

COVID-19 Prevention and Control: Mining Industry Responses to the Pandemic

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Abstract

The rapidly growing global Coronavirus Disease 2019 (COVID-19) pandemic crisis affects the labor-intensive mining industry. The industry is characterized by high worker mobility and 24-hour operations; thus, this continuous, mobile workforce increases the transmission risk of COVID-19 and has been a challenge for the mining industry during the pandemic. PT X, one of the largest mineral mining locations in Mimika District, Central Papua Province, Indonesia, was challenged to face the COVID-19 pandemic crisis. Therefore, this qualitative study aimed to analyze the COVID-19 handling efforts by PT X Concentrating Division using a descriptive-analytical method to describe the completion of PT X. The assessment aimed to examine nine critical factors formulated by the International Labour Organization and evaluated as practical steps to prevent and mitigate the virus spread in the division. Furthermore, an analysis was conducted on data related to COVID-19 handling. The results showed that the nine critical factors had an average value of 89.41%. These results indicated that the pandemic handling efforts in the division had been implemented well.

Keywords: control, COVID-19, handling, mining industry, practical steps

Introduction

During the present pandemic, Indonesia has faced three peak waves of COVID-19 cases.¹ The first wave occurred from January to February 2021 due to the Alpha variant, with daily cases reaching 14,528. From June to July 2021, the second wave occurred due to the Delta variant, with the highest cases reaching 56,757.² In 2022, the third wave was triggered by the Omicron variant, resulting in up to 63,956 cases.¹ A total of 6,055,645 confirmed cases were recorded as of June 2, 2022. These included 3,105 (0.1%) active cases, 5,895,940 (97.4%) recoveries, and 156,600 (2.6%) deaths.³

The rapidly growing global pandemic crisis has impacted health, political, economic, financial, and social aspects. This is in part triggered by the various policies issued by the government to overcome the spread.⁴ The declining productivity of the industrial and labor sectors has significantly impacted the community's economic activities. One of sectors affected by the COVID-19 pandemic is mining industry.⁵ Therefore, this sector must implement specific strategies for sustainable and safe production.

The pandemic has significantly affected the mining industry from a business standpoint, causing a decline in the prices of raw metal commodities, including gold, silver, and copper between 2020 and 2021.⁴ The impact is seen in the tight policies from operational aspects to human resources. In Mexico, mining industries shut down operations for three months in 2020, owing to the high COVID-19 prevalence. This was also experienced in mines in South Africa, where most workers were laid off because mining operations had to be stopped due to the pandemic. However, the policy was eventually adjusted to operational implementation with 50% capacity.⁴ In Indonesia, the impact decreased mining production figures by -2.18% in 2020.⁶ This indicates that the COVID-19 restrictions and control policies are a challenge for the mining industry.⁷

The physical distance between the mining industry from the general population prevents COVID-19 spread.⁸ However, the labor-intensive mining industry is characterized by high worker mobility and 24-hour operations, and this forces workers to work continuously, increasing the transmission risk. With the potential spike in COVID-19 cases, Indonesia's mining industries'

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management must make large-scale restrictions on human and operational activities.

Mining workers have various individual characteristics in terms of age, health status, and potential for comorbid symptoms related to the COVID-19. The productive-age population has varied potential for comorbid diseases in terms of prevalence. This includes 8.5%, 7.9%, 21.8%, 3.8%, and 34.1% for diabetes mellitus, stroke, obesity, chronic kidney disease, and hypertension, respectively.⁹ Furthermore, mining workers also can experience potential mental fatigue. For example, workers at seven coal-mining sites in Indonesia experienced a 32.3% prevalence of mental fatigue. This condition is caused by the increased work pressure on operators as the largest group in coal mining.¹⁰ Therefore, the mining industry must implement critical control and prevention aspects effectively, efficiently, and on target. This is because of the operational impact that affects the industry's production results.

