6 Balongan.

In this test, if the significance value is less than 0.05 or the calculated F-value is greater than the F-table value, it indicates that the independent variables (X) simultaneously have a significant effect on the dependent variable (Y). Conversely, if the significance value is greater than 0.05 or the calculated F-value is smaller than the F-table value, it indicates that the independent variables (X) do not simultaneously affect the dependent variable (Y).

TABLE VI. F-TEST RESULTS

		ANOVA ^a				
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	280.278	3	93.426	16.963	.000 ^b
	Residual	341.480	62	5.508		
	Total	621.758	65			

a. Dependent Variable: Y

b. Predictors: (Constant), X3, X1, X2

Source: Primary data, processed (2025)

Based on the formula for determining the F-table value, namely $F(k : n - k - 1)$, the critical value is obtained as $F(3 : 62) = 2.75$. From the table above, it is evident that the significance value of X1 (Identification), X2 (Risk Assessment), and X3 (Control Measures) simultaneously affecting Y (Occupational Safety) is $0.000 < 0.05$, with a calculated F value of $16.963 > F$ -table 2.75. Therefore, it can be concluded that all independent variables simultaneously have a significant effect on the dependent variable, namely Occupational Safety, at PT Kilang Pertamina Internasional Unit 6 Balongan.

5) Determination Coefficient Test (R-Square)

TABLE VII. R-SQUARE TEST RESULTS

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.671 ^a	.451	.424	2.34686	2.192

a. Predictors: (Constant), X3, X1, X2

b. Dependent Variable: Y

Source: Primary data, processed (2025)

Based on the table above, the R Square value is 0.451, which indicates that the variables Identification (X1), Risk Assessment (X2), and Control Measures (X3) collectively influence the variable Occupational Safety (Y) at PT Kilang Pertamina Internasional Unit 6 Balongan by 45.1%. The remaining 54.9% is explained by other factors not examined in this study.

IV. CONCLUSIONS

The influence of Job Safety Analysis (JSA) on Occupational Safety at PT Kilang Pertamina Internasional Unit 6 Balongan:

- a. With an F-value of 16.963 > F-table 2.75 and a significance value of 0.000 < 0.05, it means that the three variables collectively have an influence on occupational safety at PT Kilang Pertamina Internasional Unit 6 Balongan.
- b. The coefficient of determination (R Square) of 0.477 shows that 45.1% of the variation in occupational safety can be explained by the variables of Identification, Assessment, and Action, while the remaining 54.9% is explained by other factors outside this study.

The limitations of this study on Job Safety Analysis (JSA) in improving occupational safety at PT Kilang Pertamina Internasional Unit 6 Balongan lie in its emphasis solely on the quantitative analysis and procedures/steps of the JSA method. It has not yet taken into account other aspects such as data and information completeness (e.g., historical data, limited review of changes) and the resources utilized to ensure occupational safety.

Recommendations:

a. For The Company:

1. Enhancement of the Risk Identification Process
2. Optimization of Risk Assessment
3. Improvement of the Effectiveness of Risk Control Measures
4. Strengthening the Comprehensive Integration of JSA Stages

b. For Future Researchers:

Future research should be carried out using a qualitative approach, with greater attention to the resources employed in ensuring the implementation of Occupational Safety and Health programs in a corporation.

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