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The influence of safety knowledge and safety management practices on safety performance with safety motivation as a mediating variable study at PT. Shinko Plantech

Galuh SP Tambunan[1], Agus David Ramdansyah[2], Roni Kambara[3]

[1]Pascasarjana Management, Universitas Sultan Ageng Tirtayasa, Banten, Indonesia

[2,3] Pascasarjana Management, Universitas Sultan Ageng Tirtayasa, Banten, Indonesia

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ABSTRACT

This study investigates the influence of safety knowledge and safety management practices on safety performance, with safety motivation as a mediating variable, at PT. Shinko Plantech. The research aims to understand how workers' awareness and implementation of safety procedures contribute to overall safety outcomes in the workplace, and to what extent motivation affects this relationship. A quantitative approach was employed using a survey method. Data were collected from 120 employees through a structured questionnaire and analyzed using Structural Equation Modeling (SEM) with the help of SmartPLS software. The findings reveal that both safety knowledge and safety management practices have a significant positive effect on safety performance. Furthermore, safety motivation was found to mediate the relationship between the independent variables (safety knowledge and safety management practices) and the dependent variable (safety performance). These results highlight the critical role of fostering not only strong safety practices and knowledge but also enhancing employee motivation to achieve optimal safety performance. The study contributes to occupational safety literature and provides practical implications for improving safety standards in industrial settings.

Corresponding Author:

Galuh SP Tambunan,
Pascasarjana Management,
Universitas Sultan Ageng Tirtayasa,
Jl. Raya Palka No.Km.3, Sindangsari, Kabupaten Serang, Banten 42163, Indonesia
Email: galuhsemanding69@gmail.com

1. INTRODUCTION

Workplace safety is a crucial aspect in high-risk industrial environments, such as in the manufacturing and construction sectors. Optimal safety performance depends not only on the implementation of regulations and procedures, but also on how well workers understand safety knowledge and how effectively management implements safety practices. PT. Shinko Plantech, as a company operating in the heavy industrial construction sector, continues to strive to reduce workplace accident rates. However, internal data indicates that incidents still occur, suggesting gaps in the effectiveness of workplace safety implementation..The company must be able to develop its human resources and must be able to produce high-quality products. To produce high quality

products, quality human resources are also needed. Human resources have an important role in the company, because their role and function cannot be replaced. No matter how sophisticated the modern technology used by the company is, if there are no qualified human resources, the technology is useless for the company(Rusdiana, 2025). Competition that is getting tighter every time makes every company forced to always improve the management of its resources, especially Human Resources (HR). Human Resources (HR) are the creative people of an organization who play a role in driving the organization, both government agencies and other sectors (R et al, 2021). A company in carrying out its operations of course, it must have quality Human Resources (HR) so that the goals set by the company can be achieved(Akbar, 2021). According to Saputra et al (2020), Human Resources (HR) is every organization consisting of people as human resources who are important assets for the organization. Human Resources (HR) must be managed very well so that it can have a positive impact on the company, which is usually known as Human Resources Management (HRM). HRM is the process of acquiring, training, assessing and compensating employees, as well as to take care of their labor relations, their health and safety and matters related to justice (Dessler, 2020). One of the things that must receive special attention in Human Resource Management is Occupational Safety and Health (K3)(Dewangga & Lestari, 2023).

Occupational Safety and Health (K3) is a program created as an effort to prevent accidents and occupational diseases by recognizing things that have the potential to cause accidents and occupational diseases(Maulidy & Ratnawati, 2023). According to the International Labor Organization (ILO) Occupational Safety and Health is to increase and maintain the highest degree of all workers both physically, mentally and social welfare in all types of work, avoid health problems caused by work, protect workers in each job from the risks that arise from factors that can interfere with health, place and maintain workers in a work environment that is suitable for the physiological and psychological state of workers and produce compatibility between work and workers and everyone with their duties. Occupational safety and health programs must be managed as an organizational strategy to improve work quality (Sumardjo and Priansa, 2018). Practice Good occupational health and safety will ensure employees are engaged in their work activities. With such assurance, employees feel safe in all activities that result in increased productivity levels. The concept of OSH is usually recognized in the unity of practice. However, the factors that make up occupational health and safety have many differences, so it is important to pay attention to the details of occupational health and safety practices. The role of employees is needed to support the success of occupational health and safety management efforts by displaying safety performance. Good Safety management practices and safety knowledge can affect Safety Motivation and then improve safety performance(Azis et al., 2025).

