

# MANAJEMEN RISIKO FATAL DI PT. FREEPORT INDONESIA

## FATAL RISK MANAGEMENT AT PT. FREEPORT INDONESIA

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### ABSTRAK

Kata kunci:

Tambang bawah tanah, Aman dan Produktif, Nihil Fatalitas, Fatal Risk Management (FRM)

Keywords:

Underground Mines, Safe and Productive, Zero Fatality, Fatal Risk Management (FRM)

PT Freeport Indonesia (PTFI) mengoperasikan tambang bawah tanah tembaga dan emas (metode ambrukan dan stoping) yang berlokasi di daerah terpencil Pegunungan Papua, Indonesia yang berjarak sekitar 3.500 km ke arah timur Jakarta, Indonesia.

Lokasi kerja yang terjal dengan perbedaan elevasi yang ekstrim, kondisi cuaca dan kondisi geologi batuan yang bervariasi, serta aktivitas penambangan dan pengolahan bijih yang kompleks menghasilkan kondisi yang menantang pada pengelolaan operasi tambang yang aman dan produktif.

Secara unjuk kerja keselamatan kerja, *Total Recordable Incident Rates (TRIR)* dan keparahan kecelakaan terus menurun, akan tetapi pencapaian nihil fatalitas (*zero fatality*) secara konsisten masih menjadi tantangan yang signifikan.

*Fatal Risk Management (FRM)* merupakan salah satu program keselamatan kerja di PTFI dengan tujuan menghilangkan dan mengurangi kecelakaan cedera berat dan fatalitas. Paper ini menjelaskan sejarah dari program FRM, tantangan pada saat implementasi, program transformasi digital dan perbaikan di masa mendatang untuk memastikan keselamatan pekerja dan pencapaian rencana produksi penambangan-pengolahan bijih.

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## ABSTRACT

*PT Freeport Indonesia (PTFI) operates underground copper-gold mines (block cave and open stoping mining methods) located in the remote highlands of Papua, Indonesia, about 3,500 km east of Jakarta, Indonesia.*

*The rugged terrain with extreme elevation changes, highly varied weather, variety of geological condition and complex mining-processing activities create challenging situation to manage safe and productive mine operation.*

*From safety statistics performance, the Total Reportable Incident Rate (TRIR) and severity rate have declined over time, however achieving zero fatality consistently is still significant challenge for the team. Fatal Risk Management (FRM) is one of PTFI's safety programs to eliminate and reduce serious injuries and fatalities. This paper elaborates the history of the FRM program, implementation challenges, digitalization transformation program and future improvement to ensure safety of the workers and continued achievement of desired mine-mill production.*

## BACKGROUND

Number of mining sector worker in Indonesia as of February 2022 is 1,587,978 (BPS, 2022), this occupied 1% from total workers in Indonesia. However, in 2021 mining sector had 57 mining accidents with serious injury and 11 mining accidents with fatality (MEMR, 2022).

It is in line with PTFI condition which have been working seriously to reduce and eliminate serious injuries and fatalities within the workforce. The mineworkers face a challenging workplace circumstances for both surface mine and underground mines. Current ore production comes from 3 different underground mines (2 block cave mines and one stoping mine) with average total production is about 210 ktpd (kilo tons per day). The Grasberg Mine was on operation from 1988-2019 and still have significant mining activity focusing on re-sloping and reclamation also maintain the open pit infrastructures to support underground mine operation, include mine water management. Underground mines (Grasberg Block Cave Mine, Deep Mill Level Zone Mine and Big Gossan Stopping Mine) are the ore producers for PTFI. Complex and challenging underground mines, mill-concentrating, and infrastructures create specific and significant risks which need to be managed appropriately by the team.

Since 2000, The PTFI Total Reportable Incident Rates (TRIR) has continued to decrease, the severity of injuries has also declined over time. However, achieving zero fatality is still a significant challenge for the team. PTFI achieved zero fatality in 2005, 2010, 2018 and 2022. Referring to Grasberg Surface Mine data for 1997-2017 (Widijanto, 2019) that fatality accidents were associated with geotechnical issues (50%), mobile equipment (23%) and gravitational energy (13%).

