

Identifying Risks on Human Activities in Power Plants During The COVID-19 Pandemic

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Abstract. *Business organizations have prioritized employee safety in response to the COVID-19 outbreak. The power generation sector within Indonesia is a vital economic catalyst, playing a pivotal role in sustaining productivity and taking measures to mitigate the pandemic. Notwithstanding societal limitations, power facilities, such as Paiton, which are based on steam power, persist in their operations. This study aims to identify and evaluate the dangers linked to COVID-19 connected to human activities in power plants. Data was collected using interviews, observations, and questionnaires. The Failure Mode Effect Analysis (FMEA) technique was utilized to prioritize and control these risks effectively. Out of the 17 activities examined, the workshop, warehouse, administration building, and Coal Handling Control Building (CHCB) had the most elevated Risk Priority Number (RPN) scores. This analysis will be seamlessly integrated with existing risk assessments aligned with relevant administrative regulations. The findings will be incorporated into the existing risk assessments following relevant rules. The study suggests improving risk management and COVID-19 preventive protocols in power-generation firms. Power generation companies need to prioritize employee safety in response to the COVID-19 pandemic. Identify high-risk areas to improve preventive measures. Companies should engage employees in training and education regarding COVID-19 protocols. Continuously monitor data and update risk management strategies in line with the pandemic's developments.*

Keywords: *occupational health and safety, risk management, productivity, COVID-19, risk identification*

I. INTRODUCTION

COVID-19 is an exceptional respiratory virus infection first identified in the Chinese city of Wuhan in December 2019. The disease is caused by the second variant of the SARS-CoV-2 coronavirus, which has genetic connections to the viruses responsible for SARS and MERS (Boldog et al., 2020). Companies that employ offline systems must prioritize employee health by providing sterile and clean tools, including hand soap, hand sanitizers, gloves, temperature gauges, and mandating mask usage. These measures align with the current health protocols for COVID-19

prevention established by the World Health Organization (WHO) (Rahmatullah, 2020). However, there are instances where adherence to mitigation procedures may not be consistent and can impact productivity. Factors affecting productivity and employee well-being can manifest during less extreme environmental changes. Understanding the impact on employees and the drivers of success includes the support and retention efforts of managers during transitions to remote work, as experienced during the COVID-19 pandemic (George et al., 2022). The numerous pressures faced by employees during the pandemic can influence various aspects of the workplace, leading to health-related issues and increased employee absenteeism (Dewi, 2023). Regulations that restrict employee on-site presence can have implications for workplace productivity, with employees' attitudes and behaviors subject to psychological changes influenced by their work environment (Giorgi et al., 2020).

PT PLN Nusantara Power is a subsidiary operating in the field of electricity generation. The research conducted at PLTU Paiton aimed to identify specific locations within the power generation unit area that served as sources of COVID-19 transmission and to minimize the

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spread of COVID-19 to ensure employee performance during the pandemic. These locations are where various work activities occur concurrently and involve group activities, making them potential hotspots for disease transmission. Both national and international regulatory bodies have issued guidelines and recommendations for preventing COVID-19 in the workplace. This industry prioritizes occupational health and safety in its operations, and health and safety policies are communicated to all company employees to mitigate risks effectively. Within the working environment, it is common for employees to engage in close interpersonal interactions, particularly in domains that necessitate teamwork and synchronization. Physical limits, such as confined regions or inadequate airflow, may constrain certain sections inside a power plant. Insufficient provision of essential facilities such as handwashing stations, masks, or other forms of personal protection in the power plant may increase staff susceptibility to infection. Furthermore, power plants may employ individuals hailing from diverse locations. Non-compliance with recognized safety practices, such as mask usage, social distancing, hand cleanliness, and employees being compelled to work while feeling unwell owing to work constraints or business regulations, can heighten the likelihood of COVID-19 transmission. The absence of a robust mechanism to monitor and quarantine individuals who have encountered or are displaying signs of COVID-19 could facilitate additional transmission within the workplace. More knowledge of COVID-19 and efficacious preventive measures could result in employees failing to comprehend the need to adhere to safety protocols.