Production and businesses that must run continuously have been challenging to operate during the pandemic. Mining industries must consider systems, empowerment, communication, health services, tracing, mobility and community management. This is stated in the guidelines and regulations regarding COVID-19 in the workplace. Some regulations governing the handling of COVID-19 in the workplace include the Decree of the Minister of Health No. 328 of 2020 concerning the Guidelines for the Prevention and Control of COVID-19 in Offices and Industry, and No. 413 of 2020 concerning the COVID-19 Prevention and Control. Additionally, guidelines for prevention and control in the workplace have been formulated by agencies worldwide, such as the International Labor Organization (ILO), Canadian Centre for Occupational Health and Safety (CCOHS), Mine Safety and Health Administration (MSHA), and *The Commission des Normes, de l'équité, de la Santé et de la Sécurité du Travail* (CNESST).

The ILO categorizes these points into nine critical factors in COVID-19 prevention and control in the mining industry.¹¹ The factors were developed by considering regulations, systems, resources, and health implementation aspects. Therefore, this study aimed to discuss the best practices of the PT X Concentrating Division in dealing with COVID-19 during the 2020-2022 period and beyond. This study focused on managerial and operational scopes based on prevention and control according to the ILO guidelines.

Method

This qualitative study used an analytical method to describe a case study through data collection from the ore processing industry located in Mimika District, Central Papua Province, Indonesia. Data were selected

from the company's COVID-19 daily positive cases, PT X Concentrating Division data within the COVID-19 period, and PT X internal COVID-19 publication on the company website. In-depth interviews with management were conducted to validate the data and deepen the analysis results. The data were assessed using the ILO COVID-19 checklist guidelines to evaluate the critical factors as practical steps to prevent and mitigate the spread of COVID-19 in the PT X Concentrating Division. The ILO guidelines were selected as they are a specific guide for discussing the handling of COVID-19 in the mining sector. In addition, the aspects covered in this tool are comprehensive in terms of regulations, systems, resources, and health implementation.

Each critical factor consists of several questions that delve deeper into their implementation. Planning, resources, and management systems has nine questions with an average of five sub-questions regarding commitment, company mitigation plans, response teams, risk management, and evaluation. Education and communication has six questions with three sub-questions regarding training, team communication, people management, and consultation. Worker health surveillance has seven single questions regarding self-monitoring and contact tracing, medical check-up management, health management for comorbid people, health facilities, tracing mechanisms, and isolation for sick people.

Hygiene and cleaning has ten single questions regarding public facilities, personal protective equipment (PPE) availability, and social distancing at the sites. Site access and work organization has eight questions with an average of four sub-questions regarding roster management, day-off policy, access limitation, public physical distancing policy, and crew management. Travel and mobility have eight questions with two questions and four sub-questions regarding airplane transportation and health measurement in transportation. The accommodation factor has seven questions regarding access limitations in barracks and physical distancing control in local transport. Suppliers and contractors have six single questions regarding contractor management during the COVID-19 pandemic and beyond. The last factor is mining communities and indigenous peoples, which consists of nine questions, with one question having six sub-questions regarding company efforts to prevent, communicate about, and control the spread of COVID-19 to indigenous people at the site.

These questions and sub-questions were then answered based on company statistics on the COVID-19, health promotion programs during the COVID-19 pandemic, company policies regarding the COVID-19, company best practices during the COVID-19 pandemic, and post COVID-19 policy, and were added to the results of in-depth interviews with management. The percentage

weighting is determined based on the average results of each sub-question; the percentages are determined as 0% if the handling effort is not carried out, 0.1%-25% if the effort already exists but needs more specific actions to meet the requirements, 25.1%-50% if several requirements have been met and implementation has started, 50.1%-75% if most of the requirements are met, there is room for improvement, but the evaluation has not been carried out, and 75.1%-100% if almost all requirements are met, implementation is going well, and evaluation has been carried out. The results will describe the overview of the implementation of each factor, and the discussion will analyze the implementation of PT X pandemic control and prevention and post-pandemic control.