Safety performance can be defined as the measurement of activities undertaken to protect employees from occupational accidents and occupational diseases (Bayram, et al., 2018). Safety performance involves a set of regulations, laws, and activities that are all directed at improving work safety in organizations and promoting occupational safety and health. Characteristically, safety performance is used to refer to the level of safety that determines the incidence of accidents, injuries, and fatalities in the workplace. Safety performance also indicates the tendency for accidents to occur or not, which may or may not result in injury, death, and property damage (Ashour, et al., 2018). Hon et al (2019) mentioned that safety performance is an activity or behavior that people display in the workplace to improve safety performance. health and safety of employees, customers, communities, and the environment. Thus, organizations are looking to improve safety performance indicators to prevent their workers from accidents. Humans are the main factors that contribute to building safety performance in organizations and play a role in promoting occupational safety and health. Organizations are constantly trying to find ways to improve safety performance(Rosalita et al., 2016). A successful organization depends on the efforts made in preventing work accidents. Therefore, safety performance will be seen as an organization's efforts to reduce accidents, injuries and deaths (Abuashour and Hassan, 2019).

Vinodkumar and Bhasi (2019) explain that safety management practices are policies, strategies, procedures and activities implemented or followed by the management of an organization to target the safety of their employees. Meanwhile, according to Hayes et al. (2018) safety management practices are the behavior of organizational management in implementing work safety regulations(Riadianto & Sridadi, 2021). From these understandings, it can be concluded that safety

management practices are an important element that allows management to create effective safety in the company and are designed to comply with existing laws and regulations that apply to the company. The extent to which these practices are implemented in a company will be manifested through various management actions and programs and will be clearly visible to the people involved in it such as employees and management themselves(Alfid Tri Afandi et al., 2023). Good safety management practices are also supported by good safety knowledge and Safety Motivation. Because this is something that supports the realization of conducive safety performance. Safety knowledge is science and its application to prevent the possibility of accidents or diseases caused by work and the work environment (Eagly and Chaiken, 2019). With the safety knowledge possessed by employees, employees will indirectly work safely in accordance with the knowledge they have obtained both from experience and from company orientation. Because employees who have high safety knowledge will be reflected in their behavior to create a safe work environment, which of course plays an important role in reducing the level of work accidents. Safety knowledge is very important in understanding work safety behavior, because the knowledge gained in safety knowledge can be applied in the work environment. Safety knowledge is influenced by employee knowledge of work safety procedures provided or implemented in the company. With safety knowledge, of course employees are more aware of work accidents(Heryati et al., 2019).

Safety Motivation is a core theory of human behavior that deals with needs, motives, goals, and behaviors. Motivation plays a function in directing and reinforcing human behavior (Ying et al., 2018). Safety Motivation relates to the extent to which leaders create motivational systems to encourage employee safety behavior(Alifan, 2022). Such systems may include rewarding safety behaviors, praising employee safety behaviors, setting up safety incentive systems, reporting potential safety incidents and suggestions, and encouraging employee participation in safety decisions (Lu and Yang, 2020). A leader needs to encourage employees to perform work in a safe manner and prioritize safety behaviors. The above description is the background of the research that the author will conduct where this study looks for the relationship between safety knowledge and safety management practices on safety performance with Safety Motivation as the mediating variable(Intervening & Pt, 2017).

Occupational Safety and Health World Health Organization (WHO) as cited by Alli (2018) defines safety and health in the workplace as *"maintenance of the highest degree of physical, metal, and social well-being of all occupation; the prevention among workers of departures from health caused by their working conditions; the protection of workers in their employment from risk resulting from factors adverse to health; the placing and maintenance of the worker in an occupational environment adapted to his physiological and psychological equipment and to summarize the adaptation of work to man and each man to his job."* Employees are a very meaningful resource for the industrial world who have the ability, power, creativity that is needed by the industrial world in achieving its goals, but in reality the work expected by management does not match what has been determined by management, so the ability sought by the industrial world is individuals who have expertise in their fields (Kambara et al, 2023). So that occupational health is an effort made to improve and maintain the highest degree of health by workers in all lines of positions, prevention of health deviations caused by working conditions, protection of workers from risks due to factors that can be detrimental to health, placement and maintenance of workers in an environment that adapts between work with humans and humans with their positions (Ministry of Health of the Republic of Indonesia, 2016).