The relationship between occupational health and safety and productivity becomes evident through the benefits reaped by companies when they prioritize and implement occupational safety and health measures. Ensuring employees can work safely and efficiently is of paramount importance. Enhanced occupational well-being fosters comfortable and friendly working conditions, ultimately boosting representational efficiency and yielding superior

creative output. Companies should provide comprehensive health services to their employees, including thorough health assessments, well-equipped medical facilities, and access to experts and healthcare professionals. By meeting these requirements, employees can work with peace of mind, free from concerns about accidents or health issues. Managers should also implement workplace welfare initiatives, including cleaning and disinfection measures, and work environment enhancements such as seat spacing, ventilation improvements, and maximum space limits (Zhazn, Pan, and Hao 2022).

The effectiveness of occupational health and safety management is reflected in achieving organizational goals and ensuring the physical and mental well-being of employees for safe and efficient work. In COVID-19 prevention and control, the use of poster media plays a vital role in disseminating information. Strategically placed signs can effectively capture attention and encourage social compliance with health measures outside the home. This serves as a reminder to the public about COVID-19 prevention (Suprianto et al., 2021). After identification and risk assessment, the next step is to evaluate the scope of risk activities and the potential impact of harm. This assessment involves recognizing potential risks, analyzing them, and calculating the selected risk to determine the appropriate course of action, taking into account the likelihood and severity of the risks or their potential effects (Shin & Kang, 2020). Risk management theory involves several stages that must be considered: a) Development of a risk management plan, which outlines activities and decision-making approaches; b) Risk Identification, where all potential risks faced by all parties are identified; c) Qualitative Risk Assessment, which assesses the impact and potential of previously identified risks (Choi & Staley, 2021).

Previous research conducted by (Rahmanto & Hamdy, 2022) on work accident risk analysis using the Hazard and Operability (HAZOP) method at PT PJB Services PLTU Tembilahan found that workplace hazards and potential risks had a high level of severity and were categorized

as extreme, high, medium, or low sources of danger. Suggestions for mitigating these risks include providing personal protective equipment and fire extinguishing systems in each business sector and offering occupational safety and health training to employees to build a skilled workforce that understands the importance of occupational safety and health (Rahmanto & Hamdy, 2022). Additionally, previous research evaluated COVID-19 prevention and control in the petrochemical industry in South Sumatra. PT X implemented various measures in line with the International Labor Organization's (ILO) 2020 Strategy for COVID-19 prevention and control. These efforts encompassed special policies, risk assessments, the establishment of a COVID-19 Task Force Team, program funding, unique Standard Operating Procedures (SOPs) for addressing COVID-19, the implementation of promotive, preventive, curative, and rehabilitative measures, as well as comprehensive recording, reporting, evaluation, and public service programs (Rahmawati et al., 2022). Furthermore, research on human resource risk responses during the COVID-19 outbreak in Indonesian manufacturing firms aimed to assess risks and implement mitigation measures to facilitate employee productivity (Ambarwati et al., 2022).

This research was carried out at PLTU Paiton, one of the power plants that proactively identifies COVID-19 transmission symptoms within power plants. The primary objective of this research is to determine the highest-risk areas within work process activities. Identifying these areas is essential to allocate appropriate resources for effective risk management and to ensure uninterrupted industrial activities. The research conducted in this power generation unit contributes by pinpointing locations with the highest potential for COVID-19 transmission. This information enables anticipatory programs to be implemented, suppressing the spread in these locations and safeguarding employee health. As a significant number of affected workers could disrupt electricity production, this research plays a crucial role in maintaining uninterrupted power generation.

II. RESEARCH METHOD

The purpose of this analysis is determine and establish human resource risk mitigation measures to facilitate productivity employees at the COVID-19 disease epidemic. Data was collected through questionnaires, observations with objects in areas potentially spreading COVID-19, and direct interviews. The data obtained were then analyzed using FMEA [Failure Modes and Effects Anaysis]. FMEA is a set of systematic procedures to identify and evaluate hazards and take maximum precautions. The FMEA output is expressed as an RPN (Risk Priority Number) score. In this case, a weighted evaluation is made of the identified risks so that one can determine, for example, which priority issues should be addressed first. RPN is also used to assess risks based on three criteria: 1). severity, or denoted (S). Severity is the severity of the impact of the hazard being assessed. Each fault that occurs can be interpreted to be evaluated based on its severity. There is a direct relationship between the effect and the severity. If the impact is severe, for example, the severity is high. If the effect is not critical, the severity is modest.. 2). Occurrence, or symbolized (O) Incident rate, is the probability that a failure will occur for some reason during the product's life. Events correspond to the expected or cumulative frequency of possible failures. 3). Detection rate (Detect) or symbolized (D) Detection rate can be defined as current control or power measurement to control possible faults. So RPN is the product of the ranking of the multiplication of Occurrence (O), Severity (S), and Detectability (D).