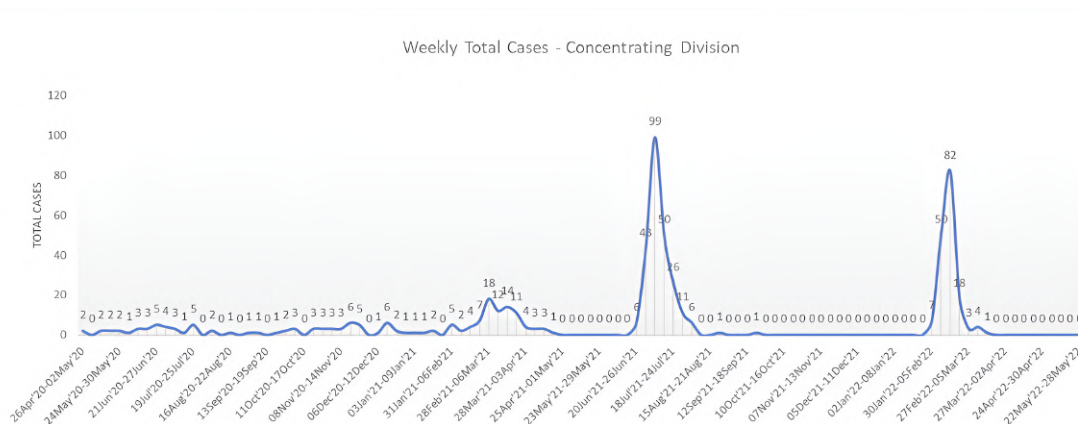
Results

PT X is one of the biggest mineral mining industries in the world that was being challenged to face the COVID-19 pandemic crisis. PT X has a contracted work area in Mimika District, Central Papua Province with an area of 90,000 hectares, which is divided into two areas:

lowland and highland. The PT X Concentrating Division is an operational division that plays an important role in mineral ore processing and has a complex area with many work activities and workers. This increases the transmission risk of COVID-19 and has posed a challenge for the mining industry during the pandemic.

The wave pattern of the COVID-19 cases at PT X was similar to the national pattern caused by the spread of new variants of the SARS-CoV-2 virus (Figure 1). The pandemic began with the Alpha, Delta, and Omicron variants in the first, second, and third waves, respectively. Although the number of cases caused by the new variants was high, development in the division was under control, with no confirmed cases in some periods. This was due to the hard work and efforts made by management and the workers regarding travel arrangements and more stringent leave times, contact tracing, and an immediate personal isolation policy of workers who were infected with the COVID-19.

Figure 2 shows that the management system and resource planning indicators have met the requirement.



Seven of the nine indicators met the criteria and achieved 100% program compliance. These included reporting the COVID-19 to the management, the COVID-19 health services, monitoring the the COVID-19 program, completeness of PPE for workers in health facilities, COVID-19 risk assessment, and commitment to implementing COVID-19 policies in writing. However, two indicators had not reached 100% fulfillment. These are the COVID-19 Task Force, which has been formed in the division but has not been maximized in planning and carrying out tasks because of the busy schedule of each team, and the preparedness and response plan, which has not carried out evaluation activities optimally.

Figure 3 shows that the communication and education indicators have also met the requirement. Five of the six indicators met the criteria by achieving 100% fulfillment. These include mental health services, providing information to workers' families and workers leaving the site, calls for physical meetings, and information flow systems. The indicator scored less than 100% was the availability of training and publications. The only COVID-19-related training carried out in the PT X Concentrating Division was induction for workers who had just returned to work after taking self-quarantine. For the COVID-19 prevention, the only education available was through print and online media.

Figure 4 shows that the indicators for surveillance, contact tracing, and monitoring of individual workers have met the requirement. Four of the six indicators meet the criteria by achieving 100% fulfillment. These are case data recording and reporting, self-quarantine facilities and information, and surveillance systems. The indicators scored less than 100% are health screening and worker self-monitoring information. The health screening carried out at the PT X Concentrating Division was limited to temperature checks that occurred during every activity in that area, especially worship activities and physical meetings. Other health screening activities such as health questionnaires had not been conducted. The PT X Concentrating Division had also educated workers to be able to monitor independently if they experienced some symptoms of COVID-19, although the education was limited through electronic media.