Looking at the existing accident record, fatality occurs not only to new employees with minimum knowledge and skill but also to senior employees. As a result, in 2017 PTFI started to implement Fatal Risk Management (FRM) program to eliminate and/or reduce serious injury and fatality. This paper elaborates the journey of FRM implementation at PTFI.

## METHOD

This article is qualitative research with case study method. A case study is defined as a method for developing a complete understanding of a process, program, event, or activity. The case is Fatal Risk Management with PT. Freeport Indonesia (PTFI) as the object/study. Data was collected from secondary data from internal reports and literature studies. Analysis is described into the following topics: Fatal Risk Management, PTFI Fatal Risk Management, Impact, and Future improvement.

## RESULT

### Fatal Risk Management (FRM)

The industry-wide shift toward FRM began with ICMM's 2009 'Leadership Matters – Managing Fatal Risk Guidance' document. The International Council on Mining and Metals (ICMM) is a CEO-led industry group that addresses key priorities and emerging issues within the industry. It seeks to play a leading role within the industry in promoting good practice and improved performance and encourages greater consistency of approach nationally and across different commodities through its association members and member companies (ICMM, 2009).

The document of 'Managing Fatal Risk Guidance' started the philosophical shift away from the old 'Heinrich Pyramid' and similar concepts such as Bird's Pyramid. The pyramid drove safety programs to focus on addressing the large number of minor incidents, believing that it would also prevent fatalities. It started a focus on precursors to high severity events, in addition to traditional pyramid-based programs. This prompted Freeport's first fatality prevention policy, including Potential Fatality Event (PFE) communication and our first list of 'Global Significant Risks' and associated policies (Rose, 2022). More detail on comprehensive fatality prevention program can be seen in detail at ICMM's 2010 with 3 key themes: live the vision of zero fatalities, focus on high potential events and recognize the fallibility of people and systems (ICMM, 2010).

The ICMM's 2019 Fatality Prevention elaborated statistics of fatalities and the lesson learned on fatality reduction in mining industry. The 8-lesson learned are: zero fatalities mind set, safety leadership at all levels, change management, learning from the past, risk management capability, critical controls, fall of ground and prevention is better than cure (ICMM, 2019).

### PTFI Fatal Risk Management

Several divisions at PTFI already identified and familiar with 'top risks' or 'top 10 risks' which associated with the risks which could kill or causing serious injury for the workers since 2000's. UG Mine Division is one of divisions which has been consistently implementing 'top 10 risks' within the workforce. The identification process involving section heads (superintendent above) and led by underground manager every year. The example of UG Division 'top 10 risks' for 2006 were: falling rocks, struck by moving equipment, working at height, LOTO failure (Lock Out – Tag Out), lifting equipment, steel erection, toxic gas, wet muck, jack leg drilling, and pinch point as described in the

Figure 1. Beside identifying the top 10 risks, the team also provided and compiled the list of existing Standard Operating Procedures (SOPs) related those risks.

**2006 UNDERGROUND DIVISION  
TOP 10 RISKS**

No	Risks
1	Falling Rock (Kejatuhan Batu)
2	Struck by Moving Equipment (Tertabrak Alat Bergerak)
3	Working at Height (Bekerja di Ketinggian)
4	LOTO Failure (Kesalahan Pengembokan Pelabelan)
5	Lifting Equipments (Peralatan & Alat Angkat)
6	Steel Erection (Perangkaian Baja)
7	Toxic Gas (Gas Beracun)
8	Wet Muck (Lumpur Basah)
9	Jack Leg Drilling (Pengeboran Menggunakan Mesin Jack leg)
10	Pinch Point (Celah / Titik Jepit)

Figure 1. Underground Division Top 10 Risks for 2006

The top 10 risks identification is basically having the same idea and general goals with current FRM program. The team at that time tried to be more focus on high potential events which could kill or causing serious injury to the workers. The associated SOPs were socialized and emphasized to the team internally within division.

From Underground Top Risk above, PTFI began to work with Corporate Team. As a result, PTFI has 23 Fatal Risks in place. Those are Underground Hazardous Atmosphere, Underground Rock Fall, Falling Object, Interaction with Aircraft, Fall from Heights, Fire, Exposed to Electrical, Contact with Molten Material, Lifting Operation, Vehicle impact on person, Rail impact on Person, Blasting, Uncontrolled Release of Energy, Personnel Hoisting, Confined Space, Vehicle Collision or Rollover, Rail Collision, Ground Failure, Drowning, Hazardous Substance Acute, Hazardous Substance Chronic, Entangled or Crushed, Exposed to Wet muck Slides. The critical risk icons or symbols can be seen in Figure 2.