The company survey was conducted by conducting questionnaires, observations, and interviews. The data taken is the distribution and locations affected by COVID-19, and the risk of hazards. This is useful for identifying and observing potential hazards that may occur during production. The subjects of this research are employees of PT PLN Nusantara Power UP Paiton. The questionnaire was distributed to respondents with specific criteria based on the respondents' experience in handling COVID-19 as a COVID-19 task force. The following criteria were

Table 1. The scale of severity-occurrence-detection

SCALE	OCCURANCE		SEVERITY	DETECTION
	Cost	Manpower		
1-2	No cost increase	There is no manpower reduction in that area	No interrupted operation	very unlikely Able to control the cause of failure up to 80-100%
3-4	There is an increase in fees <5%	There is a reduction in workforce <1%	Operational interruption occurred <8 hours	probably not happening Able to control the cause of failure up to 60-79%
5-6	There is an increase in costs <6-10%	There is a 2-3% reduction in workforce	Operational interruption occurs 9-24 Hours	the probability of happening is the same or not happening Able to control the cause of failure by 40-59%
7-8	There is an increase in costs <11-15%	There is a workforce reduction of 4-5%	Operational disruption occurs 24-48 hours	most likely happen Able to control the causes of failure by 20-39%
9-10	Cost increase <15%	There is a reduction of labor > 5%	Operational disturbances >48 hours	it's very possible to happen Occurance Able to control the cause of failure by 1-19%

Source: (Ambarwati et al., 2022)

used to select interviewees for data collection (particularly interviews): permanent employees; a minimum of five years of service, assuming personnel are familiar with the work processes in their area of responsibility and are members of the company's COVID-19 task force. The respondents filled out a questionnaire to analyze the data using FMEA. Table 1 is the scale used by respondents by filling in a scale of 1-10 for measuring the risk priority number in each area of the power plant. Positions in the company's structure, a least at the Supervisor level, include Industrial Relations Supervisor, Occupational Health and Environmental Safety Supervisor, Production Shift Supervisor, General and Services Supervisor, Logistics Supervisor, HR Manager, Maintenance Manager, Operations Manager, Engineering Manager, and similar company paramedics consisting of doctors and nurses.

The areas observed are all areas in the UP Paiton PLTU unit that have the potential to spread Covid-19. Some locations will be inspected for Employee Health Services, Canteen, Employee Entry and Exit Activities, Prayers at the Mosque,

Employee Training (PJB Academy), and Safety Briefing Room. The likelihood, consequences, and risks of each activity conducted throughout the workplace came from the Work Area Manager and the 23-member COVID-19 Task Force. The debriefing period and rating observation resulted in 17 staff activities that impacted the spread of COVID-19. Experts and researchers gathered using Zoom media for consultation and decided on risk assessment criteria on a scale of 1 to 10 and geometric mean scores with weights and calculations. The highest risk priority score proves that the impact of cases in the workplace is very high, and immediate action is needed to mitigate the consequences of emerging risks.

This research uses data analysis that involves numbers and calculations or quantities. To determine the integrity. The researcher gathered three techniques from the data: interviews, observations, and questionnaires. The researcher interviewed key informants who could share important data for analysis. Guided discussion is an unorganized interview technique where only the questions asked are essential points with the

type of quantitative data obtained directly from upstream events, events, or the earliest sources of observations, interviews, and questionnaires obtained from respondents of PT PLN Nusantara Power, as the data source used in this study is primary data to form the overall data. In this study, researchers used a purposive sampling technique to determine informants, namely, taking samples from data sources with specific considerations. Interviews used an unorganized debriefing technique where only essential questions were asked. This interview technique is more accessible and goes beyond what is desired to help the analyst. The results of the interviews are used to support and enrich the discussion based on the results of the FMEA data analysis. The limitations of the problems included in the scope of this research are company activities that involve human resources to support productivity in companies. There are several management systems implemented in power generation, this research is only guided by the K3 Management System and the Environmental Management System in the company.

