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Determining the Safety Performance of Mining Contractors through the Implementation of a Mining Safety Management System

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Abstract: The implementation of safety management systems in the mineral and coal mining sector in Indonesia is still not optimal. This study was conducted to analyze how the implementation of safety management systems consisting of planning, organization and personnel, implementation, evaluation and follow-up, and management review affects safety performance in companies. In this study, data was obtained by distributing questionnaires to supervisors, drivers, and heavy equipment operators using simple random sampling techniques, involving a total of 130 respondents, with data analysis using a path analysis model approach. The results of the study indicate that the planning of the safety management system, organization and personnel, implementation of safety programs, evaluation and follow-up, and management review have a significant effect on the achievement of safety performance.

Keywords: Planning, organization and personnel, implementation, evaluation and follow-up, management review, safety performance

INTRODUCTION

Every company is required to implement an occupational safety and health management system that is integrated with the company's existing management system (*Undang - Undang No. 13 Tentang Ketenagakerjaan*, 2003). Mineral and coal mining contractors, as companies licensed to conduct mining or land clearing and extraction of both coal and minerals, are required to implement a mining safety management system to ensure that mining activities adhere to occupational safety principles. The application of occupational safety principles is an effort to prevent mining accidents. The occupational safety principles in mining companies are usually written in Standard Operating Procedures (SOPs) which are summarized in the Mining Safety Management System (SMKP). Based on data from the Directorate General of Minerals and Coal of the Ministry of Energy and Mineral Resources, the number of mining accidents resulting in fatalities in 2023 was 48 incidents and in 2024 there were 52 incidents, even though every company engaged in mineral and coal mining wants zero fatalities in mining accidents. Work accidents in the

mining sector are referred to as mining accidents, which are incidents that meet the established criteria, namely that the accident actually occurred, resulted in injury to workers or authorized parties, occurred as a result of mining activities, occurred during the victim's working hours, and took place within the mining business permit area (IUP) (Keputusan Menteri Energi Dan Sumber Daya Mineral No.1827K/30/MEM, 2018). Reese, (2012) states that there are a number of factors that can hinder the success of occupational safety programs, including suboptimal planning, the absence of a well-structured safety management system, poorly implemented safety training, inadequate safety budget allocation, and accident investigation processes that do not follow procedures.

The safety management system implemented in one of the mining contractor companies refers to several regulations related to mining safety, namely regulations on Guidelines for the Implementation of Good Mining Practices (Keputusan Menteri Energi Dan Sumber Daya Mineral No.1827K/30/MEM, 2018). Regulations on Technical Guidelines for Mining Safety Implementation and Assessment and Reporting of SMKP Minerba (*Keputusan Direktorat Jenderal Mineral Dan Batubara No. 185.K/30/DJB/*, 2019). In addition, mining contractor companies also apply the ISO 14001:2015 standard related to Environmental Management Systems and ISO 9001:2015 related to Quality Management Systems. Based on the results of an internal audit of mineral and coal mining contractor companies conducted in July 2025, the level of SMKP implementation achievement was 75% of the minimum implementation achievement target of 85%. This achievement shows that there are still discrepancies in the elements of SMKP that require follow-up improvements.

The implementation of SMKP Minerba applies to holders of exploration and production mining permits, including mining service companies. This system comprises seven elements: policy; planning; organization and personnel; implementation; monitoring, evaluation, and follow-up; documentation; and management review and performance improvement. Work safety performance is an integral part of overall organizational performance and is a measure of a company's success in preventing accidents (Hasan & Jha, 2013). Previous studies have concluded that safety management systems affect a company's safety performance (Mohammadi et al., 2018). To measure safety performance, two approaches are used: the reactive method, which is to evaluate after an accident occurs, and the proactive method, which is to assess the extent to which the existing safety system has functioned effectively (Aghaei et al., 2020; Cooper & Phillips, 2004). The proactive approach is particularly popular in recent research because it is able to evaluate worker safety behavior as a more preventive indicator of occupational safety than relying solely on accident records (Penaloza et al., 2020). Research conducted at a mining contractor company in East Kalimantan concluded that the implementation of SMKP and safety leadership have a significant impact on safety performance, meaning that the implementation of SMKP and the role of leaders greatly influence safety performance. Furthermore, safety leadership has a strong positive correlation with the implementation of SMKP in the workplace; the better the leaders' knowledge of occupational safety, the better the implementation of SMKP (Kurniawan et al., 2019). Sistem Manajemen Kesehatan dan Keselamatan Kerja (OHSMS) menunjukkan efek langsung yang signifikan terhadap Kinerja Keselamatan Organisasi, yang secara substansial ditingkatkan ketika dimediasi oleh Manajemen Sumber Daya Manusia. Praktik manajemen sumber daya manusia kunci seperti perencanaan, partisipasi, dan evaluasi berkelanjutan muncul sebagai tautan krusial (Navarro Claro et al., 2025).