Fatal Risk Management implementation in PTFI began in 2017. Each year has their objectives and targets based on system, people, and process approaches (Table 1). An innovation was conducted in 2020 by replacing the FRM paper-based form to electronic FRM (e-FRM). The massive adoption of e-FRM resulting to approximately 5,000 submitted forms per day and 16,000 digital users in 2021.



Figure 2. The 23 Fatal Risks in PTFI

The FRM in PTFI has four stages of process: line-out meeting, Critical Control Check (CCC), Critical Control Field Verification (CCFV), and Critical Control Verification (CCV). Line-out meeting is basically a discussion between supervisor and workers on understanding of types of tasks/jobs with potential fatal risks and determination of critical controls that need to be fulfilled to prevent fatality. CCC is a process carried out by workers in the form of Critical Control Check for every Fatal Risk in workplace to ensure that these Critical Controls are fulfilled. Workers must STOP the Work if there are critical controls that are not fulfilled, take corrective action, and immediately report to supervisors. CCFV is a process carried out by supervisors in the field to ensure that their workers have implemented Critical Controls for Fatal Risks within the work they do. Supervisors must STOP the Work if critical control is not fulfilled, then discuss with crew to take immediate corrective action. CCV is a process carried out by Management in the form of analysis based on data to produce outputs for continuous improvement of the FRM process and/or improvement of critical controls. The FRM Process is described in Figure 3.

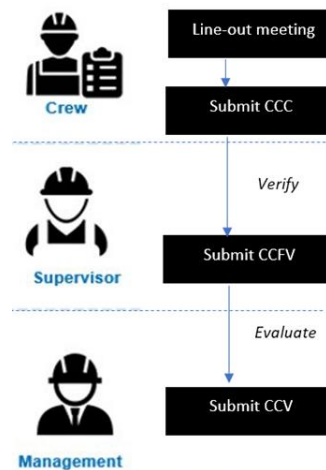


Figure 3. The FRM Process

Table 1.FRM Implementation Phase at PTFI

Year	Description
2017	PTFI conducted Fatality Prevention Training for approximately 7000 employees while Rio Tinto hosted a group of PTFI leaders at Oyu Tolgoi Mine (Mongolia) for learning its Critical Risk Management (CRM). PTFI began to develop its own Fatal Risk Management (FRM) with 23 Fatal Risks and 322 critical controls. The FRM Implementation at PTFI following FCX published Roadmap for FRM Implementation with System, People, and Process approaches.
2018	PTFI implemented FRM phase 1 with objectives as follow: [System] site communication and awareness implementation, provision of visual messaging and tools/materials; [People] deliver site wide supervisor training and tools utilization.
2019	PTFI implemented FRM phase 2 with objectives as follow: [System] work with Global Sourcing to ensure available tools; [People] continue deliver site wide supervisor training; [Process] review quality of process and feedback by conducting FRM audit and implement corrective actions based on FRM audit result.
2020	PTFI implemented FRM phase 3 with objectives as follow: [System] Integration of FRM into Safety Accountability Program, develop electronic FRM (e-FRM) to replace FRM paper-based form, implement e-FRM for 5 Divisions with 1097 users, STOP the Work is recorded in e-FRM and PTFI's command center was notified so that they can verify that corrective action was taken before work continues; [People] continue with FRM tactile training for 5331 employees, established regular meeting with FGD (Focus Group Discussion) FRM; [Process] develop power BI Dashboard for monitoring and evaluating e-FRM
2021	PTFI implemented FRM phase 4 with objectives as follow: [System] implement e-FRM for 25 Divisions with 16,139 users; [People] conduct field observation to ensure the effectiveness of FRM implementation, continue with FRM tactile training for 1948 employees; [Process] utilize power BI Dashboard for monitoring and evaluating e-FRM
2022	PTFI implemented FRM phase 5 with objectives as follow: [System] continue with e-FRM implementation, improve the network infrastructure coverage; [People] develop and deliver FRM coaching training as safety behavior intervention program; [Process] improve the quality of FRM, identify and conduct correlation analysis of FRM as leading indicators to lagging indicators, enhancing power BI Dashboard for monitoring and evaluating e-FRM.