The study has obtained informed consent from participants, ensured confidentiality and anonymity of their data, and provided transparency regarding how their data will be used. In addition, the study should have received ethical approval from an appropriate review board or committee. The research team had also previously entered into a Non-Disclosure Agreement (NDA) with the power generation company to keep important information/trade secrets of the company from being disclosed. Adhering to ethical guidelines not only upholds the rights and welfare of participants, but also enhances the credibility and validity of research findings. Researchers and institutions prioritize ethical considerations to maintain the highest standards of integrity and trustworthiness in their work.

III. RESULT AND DISCUSSION

Data processing results were obtained by collecting quantitative information on HR management through interviews, observations,

questionnaires, and risk assessments. The following is a risk assessment for productivity and maintenance actions use of FMEA methodology. Productivity-supporting activities which include staff on/off activities, mosque prayers, staff training (PJB Academy), and a safety briefing room. Pantry, visitor reception lobby, meeting room, toilet activities, CCR main body (manufacturing), CHCB (coal handling management building), management building, workshop, warehouse, pick-up service, attendance service, Employees also enter and exit the plant site. Office duties include document sharing, duplicating, entertaining guests, handling customer complaints, training, briefing, and employee vacations. Safety includes Accident prevention, prevention and reduction of permanent injuries, prevention of occupational diseases, prevention or reduction of fatalities, material safety, construction, and maintenance, all aimed at improving human well-being. Occupational safety can therefore be understood as the physical protection of employees to protect them from suffering and loss on site. Risk can affect performance. With low companies, these risks can arise internally or through external influences. Risk management also includes identifying potential risks that need to be addressed and trying to protect oneself so that the impact of these risks can be minimized or even eliminated in a big way (da Silva & Amaral, 2019). The RPN results show the respondents' severity, occurrence, and detection assessment. Figure 1 and Table 2 show the highest RPN values are workshop 23,077, warehouse 21,144, Administration building 21,005, CHCB 20,248, and employee training 18,571.

The RPN score shows that the workshop location has the highest risk and urgency of mitigation. The workshop at the PLTU is intended for workers, and there are machines to operate the existing PLTU. There is no screening process or hand washing place in this workshop room because there are only machines, and employees can go in and out freely, so the risk in the workshop room has the highest value compared to other rooms or places. Ability to transmit. The most important part of the virus activity is testing

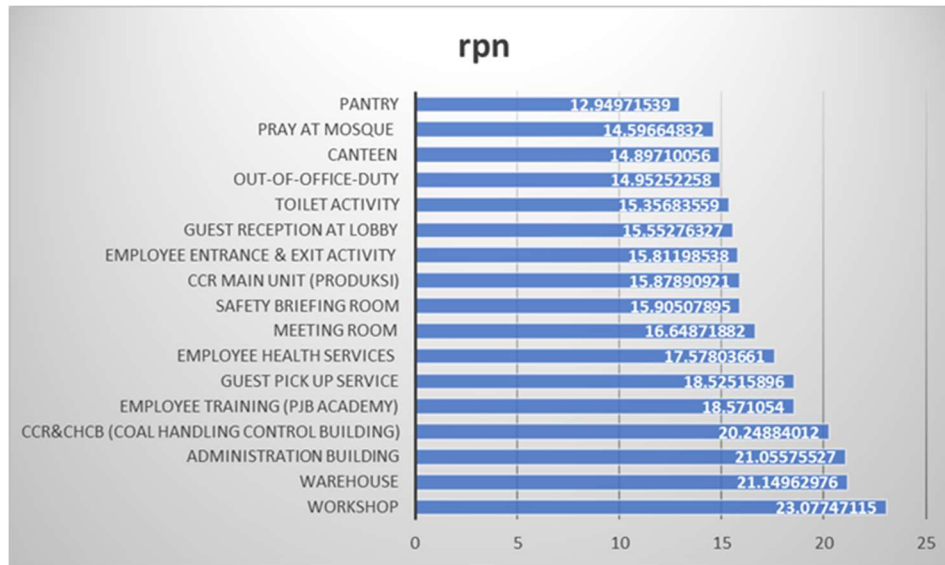


Figure 1. Risk Priority Number (RPN)