Figure 5 shows that only two of six indicators met the criteria by achieving 100% fulfillment. The indicator of providing face masks and tissues regularly has a value of less than 100% because the activities of providing masks and tissues were only carried out at the beginning of the COVID-19 pandemic. When cases declined and handling began to be under control, the allocation of funds for the provision of masks was diverted to other activities, such as strengthening health screening. The indicator of providing hand washing and hand sanitizer had been carried out by the PT X Concentrating Division by

providing proper hand washing facilities in every office building equipped with hand soap and hand sanitizer, but hand washing facilities were limited in the field area.

Figure 6 shows that the access to sites and work organization indicators have met the requirement. Five of the six indicators meet the criteria by achieving 100%. The six indicators are access to sick leave and sick benefits, availability of hotline facilities, work planning for workers at risk of the COVID-19, efforts to reduce on-site workers, and limiting site access for less im-

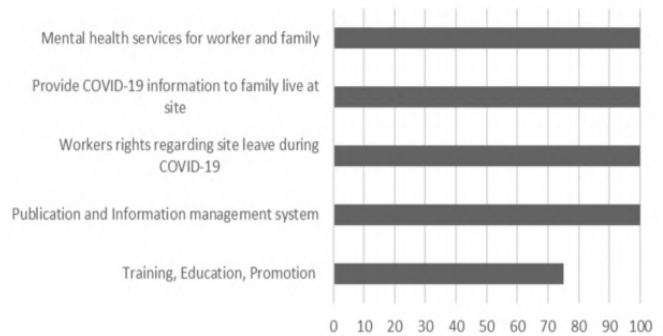


Figure 3. Education & Communication Overview

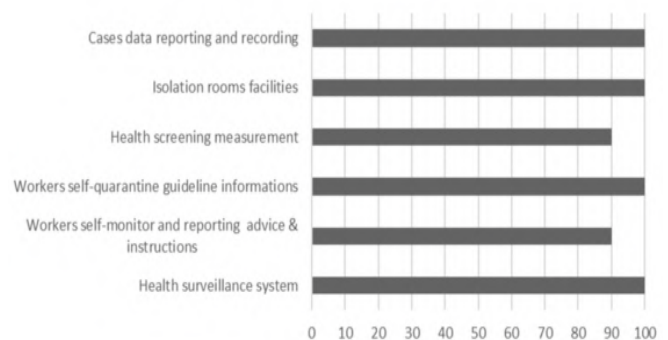


Figure 4. Worker's Health Surveillance, Self-Monitoring, and Contact Tracing Overview



Figure 5. Hygiene and Sanitation Overview

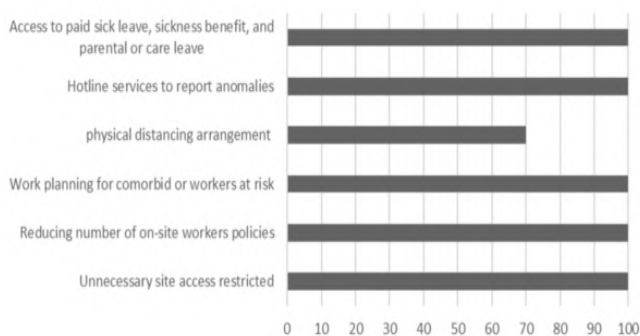


Figure 6. Site Access and Work Organization Overview

portant matters. The one indicator whose fulfillment was less than 100% is the physical distancing arrangement. Physical distancing arrangement had been made by the corporate management, but raised awareness by workers is necessary to carry out physical restrictions.