In 2022, PTFI change the FRM implementation strategy from quantity to quality. PTFI not only maintain its FRM quantity but also made some improvement related with the quality process. In March 2022, the FRM process was simplified by providing CCFV Ad hoc as a supplementary for existing or conventional CCFV form also removing verification process by Command Center Team.

The additional CCFV Ad hoc provide flexibility for the indirect supervisor to do STOP action. Previously only direct supervisor can do STOP actions for his/her workers and with this CCFV Ad

hoc facility every supervisor can do STOP action in other team or other area of responsibilities. The previous step involving the Command Center Team to do verification and it creates reluctances from the workers to do STOP action. The workers felt inconvenient while somebody verify the background of their STOP actions and the workers try to save their time by avoiding verification process.

As a result, the number of STOP the Work has significantly change with average 110/day (Figure 4).

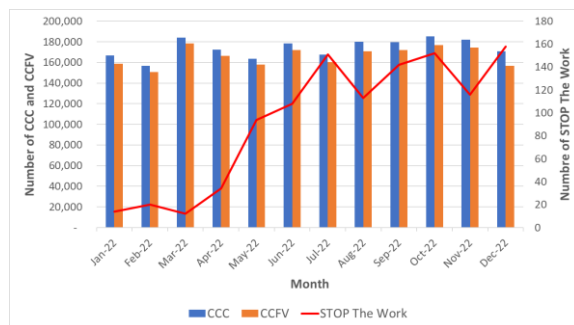


Figure 4. STOP The Work

**Impact**

The following items are positive impacts from the FRM implementation in PTFI:

1. According to MEMR Mining accidents data (MEMR, 2022), in 2013 to 2016 there were 115 fatality (42 fatality from PTFI) means PTFI has 36% contribution of Fatal incident in National level. In 2017 to 2021 there were 80 fatality (9 fatality from PTFI) means PTFI has 11% contribution of fatal

incidents in national level. As a result, there are 25% significant decrease of PTFI contribution to fatal incidents in National level before and after 2017 where PTFI began to implement FRM in 2017.

2. Total average number of STOP The Work in 2021 was only 16 per month and in 2022 is 110 per month. There is 7 times higher number of STOP the Work per month from 2021 to 2022. It has been observed several indications to this significant increase: FRM process simplification also better knowledge and understanding from both supervisors and their crews the importance of this program to eliminate and/or reduce fatality and serious incident. As the knowledge and understanding increase so the workers have more confidence to do STOP actions in the field. STOP the work is required if the critical control is not fulfilled, then discussion in place between worker and supervisor about Stop the work and take immediate corrective action.
3. Average number of CCFV in 2021 was 95.12% and in 2022 is 95.62%. This consistent number is positive since supervisors consistently having field communication with his/her workers. The interaction between supervisor and the workers is critical to discuss how to control critical risks and also to get the inputs on critical control improvement in the field.
4. In 2021 there were only 4 improvements of Critical Control and in 2022 there are 47 improvements so far in Critical Controls. There are significant improvements from 2021 to 2022 related with Critical Control Improvements. This number also show the increase of team involvement to support this program.

#### Future Improvement

With the implementation of FRM in PTFI for 6 years, resulting future challenge and improvement as follow:

1. [System] Massive data production from e-FRM required Big Server and Fast Connection from existing network infrastructure.
2. [People] there are some employees reluctant to digitalization
3. [People] Behavior Intervention program with coaching approach effectiveness
4. [Process] The increasing level of data analysis from descriptive, diagnostic, predictive, to prescriptive analytic.
5. [Process] the correlation analysis of FRM as leading indicators to lagging indicators

#### CONCLUSION

Fatal Risk Management (FRM) is basically one of PTFI safety program which focusing to reduce and eliminate serious injury and fatality. FRM program has been evolving to adopt changes and requirements.

The FRM program proved and contributed to increase awareness and understanding the team to be more focusing on high potential risks which could kill or causing serious injuries to the workers.

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