Table 2. Risk Priority Number (RPN) score

Activity	Severity	Occurrence	Detection	RPN
Workshop	3.677	2.379	2.439	23.077
Warehouse	3.677	2.309	2.490	21.149
Administration building	3.826	2.276	2.416	21.055
CCR&CHCB (Coal Handling Control Building)	3.848	2.356	2.232	20.248
Employee Training (PJB Academy)	3.281	2.142	2.640	18.571
Guest Pick Up Service	3.532	1.030	2.243	18.525
Employee Health Services	3.630	2.317	2.089	17.578
Meeting ROOM	3.169	2.092	2.510	16.648
Safety Briefing Room	3.011	2.282	2.374	15.905
CCR Main Unit (Production)	3.255	2.129	2.290	15.878
Employee Entrance & Exit Activity	3.335	2.077	2.281	15.811
Guest Reception At Lobby	3.058	2.063	2.464	15.552
Toilet Activity	2.948	2.213	2.353	15.356
Out-Of-Office-Duty	2.902	2.183	2.358	14.952
Canteen	3.308	2.016	2.233	14.897
Pray At Mosque	3.137	1.912	2.432	14.596
Pantry	2.785	2.282	2.036	12.949

techniques in the company's work area, and the air-conditioning and having an enclosed space can increase this significant risk. The workshop is

a closed room located in the generating unit area that is used as a maintenance workplace. Activities in the workshop include the scope of maintenance and testing of mechanical, electrical and control equipment. In the workshop itself, various kinds of work tools/equipment cover all the needs for completing work that can be completed by yourself without having to be done by outside parties/vendors. The close working conditions in these settings can increase the risk of virus transmission. The implementation of equipment repairs involves few workers but frequent interactions. They shed light on the adequacy of measures for reducing close interactions and the potential for virus spread. There is interaction between workers, borrowing tools, using the same tools alternately, and receiving spare parts from the warehouse in the workshop. Activities in the workshop will be busier if the generating unit experiences problems, so the damaged equipment is taken to the workshop for repair. Apart from that, sometimes if there are difficulties in carrying out repairs, the maintenance party will invite vendors/external parties to carry out repairs in the workshop. Efforts made to stop the spread of the outbreak in the workshop space are by providing hand sanitizer facilities, masks, hand washing stations, optimizing ventilation of the workshop space, and fogging activities to prevent the

massive spread of the virus. As socialization material about the dangers of the spread of COVID-19, banners and notice boards on the dangers of COVID-19 were installed in the workshop; Apart from that, daily Covid meetings are also held regularly, including socialization via social media. The value of employee activities and company operations is relatively high, namely a workshop of 2,379 points. The probability score of an event and the ability to detect risk are 2.439 and 3.677 respectively. Changes to workshop provisions include the implementation of health protocol procedures. By implementing occupational health management by reducing the consequences of occupational health and safety risks, such as absenteeism, staff shortages and poor product quality, organizational turnover can be increased.

The second priority is the warehouse which is a closed room located in the generating unit area and is used as a storage area for the operational and maintenance needs. The scope of activities in the warehouse itself includes administrative activities and providing services for taking goods and returning unused or scrap goods. In the warehouse, there are interactive activities between workers, including external parties who deliver goods purchased from outside to be received and stored in the warehouse. Warehouses often involve close quarters and frequent interaction among workers, which can elevate the risk of virus transmission. The warehouse involves a few people with a moderate frequency of interaction. It is imperative to examine how safety protocols address and mitigate these specific challenges within this work environment. Moreover, the activities in the warehouse tend to be busy when the unit is experiencing interference, so often the activities of picking up goods/parts and returning damaged goods/parts are carried out and even when outside the working day/holiday. The second level is with an RPN value of 21,149 (occurrence 2,309, severity 3,677, detection 2,490). Efforts to prevent the risk of spreading COVID-19 are the same as the workshop area where what is done in the warehouse area includes: restrictions with partitions between

administrative staff, providing hand sanitizer facilities, masks, hand washing stations, optimizing air circulation/ventilation of the warehouse space and fogging activities to prevent the massive spread of the virus. As socialization material about the danger of the spread of COVID-19 in the workshop, banners and announcement boards on the dangers of COVID-19 are installed.

