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Increasing Hauler Productivity with Fleet Management System and the Application of Mining Operational Safety of PT. Antareja Mahada Makmur

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ABSTRACT

The Maternal Mortality Rate (MMR) reflects the quality of health services. This study aims to identify determinant factors that affect the performance of midwives in antenatal care (ANC) services in Puskesmas. The method used is a systematic literature review of original articles from electronic databases such as Google Scholar and Garuda, published between 2019 and 2024. Inclusion criteria include quantitative research with a cross-sectional design and variables related to midwifery performance in ANC. From the 6 articles analyzed, it was found that individual factors such as knowledge, motivation, age, and worker status; psychological factors such as attitudes; and organizational factors such as leadership, incentives, tenure, and relationships between colleagues have a significant relationship with midwifery performance. These results show that capacity development, incentives, and increased motivation can improve midwifery performance in ANC services. In conclusion, efforts to improve the quality of ANC services require collaboration between health institutions and professional organizations to provide technical guidance and continuous evaluation.

Introduction

Coal Hauling in the mining industry is a transportation activity carried out using transportation such as trucks from open and closed mining areas taken to processing facilities, and stock areas for further processing (Devoney, 2021). The use of trucks is regulated in the provisions of ESDM No. 1827 K/30/MEM/2018 concerning Guidelines for the Implementation of Good Mining Technical Principles Appendix 2 to realize the principles of good mining techniques Good Mining Practice (Arpi et al., 2023).

Operational definition Productivity or Productivity is the efficiency of using resources to produce outputs. Productivity includes the entire process that is carried out to find opportunities for improvement. To improve productivity, one of the efforts for

monitoring is through the Fleet Management System (Citra, Hapsa, & Baidawi, 2021). Fleet Management System hereinafter referred to as FMS is one of the Digital Transformation programs applied to coal transportation activities to monitor in real-time the driving behavior of dump truck operators, operator safety, and equipment, and find out every information related to dump truck operations monitored through the website (Yoon, Lee, & Lee, 2024).

PT Antareja Mahada Makmur hereinafter referred to as PT. AMM is a company that is a member of the PT. Putra Perkasa Abadi is a company engaged in the Mining Services Business with the types of activities carried out including activities such as stripping of rock/overburden subfields of excavation, loading and removal of layers (stripping) of rock/overburden with or without being preceded by blasting, Transportation Services (Annie, Iman, & Anoraga, 2023). PT Antareja Mahada Makmur operates in several regions in Indonesia, one of which is at PT. Borneo Indobara with the address of Angsana District, Tanah Bumbu Regency, South Kalimantan. PT. AMM has implemented a Fleet Management System for operational activities of transporting coal using trucks (MUHAMMMAD, 2019). The implementation of the Fleet Management System has a role in systematically monitoring both the productivity of transportation equipment and the monitoring of safety of activities carried out by the Dump Truck Driver of PT. Antareja Mahada Makmur (Puspita & Lesmana, 2022).

The objectives of this study are:

1. Increasing the productivity of hauler units operating at PT AMM from Rom to port BIB
2. Application of Fleet Management System in Mining Safety Management

Method

The research method used is a descriptive method, where this study will explain the implementation of monitoring the achievement of hauler unit productivity and digitization of hauling operational safety by determining the scope of each unit object through the Fleet Management System (FMS). This study also makes a comparison of what can be done to increase the percentage of hauler unit productivity achievement and operational safety monitoring of hauling units with Fishbone's Rootcouse analyst.

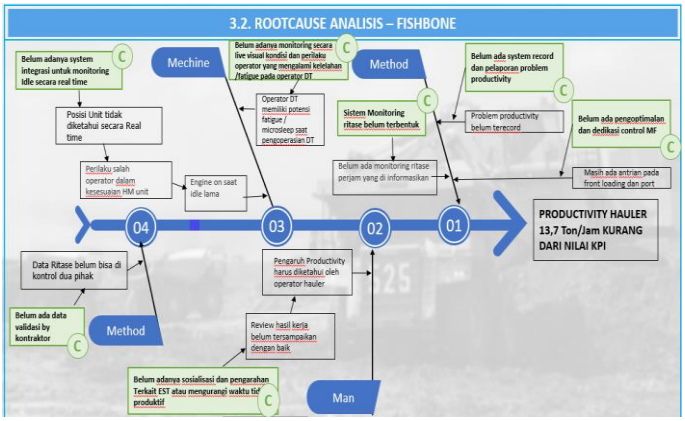
Results and Discussion

Based on the Decree of the Minister of Investment/Head of Investment Coordination Number; 13/1/IUJP/PMDN/2023 concerning the Approval of the Extension of the Mining Services Business License to PT. Antareja Mahada Makmur has a transportation business and sub-business fields using trucks (Putri & Martini, 2022). The unit that operates to transport is the Mercy 4845K Arocs unit with a process of loading or *loading* in ROM and then traveling on the hauling road of PT. The BIB then deposits the material on the stockpile or *crusher* at the port and then travels back to the ROM to continue the reloading in the ROM area (Wicaksana, 2020).