The conceptual framework and hypotheses in this study are described as follows:

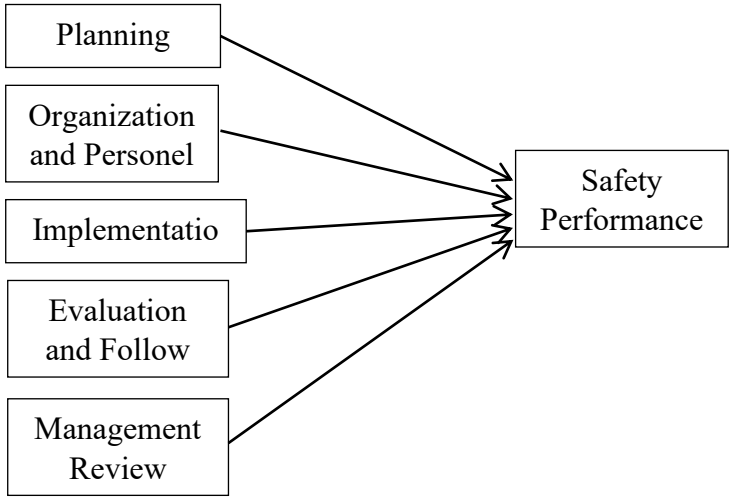

Figure 1: Conceptual Framework
Sources: Result of Research (2025)

The hypotheses in this study are:
Hypothesis 1: Safety management system planning affects safety performance.
Hypothesis 2: Organization and personnel affect safety performance.
Hypothesis 3: Implementation of a safety management system affects safety performance.
Hypothesis 4: Evaluation and follow-up affect safety performance.
Hypothesis 5: Management review affects safety performance.

METHOD

1) Population and Sample

This study used a quantitative approach with an instrument in the form of a questionnaire containing a number of statements developed based on the indicators of each research variable. To make it easier for respondents to fill out, the questionnaire was accompanied by instructions. The questionnaire was distributed online via text message to respondents, either personally or through supervisors or coworkers.

The research population included all workers at a coal mining contractor operating in South Sumatra Province. The population consisted of field supervisors, heavy equipment operators, and production truck drivers, totaling 130 people. The simple random sampling technique was used in selecting the sample because the research population had uniform characteristics, namely that all respondents were related to the implementation of occupational safety in coal mining areas (Sanusi, 2017). The sample size was determined using the Slovin formula. Of the total 105 questionnaires collected, 3 were deemed inconsistent and 1 was incomplete, leaving only 101 questionnaires that could be used as research data.

2) Data Analysis

Data analysis was conducted using two main approaches. First, descriptive analysis was used to describe the respondents' tendencies in assessing each research variable. Second, multiple regression equation modeling was used to test the causal relationship between variables (Ghozali, 2013).

Next, classical assumption tests were conducted, consisting of data normality tests, linearity tests, heteroscedasticity tests, and multicollinearity tests (Ghozali, 2018). Hypothesis testing was carried out by examining the t-value and significance. The hypothesis is accepted

if the t-value is greater than the t-table value or the significance value is less than 0.05; conversely, if the t-value is smaller than the t-table value or the significance value is greater than 0.05, the hypothesis is rejected (Sugiyono, 2014).

RESULT AND DISCUSSION

1) Data Analysis

Based on the results of the data analysis that has been carried out, the data is as shown in the table below:

Table 1. Multiple Linear Regression Analysis Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	41.933	6.836		6.134	.000
	X1	.226	.047	.433	4.796	.045
	X2	.412	.073	.582	5.608	.000
	X3	.415	.068	.565	6.131	.000
	X4	.290	.482	.471	5.284	.030
	X5	.571	.099	.580	5.775	.000

a. Dependent Variable: Y

Sources: Result of Research (2025)

Based on Table 1 above, the Multiple Linear Regression Equation can be written as: Y = 41.933 + 0.226 X1 + 0.412 X2 + 0.415 X3 + 0.290 X4 + 0.571X5. The constant value of 41.933 means that if the independent variables are considered constant, the company's safety performance (Y) will be 41.933%. The regression coefficient values for the independent variables, namely planning (X1), organization and personnel (X2), implementation of the safety management system (X3), evaluation and follow-up (X4), and management review (X5), also have an impact on safety performance (Y), with varying degrees of impact. The regression coefficient value for management review has the greatest impact on safety performance achievement, while the smallest impact, which can even be said to have no impact on safety performance, is evaluation and follow-up.