The third priority is the Administration building, used for routine operational and maintenance administrative activities in the generating unit. The scope of activities in the Administration building includes routine administrative activities, meetings, training, and reception of internal and external guests. The nature of administrative work often involves regular interactions and close collaboration among employees. The administration building involves many people with a high frequency of interaction. The optimizing safety strategies that are contextually relevant to administrative operations within a power plant, ultimately safeguarding the health and well-being of the workforce in this unique setting. Third value with an occurrence value of 2.276, a severity of 3.826, and a detection of 2.416. To prevent the risk of spreading COVID-19, it is the same as the workshop and warehouse area where what is done in the Administration building area includes: restrictions with partitions between administrative staff, providing hand sanitizer facilities, masks, hand washing stations, optimizing air circulation / ventilation of the warehouse space and fogging activities to prevent the massive spread of the virus as socialization material about the dangers of the spread of COVID-19 in the workshop, banners and announcement boards on the dangers of COVID-19 are installed.

The fourth priority, CHCB building is a building used to control and monitor the coal fuel management process starting from unloading coal at the jetty until it enters the silo bunker. CHCB Building is a restricted area where not all employees are allowed to enter unless they have obtained permission on the grounds of the need for operation and maintenance activities of the generating unit. This area is only specialized for

coal fuel control operators. The CHCB typically involves close collaboration with few workers and frequent interactions among employees responsible for overseeing critical control operations. Adjustment and enhancement to safety strategies specifically suited to the unique operational demands of CHCBs within power plants. Then the fourth level is CHCB which has a severity value of 3,848 and 2,356, a detection score of 2,232.

To prevent the risk of COVID-19 spread, carried out in this area include: Providing vitamin C to maintain the operator's immune system, Routine room sterilization activities using UV light, providing hand sanitizer facilities, masks, hand washing stations, fogging activities to prevent the massive spread of viruses, routine Air Conditioner (AC) Cleaning. As socialization material about the dangers of the spread of COVID-19 in the CHCB Building, banners and announcement boards on the dangers of COVID-19 are installed; besides that, daily COVID-19 meetings are also held regularly, including socialization through WhatsApp groups.

Based on the results presented in Table 2, the overall calculations provide us with confidence in anticipating the spread and number of infections. Employees are strongly encouraged to adhere to health protocols, adopt a healthier lifestyle during the COVID-19 pandemic, and take precautions to avoid direct contact with individuals who have tested positive for the coronavirus (Oarga et al., 2018). The time spent in the workplace and interactions with coworkers significantly increase the risk of infection by nearly 70%. Given that many activities are conducted in group settings and control measures are in place around work areas, companies should enhance their process controls within departments to improve employee safety. The distribution of personal protective equipment (PPE) should be equitable, and occupational health and safety counseling should be integrated into processes vulnerable to COVID-19 transmission. Information dissemination and socialization on worker safety within the company should not solely rely on company systems but also on individual awareness to mitigate the

virus's spread in the workplace. Such socialization efforts aim to enhance employee knowledge, understanding, and foster a comfortable and secure work environment (Onyeka & Agunwamba, 2019).

Acquiring worker feedback on COVID-19 safety measures is essential in an academic setting to thoroughly grasp their feasibility and effectiveness. The input from employees highlights the practical difficulties associated with maintaining social separation, wearing masks, and practicing hand hygiene. It also identifies specific obstacles, such as the arrangement of workspaces, availability of sanitization stations, and the effectiveness of safety communication. Furthermore, employees' perspectives provide valuable information regarding the effects of these measures on their productivity and workflow, potentially revealing areas that can be enhanced (McAleer, 2020; Singh & Hong, 2020). Their pragmatic recommendations for modifying safety protocols, participation in surveillance and documentation of COVID-19 instances, and emphasis on the psychological and emotional repercussions collectively contribute to a comprehensive evaluation (Ingrassia et al., 2020; Onyeka & Agunwamba, 2019). Gaining insight into employee motivations and acknowledging the varying demands that arise from ethnic backgrounds, age, or health issues can enhance the effectiveness of safety protocols. Implementing a perpetual feedback loop guarantees that employees' concerns and suggestions actively contribute to the continuous and iterative improvement of safety standards.