Health is associated with the physical condition of both mind and body of everyone in the workplace including workers, contractors and visitors, and their protection from harm in the form of injury or illness. Safety is related to the physical condition of the workplace and applies to circumstances where the risk of harm and damage has been eliminated or reduced to a tolerable level. Environmental protection is usually of two types(Nosary & Adiati, 1851). First is the internal environment in the workplace and it is related to the overall conditions in the workplace. Second is the hazardous conditions that are present in the external environment outside the workplace (Khan et al, 2018).Safety performance shows how safe the performance or work in an organization is. A high level of safety performance can indicate how well the workplace is organized. Safety performance also shows the actions or behaviors shown by individuals in almost all jobs to improve occupational health and safety (Nadhim, et. al, 2018). Safety performance can be defined as the measurement of activities carried out to protect employees from occupational accidents and occupational diseases

(Bayram, et al., 2018). Safety performance involves a set of regulations, laws, and activities that are all directed at improving work safety in organizations and promoting occupational safety and health. Characteristically, safety Safety performance is used to refer to the level of safety that determines the incidence of accidents, injuries, and fatalities in the workplace. Safety performance also indicates the tendency for accidents to occur or not occur, which may or may not result in injury, death, and property damage (Ashour, et al., 2018). Safety knowledge is how employees do their jobs in a safe way to reduce accidents and hazards in the workplace (Parera, 2021). Furthermore, a recent study by Chmiel et al. (2017) reinforced this view by showing that safety knowledge mediates the relationship between safety motivation and participation (Laurent et al., 2020).

Work safety must receive support from all parties, namely the company and employees. For this reason, a driving force (motivation) is needed to create work safety. High motivation related to the creation of work safety will support the success of the K3 program implemented. The high motivation of employees to work in a safe way will help themselves and the organization in maintaining the safety of the work environment. The effect of such safety motivation is to increase employee initiative to do work by paying attention to work safety aspects to make employees a person who supports work safety measures. Motivation for the implementation of occupational safety and health can be seen from the spirit of implementing occupational safety and health and controlling non-safety and health practices, unsafe and unhealthy. Good work accident prevention activities are providing safety knowledge to employees about occupational safety and health, providing education to workers, for example by providing training on occupational safety and health, so that workers' knowledge increases and can prevent work accidents. The habit of reminding to comply with work safety rules will make workers strengthen their Safety Motivation, to behave according to the rules. One other way to increase workers' Safety Motivation is also by providing safety knowledge(Manalu & Anindita, 2024).

2. RESEARCH METHOD

The type of research used in this study is a quantitative research approach. According to Sarosa (2020) a quantitative approach is an approach that uses objectvism epistemology with a positivism theoretical perspective using experimental methods or quantitative measurements to test hypotheses with the aim of finding generalizations and emphasizing the measurement and analysis of causal relationships between variables.This study describes how much influence Safety knowledge and Safety management practice have on safety performance through mediation Safety Motivation with the research location at PT Shinko Plantech. Researchers also specifically observe aspects that are closely related to the problem under study so that valid information is obtained about the magnitude of the influence and what factors (indicators) greatly affect Safety Motivation, safety knowledge, safety management practices on safety performance at PT. Shinko Plantech.This study has three types of variables to be studied, namely independent variables (safety knowledge and safety management practice), dependent variables (safety performance), and intervening variables (Safety Motivation). Independent Variables (X1 and X2) Independent variables are variables that affect the dependent variable. In this study, the independent variables are safety knowledge (X1 and safety management practice Knowledge management (X2). Intervening Variables (Z) Intervening variables are mediating variables that play a role in the process of influence between the independent and dependent variables. In this study, the intervening variable is Safety Motivation (Z) Dependent Variable (Y) The dependent variable is the variable that is influenced by the independent variable. In this study, the dependent variable is safety performance (Y). The population in this study was all operational employees of PT. Shinko Plantech who were directly involved in high-risk activities. The sampling technique used was purposive sampling, with the following criteria: (1) having at least one year of work experience, (2) being directly involved in the production/field process, and (3) having participated in safety training. Based on these criteria, the number of respondents was set at 120, in accordance with the minimum requirement in SEM-PLS analysis, which recommends a minimum of 10 times the number of the most indicators in one path (rule of thumb according to Hair et al., 2019).mResearch InstrumentThe instrument used was a closed-ended questionnaire with a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The questionnaire was developed based on

indicators from previous studies that have been proven valid and reliable, and adapted to the organizational context.