2) Hypothesis Test Results and Discussion

Table 1 above explains the results of the hypothesis test in this study, namely:

Hypothesis 1 states that mining safety management system planning affects the company's safety performance. Looking at the significance value of 0.045, which is lower than the significance level of 0.05, it can be stated that hypothesis 1 is statistically accepted, meaning that mining safety management system planning has a positive effect on mining safety performance in the company. The more planning related to the implementation of work safety programs is carried out, the more the company's safety performance will improve. This is in line with previous research which states that good safety management system planning can improve safety performance in construction work (Agustin & Honesti, 2025).

Hypothesis 2 states that organization and personnel affect safety performance. The significance value for this relationship is 0.000, which is lower than the significance level of 0.05, so hypothesis 2 is statistically accepted, meaning that organization and personnel have a positive effect on mining safety performance in the company. The better the condition of the organization and personnel in a company, such as clear division of tasks and continuous improvement of personnel capabilities, the greater the impact on improving the company's safety performance. This is in line with the results of previous studies which concluded that

organizational conditions will affect the safety performance of the organization (Mayangsari & Djunaidi, 2023).

Hypothesis 3 states that the implementation of a safety management system affects safety performance. The significance value for this relationship is 0.000, which is lower than the significance level of 0.05, so it can be stated that hypothesis 3 is statistically accepted, meaning that the implementation of a safety management system has a positive effect on mining safety performance in the Company. The better the implementation of the planned safety management system in the company, the greater the impact on the Company's safety performance. Previous research related to the implementation of safety management systems concluded that the rate of work accidents and fatal accidents in construction companies in South Korea significantly decreased with the implementation of the Occupational Safety and Health Management System (Yoon et al., 2013).

Hypothesis 4 in this study is that evaluation and follow-up affect safety performance. The significance value for this relationship is 0.030, which is lower than the significance level of 0.05, so it can be stated that hypothesis 4 is statistically accepted, meaning that evaluation and follow-up affect mining safety performance in the Company. Evaluation and follow-up of the implementation of the safety management system are monitoring and controlling activities of the improvement plan based on the findings from the implementation of the safety management system, which will have a direct impact on the achievement of safety performance in the Company. Previous empirical studies have concluded that the implementation and evaluation of safety management system requirements are very important for continuous improvement that has an impact on organizational safety performance (Qalati et al., 2022). Other studies have also concluded that the effectiveness of safety management practices in the form of evaluating the implementation of safety management systems will have an impact on safety performance, with the main focus being the evaluation of procedural safety (Tawfeeq et al., 2024).

Hypothesis 5 in this study is that management review affects safety performance. The significance value for this relationship is 0.000, which is lower than the significance level of 0.05, so it can be stated that hypothesis 5 is statistically accepted, meaning that management review affects mining safety performance in the Company. Management review is a management-level meeting within the Company to discuss and find solutions to problems or gaps in the fulfillment of the mining safety management system, so that improvements can be made to the root causes of non-compliance with the implementation of the safety management system, which can improve the achievement of safety performance in the Company. The results of research conducted in mining companies in China show that management commitment to safety, safety training, and the promotion of employee participation directly affect employee safety performance, which in turn has an impact on the Company's safety performance. This study also provides valuable guidance for practitioners in identifying mechanisms that can be used to improve safety in the workplace (Lu et al., 2020).

CONCLUSION

This study shows that effective mining safety management system planning will have an impact on improving safety performance in the Company, because the planning will include strategies for implementing safety work programs aimed at making operational activities safer and preventing mining accidents. The second factor, namely organization and personnel, also has a positive impact on the Company's safety performance. An organization is a group of personnel who are tasked with carrying out their respective responsibilities in accordance with the organization's objectives. Personnel play a key role in every work program that will be implemented by the organization in their respective work areas. When

personnel in an organization are directly involved in the implementation of a safety management system, it will be the key to the success of the Company's safety performance. The implementation of a safety management system also has a positive impact on the achievement of safety performance, because implementation is a concrete step in running a safety management system, which will directly impact the achievement of a company's safety performance. The fourth factor that has a positive impact on safety performance is evaluation and follow-up. Evaluation and follow-up are the next steps in the implementation of a safety management system. Once the safety program implementation process has been carried out, evaluation activities become important in order to assess the effectiveness of the safety management system. Management review, as a process of conducting a comprehensive evaluation of the implementation of the safety management system, has a significant impact on safety performance, because during the management review, important decisions are made to achieve optimal safety performance for the company.

Overall, the results of this study emphasize the importance of implementing an effective safety management system to improve the Company's safety performance in the mineral and coal mining sector.

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