The advantage of this research lies in its potential to identify high-risk locations for COVID-19 transmission, enabling the development of targeted mitigation programs within those areas. These programs can effectively reduce COVID-19 exposure among workers in power plants, thus enhancing workplace safety. However, this study has certain limitations. It primarily focuses on internal sources of COVID-19 transmission and does not consider external factors. Additionally, it should consider the presence of various COVID-19 variants, each with differing transmission rates. Implementing

occupational safety and health measures plays a crucial role in increasing work productivity and shaping workers' behavior toward safety (Bernardi, 2019). Ensuring occupational health is vital for maintaining business continuity and safeguarding workers against COVID-19 transmission in the workplace. Adherence to occupational safety and health requirements, as stipulated by statutory provisions, and the incorporation of health standards and protocols set by the Ministry of Health can effectively prevent workplace COVID-19 transmission (Sasaki et al., 2020). Monitoring potential sources of danger is essential to reduce occupational hazards and minimize risks. This can be achieved through a comprehensive risk assessment of each work activity, determining the risk level for each process or profession, and implementing appropriate control measures based on the assessed risk level (Kumar et al., 2020).

Exposure to COVID-19 risks can occur at any time in the workplace, including during business trips to areas with COVID-19 cases and during commuting to and from work (Lingard et al., 2019). Work that requires collaborative efforts among employees, such as tasks conducted in workshops, warehouse areas, building administration, CHCB, and employee training, necessitates constant caution during working hours to ensure compliance with safety and health standards. Exceptions for on-site work are granted only to those with authorization who are aware of the high-risk nature of their locations. To prioritize the safety and well-being of employees in the execution of company duties, occupational health and safety procedures are rigorously enforced to create a secure and comfortable working environment. This includes the mandatory use of personal protective equipment (PPE) by employees (Temel & Vanhaverbeke, 2020). Since management's responsibility extends beyond prevention alone, as COVID-19 is a newly discovered disease, continuous efforts are needed to provide information on prevention. The key to prevention lies in breaking the chain of transmission through isolation, early detection, and basic protective measures, thereby ensuring

vigilant control of the COVID-19 outbreak (Rosenberg et al., 2020).

IV. CONCLUSION

Based on the results of risk analysis using the FMEA method at PT PLN Nusantara Power, which has a high risk of contracting COVID-19, there are four priorities that emerge from the highest RPN results: workshops, warehouses, building administration, and CHCB. By obtaining the highest score, it will be easier to determine the risks of work process activities because they require adequate handling resources so that activities are not disrupted. Then, after finding a location with the highest risk of transmission, control can be carried out. This is done through risk management and identification of potential risks. The aim is to minimize the level of risk of loss that may occur at the production location.

This human activity risk analysis is related to expected changes in behavior so that these changes can provide results regarding the risks that occur. Worker behavior has been modified to require regular use of masks and frequent hand hygiene. Technological engineering is a strategic initiative by management to minimize physical interaction, decrease crowding, and manage production effectiveness. In COVID-19 risk analysis using the FMEA methodology, there are indicators that show the impact of risks related to company losses in terms of costs, human resources, and operations. By using FMEA analysis, the business world can reduce the risk of losses that may arise due to infection with the COVID-19 virus. The implications of this research come from research that details the risks that arise from always paying attention to the balance between employee health and production capacity. This research suggests problem-solving for company management to deal with threats during human resource activities.

The elevated RPN scores indicate that these areas have a higher likelihood of COVID-19 transmission, which is of particular concern given the critical nature of operations in the power generation sector within Indonesia. Industry standards and best practices emphasize the

importance of these areas in maintaining operational continuity and ensuring the safety of our workforce during the pandemic. The workshops are essential for equipment maintenance and repair, making them high-traffic areas. Warehouses hold critical supplies and materials necessary for uninterrupted power generation. Administration buildings house key personnel responsible for operational coordination, while the Coal Handling Control Building (CHCB) directly impacts our coal-based power generation process. This analysis reinforces the need to implement robust risk management and COVID-19 preventive protocols in these specific areas to mitigate the pandemic's impact and ensure the continued sustainability of our productivity.

This research is based on human resource activities that are at risk of contracting the corona virus in the manufacturing industry without considering external factors. External factors stemming from impacts due to contagion from the environment outside the power plant. Therefore, it is recommended that future research concentrate on risk assessment based on the risk value of corporate assets and endogenous human capital characteristics, as well as consider other measurement methodologies.

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