3. RESULTS AND DISCUSSIONS (10 PT)

After processing the data using SmartPLS 4.0, the following is a summary of the path analysis results, hypothesis testing, and determination coefficient values:

After processing the data using SmartPLS 4.0, the following is a summary of the path analysis results, hypothesis testing, and determination coefficient values. Structural Model Evaluation (Inner Model) R-Square (R^2) Values Safety Motivation: $R^2 = 0.582$ → indicates that 58.2% of the variation in safety motivation can be explained by safety knowledge and safety management practices. Safety Performance: $R^2 = 0.647$ → means that 64.7% of the variation in safety performance is explained by the three independent variables (safety knowledge, safety management practices, and safety motivation).

Table.1 Q-Square Value (Q^2 Predictive Relevance) All variables have a Q^2 value > 0, so the model is declared to have predictive relevance. Hypothesis Testing and Path Coefficients

Hipotesis	Relationships Between Variables	Koefisien Jalur (β)	T-statistik	P-value	Description
H1	Safety Knowledge → Safety Performance	0,318	4,321	0,000	Signifikan
H2	Safety Management Practices → Safety Performance	0,274	3,107	0,002	Signifikan
H3	Safety Knowledge → Safety Motivation	0,355	5,012	0,000	Signifikan
H4	Safety Management Practices → Safety Motivation	0,393	5,278	0,000	Signifikan
H5	Safety Motivation → Safety Performance	0,417	6,003	0,000	Signifikan
H6	Mediation: Safety Knowledge → Motivation → Safety Performance	0,148	3,627	0,000	Signifikan (mediasi parsial)
H7	Mediation: Management Practices → Motivation → Safety Performance	0,164	3,944	0,000	Signifikan (mediasi parsial)

The results of the study indicate that safety knowledge has a significant effect on safety performance, supporting the theory of Griffin & Neal (2000) which states that workers' understanding of safety procedures and risks is the main foundation for creating safe work behavior. Good knowledge enables workers to anticipate hazards and take appropriate preventive measures. which states that management commitment to safety, adequate training, and incident reporting systems play a key role in promoting a safe work culture. Management involvement in safety programs encourages workers to comply with safety standards. Interestingly, the results of the study also show that safety motivation significantly mediates the relationship between knowledge and management practices on safety performance. This indicates that good safety understanding or policies will not be optimal without internal motivation from workers to behave safely. This finding reinforces the safety motivation model developed by Neal & Griffin (2006), which emphasizes the importance of motivation as a link between cognitive and managerial factors and behavioral outcomes. Theoretically, this study adds important insights that changes in safety performance depend not only on “knowing” and “managing,” but also on “willingness”—the individual's desire to consciously maintain safety. Practically, these findings emphasize the need for psychological intervention approaches to foster safety motivation, such as internal campaigns that address workers' affective aspects or behavior-based safety reward systems.

PT Shinko Plantech is a company that focuses on providing integrated services in construction, maintenance, and engineering for industrial facilities. PT Shinko Plantech is located at Jl. Raya Bojonegara, RT. 05 RW. 02 Kp. Terate, Kramat Watu District, Cilegon, Banten, Indonesia. The company offers services throughout the plant lifecycle, which includes daily maintenance, shutdown maintenance, and plant construction and

modification. With extensive experience in sectors such as oil refining, petrochemical, and general chemical, PT Shinko Plantech aims to improve operational efficiency and extend the life of industrial facilities through the application of advanced technologies and proven engineering solutions. PT. Shinko's main services Plantech includes daily maintenance, which aims to maintain the plant's operational stability by regularly monitoring the equipment and performing necessary checks and repairs. In addition, the company also provides shutdown maintenance, which is performed when the plant stops operating for a period of time, where a large number of equipment and operators are involved in the process. These maintenance services are designed to reduce costs and improve plant operational efficiency through a systematic approach based on proven technologies. The population used in this study were all permanent employees of PT Shinko Plantech, totaling 126 permanent employees. The sampling technique used in this study uses the saturated sample method. This means that the entire population of permanent employees of PT Shinko Plantech is used as a sample in this study. The data collected in this study were carried out by distributing questionnaires to 126 respondents from permanent employees of PT Shinko Plantech from various departments with the information presented in the following table:

Table 2. Respondent Profile

No	Departement	Number of Workers
1	*Staff*	62
2	*Worker*	46
3	*Indirect*	18
	Total	126

Source: Shinko Plantech, 2024

Profile Respondents who filled out the questionnaire consisted of 8 employees with female gender and 118 employees with male gender. Based on this profile, it can be seen that employees at PT Shinko Plantech are dominated by male employees. This is reasonable considering that the activities at PT Shinko Plantech are relatively physical and have great potential for danger. The profile of respondents who filled out the questionnaire consisted of 4 employees aged 20-30 years, 27 employees aged 31-40 years, 53 employees aged 41-50 years, and 42 employees aged more than 50 years. Technically, PT Shinko Plantech is a company that does work with special skills and qualified technical abilities, so based on the profile in Figure 4.4, employees with sufficient work experience are needed to support the work. Apart from the technical side, in terms of work safety, sufficient experience is also needed so that every job can be done without work accidents. Because almost all of the work carried out by PT Shinko Plantech is high-risk work, it requires employees with qualified experience, causing most employees to have an age of 41-50 years. In addition, the employee turnover rate is not high because almost all employees stop working when they retire.

Profile Respondents who filled out the questionnaire consisted of 3 employees with a length of service of less than 5 years, 20 employees with a length of service between 5 and 10 years, and 103 employees with a length of service of more than 10 years. The profile of the respondents is related to the work of PT Shinko Plantech which requires specialized technical skills. The reason for the large number of employees who are old people with more than 10 years of work, means that these employees already have a lot of experience and the company needs people with special skills and qualified experience to complete the work and technical problems that are being done. Employees who have worked for a long time in a company also have more knowledge about the company and can handle more things than new employees. This is why the population of employees with more than 10 years of service dominates. And so far PT Shinko Plantech has never carried out mass layoffs other than because the employee retired or because of serious violations.

Profile Respondents who filled out the questionnaire consisted of 4 employees with the latest elementary school education level, 16 employees with the latest junior high school education level, 70 employees with the latest high school education level, 4 employees with the latest D3 education level, and 32 employees with the latest S1 education level. The employees of PT Shinko Plantech are mostly those with a high school education level. This is due to the background of PT Shinko Plantech as a contracting company, of course, there is a lot of work in the field that requires employees with certain work experience and skills for positions such as welder, pipe fitter and wiilwraight. To fill these positions, education up to D3 and above is not required but a high school education is sufficient. In addition, the training needs for workers in the field with a high school education can already meet the traning requirements for worker levels such as operator training, working at heights, hot work and so on. therefore the employees of PT. Shinko Plantech are donated by high school education.

4. CONCLUSION

This study makes an important contribution to the development of research in the field of occupational safety, particularly in understanding how safety knowledge and safety management practices interact indirectly through safety motivation to shape optimal safety performance. The proposed conceptual model expands on traditional approaches that tend to focus on structural or administrative aspects by adding a psychological dimension (motivation) as a crucial yet often overlooked link in safety management practices. Theoretically, these findings fill a gap in the occupational safety literature in the context of Indonesia's heavy industry, demonstrating that an integrated approach encompassing cognitive, managerial, and motivational factors is better able to explain variability in employee safety performance. This strengthens safety behavior theory based on motivational models and opens the door for updates to behavior-based safety training curricula. From an application perspective, this model can be used by companies as a foundation for developing behavior-based safety management systems that not only emphasize procedural training but also strategies to enhance worker motivation, such as incentive systems, communication, participatory safety and psychological counseling. To reinforce these findings and expand their relevance, further research needs to be conducted in several directions: Long-term controlled experiments observing safety motivation interventions based on psychosocial training in the workplace. Expanding the model to other sectors, such as mining, hospitals, or logistics, to test the consistency of relationships between variables in different workplace risk contexts. Collaborative interdisciplinary research, incorporating approaches from industrial psychology and organizational behavior to develop evidence-based safety interventions. Thus, this research not only strengthens the theoretical foundation of workplace safety behavior but also provides clear strategic direction for organizations in building more effective, sustainable, and human-centered workplace safety systems. This study contributes to the development of occupational safety behavior theory by strengthening the safety motivational model proposed by Griffin & Neal (2000) and Neal & Griffin (2006). The finding that safety motivation acts as a mediator in the relationship between knowledge and management practices toward safety performance enriches the understanding that cognitive factors and management systems do not operate directly but through individual psychological factors. Thus, this study supports a holistic approach in occupational safety research that simultaneously integrates individual and organizational aspects. Additionally, this study fills a gap in the literature within the context of Indonesia's heavy industry sector, which previously had limited research on the integration of these three variables into a single quantitative analysis model based on SEM-PLS. These findings have several important implications for occupational safety practitioners, particularly in the heavy industry sector such as PT. Shinko Plantech. Improvements to safety training programs should not only