Figure 7 shows the travel and mobilization indicators have met the requirement by reaching 100%. The four indicators include the COVID-19 checks for each traveler, travel restrictions to the city center, and travel and mobilization arrangements. Accommodation factors shows that three of the six accommodation indicators have fulfilled the program by reaching 100%. These include education for safe activities during the pandemic, monitoring the cleanliness of workers' residences, and providing a place to live far from the city center. Additionally, the three indicators with fulfillment of less than 100% were restrictions on access to high-risk communities, physical distancing rules in public facilities in areas where workers live, and crowd control in residential areas.

The high-risk community referred to in this study was the local community living near the site. Restrictions on local communities are difficult to do because their primary needs, such as clothing and food, are obtained from shopping centers located in the area of the site. The company has carried out restrictions on social activities in public spaces by closing various public facilities, such as sports and recreation centers, but the closure of these facilities resulted in increased crowds in open spaces. the crowd in an open space is referred to as a pedestrian area, which was used as a morning exercise path for workers.

Figure 8 shows that supplier and contractor indicators have met the criteria well. Three of the five indicators have met the criteria by reaching 100% program fulfillment. These are communication forums with contractors and suppliers, proactive management attitude in implementing health protocol practices, and relationship

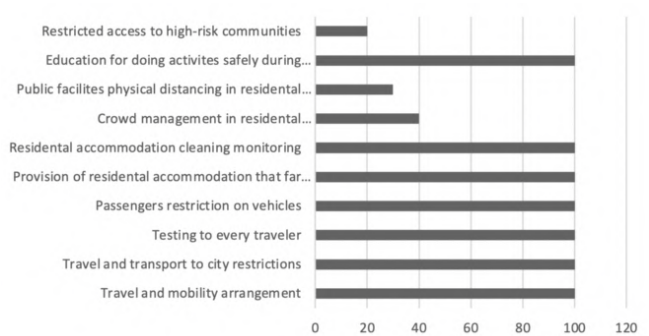


Figure 7. Travel, Mobility, and Accommodation Overview

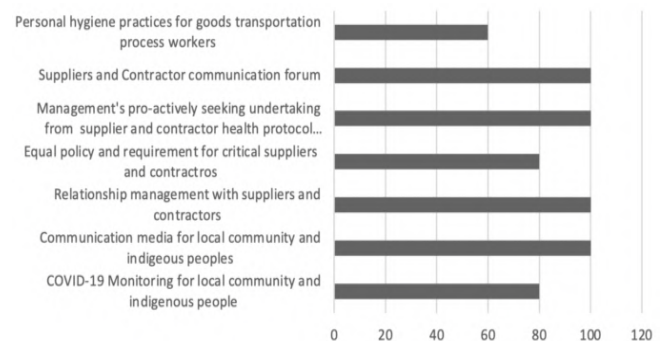


Figure 8. Supplier and Contractors and Mining Communities, and Indigenous People Overview

management with suppliers and contractors. The two indicators in which fulfillment was less than 100% are personal hygiene practices for workers in the goods transportation process and the same arrangements for important suppliers and contractors.

The indicators of mining and local communities are communication media with 100% compliance and monitoring of the COVID-19 for those around the sites with 80% compliance. The mining communities referred to in this study are all mining workers and their families left in the site's residential area and indigenous people, namely local communities living not far from the site's residential location and fulfill their basic needs from the shopping center located in the site's settlement. Communication media for the prevention of the COVID-19 for mining communities and indigenous people is carried out quite massively through print media (posters, banners, and billboards) and online media (websites and emails), and in every area of the settlements, recommendations have been made to implement health protocols to prevent the COVID-19. Monitoring of health protocols in mining communities can still be carried out

well, except for in the local communities because of the low level of awareness regarding COVID-19 and their location of residence, which is quite far and remote from the site location, making it difficult to carry out direct monitoring.

Discussion

COVID-19 Handling and Prevention at the PT X Concentrating Division for the 2020-2021 Period

The PT X Concentrating Division has made efforts to overcome the pandemic at the workplace. During monthly or daily lineup meetings, management's commitment and communications are conveyed regarding planning, resources, and the systems in place. Furthermore, the COVID-19 Task Force delegated tasks according to the regulations implemented by the Indonesian Government. This involves contact tracing, where workers identified as positive and active contacts, although not COVID-19-confirmed, must self-quarantine in their barracks for 14 days. The policy is effective, as evidenced by the stable number of cases below ten people per month in the early days of the pandemic.