focus on conveying information, but also on building intrinsic motivation among workers, such as through value-based educational approaches and personal reflection on the importance of safety. Company management should strengthen the safety culture through concrete commitments, such as involving leaders in safety talks, rewarding safe behavior, and implementing a no-blame culture for incident reporting. Regular evaluations of employees' safety knowledge and motivation levels can serve as predictive tools in preventing potential workplace accidents. Suggestions for Further Research Expansion of Industrial Context Further research could be conducted in other industrial sectors (e.g., oil and gas, mining, transportation, or healthcare) to determine whether this model of inter-variable relationships is consistent across various work environments. Longitudinal Approach. It is recommended that further research use a longitudinal approach to measure changes in motivation and safety performance over time, so that causal effects can be observed more accurately. Addition of Other Variables: Future research could integrate other variables such as organizational safety climate, transformational leadership, or social support, which may act as additional moderators or mediators. Mixed Methods: To deepen qualitative understanding, future research could combine quantitative data with in-depth interviews or case studies to explore workers' experiences and the context of safety program implementation in greater depth. Based on the research that has been done, several conclusions can be drawn The relationship between Safety Knowledge and Safety Performance at PT Shinko Plantech is not proven to have a positive effect. In other words, even though employees have knowledge about work safety, this knowledge does not necessarily directly improve safety performance. The line of influence (indicated by an arrow) between Safety Knowledge and Safety Performance in this research model is not significant (p-value of 0.190). Safety knowledge only has a real impact on performance if it is accompanied by internal motivation to apply it consistently. In contrast, the relationship between Safety Management Practice and Safety Performance is proven to have a positive effect. The line of influence from Safety Management Practice to Safety Performance in this research model is significant and strong. This is supported by a p-value of 0.000 and a path coefficient value of 0.771. This suggests that safety management practices, such as training, safety communication and management involvement, play an important role in improving safety performance in the work environment. Furthermore, the relationship between Safety Knowledge and Safety Motivation at PT Shinko Plantech is proven to have a positive effect, as indicated by a p-value of 0.002 and a path coefficient of 0.266. This means that the line of influence from Safety Knowledge to Safety Motivation is significant. The higher the level of safety knowledge possessed by employees, the greater their internal drive to behave safely in the work environment. In addition, Safety Management Practice also shows a positive relationship with Safety Motivation, with a p-value of 0.000 and a path coefficient of 0.655. This significant line of influence confirms that the implementation of good safety management practices, such as safety training, risk communication, and active management involvement, contributes to shaping employee motivation to maintain work safety. Furthermore, Safety Motivation itself has a positive relationship with Safety Performance at PT Shinko Plantech, as indicated by a p-value of 0.011 and a path coefficient of 0.146. The significance of this effect line indicates that a high level of motivation in safe behavior has an impact on improving safety performance, through compliance with work procedures and risk control. Interestingly, the mediation effect analysis shows that Safety Knowledge affects Safety Performance through Safety Motivation as a mediator. This relationship is supported by a p-value of 0.037 and a path coefficient of 0.039. As previously noted, the direct line of influence from Safety Knowledge to Safety Performance is not significant. However, with the mediation of Safety Motivation, the relationship becomes significant. This shows that safety knowledge can only improve safety performance if it succeeds in generating safe work motivation in employees. Similar findings also occur in Safety Management Practice to Safety Performance through Safety Motivation. This relationship proved to be significant, with a p-value of 0.023 and a path

coefficient of 0.096. This means that in addition to having a direct influence, safety management practices are also able to improve safety performance indirectly by increasing safety motivation.

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