The PT X Concentrating Division COVID-19 protocols have also been implemented in the field through awareness and training. A special induction discussing the COVID-19 materials for workers was attached to online safety training opportunities. Moreover, workers were given a brief induction regarding the necessary considerations when resuming work after self-quarantine. The peak time for the infection rate during the Alpha COVID-19 wave from June to August 2021 was due to the transition between workers who were on leave (school children's holidays).

At the PT X Concentrating Division, workers typically take the opportunity to take time off during this period. High infections occurred because in the previous month, there was no upward trend in the COVID-19, hence workers saw that there would be no potential for an increase in the number of cases. Written posters and interoffice memoranda were constantly being submitted and updated. The division implemented a policy of leaving the site for workers with potential comorbidities in the high-risk category. Healthy and productive workers were instructed to not leave the site for a certain period. Additionally, the 24-hour mental health services were provided to workers and their families living on-site.

The PT X Concentrating Division allocated three barracks, each with 100 people, for quarantine at Mile 68 and 72 residential locations. Disinfection was conducted weekly in the office and workshop areas. This policy is more intense than in the other divisions at PT X and was useful in reducing the number of COVID-19 cases among workers in the Concentrating Division.

The implementation of social restrictions on every

facility in this area must be improved, as described in the accommodation results. The division has implemented several policies, such as providing boundaries in the meeting areas, and hybrid meeting methods to standardize movement up and down stairs. Furthermore, workers used masks and the PPE to reduce the risk of COVID-19. The PT X Concentrating Division exhibited high COVID-19 awareness by sharing their active participation in tracing and communications through social media, such as WhatsApp groups and stories. Thus, it raised the workers' opportunity to avoid the COVID-19 infection.

In the early phase of the pandemic, public facilities such as mess halls, cooperatives, and restaurants were closed for on-site dining and workers were only allowed to eat at home. Mosques and churches have also been a concern for workers wishing to use public facilities. In addition, workers have used disinfectants because the PPE is a personal responsibility.¹¹

Initiatives have also been implemented by contractors or external subordinate company in the PT X Concentrating Division. Most contractors distributed masks and hand sanitizers during joint agendas such as safety meetings or divisional togetherness events. This was also supported by divisional management through the procurement of public facilities such as hand washing stations and sanitizers for public use and free of charge. The self-monitoring work by the PT X Concentrating Division was carried out daily using a standard self-checklist following the government's standards. The missed implementation was documentation and evaluation in the form of meeting minutes, which are monthly recapitulated.

Mobility has been adjusted to the COVID-19 conditions, such as when workers were detained and could not leave the site during the early pandemic. The management made a policy that only 75% of workers should be on site at a given time. However, the management also developed a roster policy of nine weeks onsite and three weeks of leave for each worker.¹² This was accompanied by a work-from-home policy during the increased wave of Alpha variants.

The accommodation on the site is also of concern to the PT X Concentrating Division that has implemented social restrictions on public facilities such as buses and light vehicles. The policy of providing IDR 1,500,000 to workers who did not transit to Timika City was implemented to reduce the risk of the COVID-19 virus exposure from outside the site area.¹² This was considered effective, as evidenced by the sloping curve of the pandemic wave in the Delta wave period. Crowd management was conducted by the PT X Concentrating Division at the beginning of the COVID-19 pandemic. The implementation had been carried out quite well, as

indicated by the presence of social distancing signs in every public place. However, over time, the behavior of workers loosened, which can be seen apart from the peak time due to the COVID-19 wave, namely, the trend of setting crowd management in the airport area as a transportation center for the PT X with outside areas.

A study by Manullang, *et al.*, revealed that the mental health impact of the pandemic has been greater among 18- to 24-year-olds than in older adults.¹¹ This age group also reported significantly greater loneliness and dropped positive mood, both of which were associated with greater mental health difficulties. During the COVID-19 pandemic, the company implemented a policy to limit social interaction with people outside the site. Interactions were carried out by workers trapped on site with their families through personal social media. Companies must consider social interactions as a critical factor in restoring workers's mental health.¹³

Access restrictions for residents around the site were already implemented prior to the pandemic. This is because Mile 74 is the PT X Concentrating Division's limited production area, which is accessible only for workers. However, the PT X Concentrating Division remains involved in the outreach by PT X management to the local community.¹² The challenge is that the community has trouble participating in the COVID-19 program due to differences in understanding and knowledge of the pandemic.¹⁴

Coping and Prevention of the COVID-19 at the PT X Concentrating Division 2022-Current Period

Policies have been readjusted by the management of the PT X Concentrating Division as COVID-19 cases decrease. The work roster has been changed to six weeks onsite and a two-week leave applied to each worker. Incentives for workers going to Timika City were also removed. Additionally, social restrictions on public facilities such as restaurants, churches, and mosques have eased.¹⁵

For "essential activities" such as mining, some of the more significant measures that are necessary to mitigate the spread of COVID-19 include periodic testing, case monitoring, and priority vaccination of all people working in this sector. In addition, the number of people infected and suspected cases in the sector must have been periodically disclosed because, as this study has shown, there is a higher risk of incidence and comparatively rapid spread of the disease in locations where minerals are produced. Priority attention must be paid to indigenous lands that overlap the mining areas.¹⁶

The key driver for implementing health protocols is top management commitment. Implementation of the COVID-19 response in the workplace through the corporate policies and procedures regarding the COVID-

19 and the establishment of a COVID-19 Task Force are key to navigating the COVID-19 pandemic.¹⁷ The assumption here is that when there is a change in policies and the easing of restrictions, it will not slack the workers' health awareness because they will continue using masks and hand sanitizers. Communications and outreach to maintain health and fitness should be continuously promoted. This can be conducted massively through the media and small meetings between sections within the division.

Limitation and Strength

The limitation for the present study is that the scope of study is only one division; therefore, the results of study are insufficient to assess the handling efforts made by the company. The existence of some confidential data is also a drawback in this study because it has affected the quality of study results and analysis. The strength of this study is novelty for the PT X Concentrating Division as well as for mineral companies. This study can also be used as input and evaluation material for continuous improvement in efforts to handle the COVID-19. The observation method used includes implementation by companies during the pandemic and post-pandemic.

Conclusion

The total average for all factors completion is 89.41%. The nine critical factors covering Planning, Resources, and Management Systems at the PT X Concentrating Division have been implemented well. Workers' active participation and awareness also support the implementation of policies and programs. The implementation of prevention and control by the PT X Concentrating Division is adequate, as indicated by the trend of peak numbers which may decline as soon as the PT X Concentrating Division implements the policies and programs.

Abbreviations

COVID-19: Coronavirus Disease 2019; ILO: International Labour Organization; CCOHS: Canadian Centre for Occupational Health and Safety; MSHA: Mine Safety and Health Administration; CNESST: *Commission des Normes, de l'équité, de la Santé et de la Sécurité du Travail*; PPE: Personal Protective Equipment; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2.

Ethics Approval and Consent to Participate

This study was approved by the Learning and Organizational Development, PT Freeport Indonesia, with a letter-number: 009/TA/JA/L&OD-CPM/II/2022.

Competing Interest

The authors declares that there are no significant competing financial, professional, or personal interests that might have affected the per-

formance or presentation of the work described in this manuscript.

Availability of Data and Materials

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Authors' Contribution

AS and AMK, conceived the idea, data collection, data analysis, interpreted the study results, and drafted the manuscript. AS, AMK, and MRI performed data collection, critically analyzing and interpreting the study results. EKP gave his expert opinion in sampling design and data collection. ADA gave her input in the manuscript drafting. All authors read and approved the final manuscript.

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