In the operation of transporting coal using trucks at PT. Antareja Mahada Makmur identified existing conditions using the *root cause analysis method with the analysis* approach of Man (human), method (method), machine (machine), and Environment (environment). In the analysis of the human approach, the current condition is that the understanding of the influence of achieving productivity targets has not been fully understood by hauler operators (Tanamal, Adhiatma, Alghifar, Nadeak, & Fathoni, 2023). There is no Manpower control and reporting for Ritase. In the method approach, the problems include that there is still a queue on the front loading, the operator starts the engine when the unit is idle for a long time, there is no hourly rate monitoring that has been informed, productivity problems have not been recorded, rise data cannot be controlled by two parties. With a machine approach, the existing problem is that the position of the unit is not known in real-time.

With these conditions, specific problems are re-identified to get the root of the problem by analyzing the fishbone diagram. The problem of not achieving the productivity of the hauler unit operating at the PT Antareja Mahada Makmur BIB site, which is 13.7 Tons/Hour less than the KPI Value. With the branches of fish spines, namely Machine, Methode, and Man. In the first branch, namely the machine, the problem is that the engine starts during a long idle condition caused by inappropriate behavior by the operator with the position of the unit that is not known in real-time. There is no integration system for idle monitoring in real-time. In the branch of method problems, there is a condition that there is no hourly monitoring that has been informed, with the root of the problem of the rise monitoring system not being formed. The existence of problem productivity has not been recorded because there is no problem productivity recording and reporting system. There are still queues on the front loading and ports with the problem that there is no optimization and dedication to fleet management control.

From the methods branch, there is a condition that the rise data cannot be controlled by two parties because there is no validation data by the contractor. From the shorthand branch, the existing condition, namely the influence of productivity, must be known by the hauler operator and the review of work results has not been conveyed properly with the root of the problem, namely the lack of socialization and briefing related to *Empty Stop Time* (turning off the engine when not operating) or reducing unproductive time.



Kategori	Permasalahan	Usaha	Cost	Total
Machine	Belum adanya system integrasi untuk monitoring Idle secara real time	5	4	20
	Belum adanya monitoring secara live visual kondisi dan perilaku operator yang mengalami kelelahan/ faitigue pada operator DT	5	4	20
Method	Belum ada system record dan pelaporan problem productivity	3	5	15
	Sistem Monitoring ritase belum terbentuk	5	5	25
	Belum ada pengoptimalan dan dedikasi control MF	4	5	20
	Belum ada data validasi by kontraktor	5	3	15
Man	Belum adanya sosialisasi dan pengarahan Terkait EST atau mengurangi waktu tidak produktif	1	5	5

Figure 1
Root Cause Analyst -Fishbone and Root Cause Priority

To determine the priority of solving the root of the problem, an assessment analysis matrix is made with a scale of 1 to 5 at the level of the amount of effort that must be spent multiplied by the amount of *cost* that is possible to be spent. Based on the matrix that has been made, the root priority of the problem is:

1. The rise monitoring system has not yet been formed
2. No MF control optimization and dedication yet
3. There is no integration system for idle monitoring in real-time
4. There has been no live visual monitoring of the condition and behavior of operators who experience fatigue in DT operators
5. There is no system record and reporting of productivity problems
6. There is no validation data by the contractor yet
7. There has been no socialization and briefing related to EST or reducing unproductive time.

Fleet management systems also have a role in the implementation of operational safety. Where previously there was no integrated system for safety monitoring of fatigue events. In the context of work, the term fatigue in the workplace refers to a state or condition of reduced mental and physical capacity of workers as a result of several continuous stimulation factors, either stimulation from occupational or non-occupational factors, and arises with several symptoms of fatigue (Melly, et al., 2021). Monitoring operator safety can not only be done through a radio attached to the unit because it cannot directly check the situation experienced by the operator. Symptoms of fatigue can be detected by operator behavior that is often carried out such as yawning and closing eyes/microsleep. If there are no tools that can monitor the safety and behavior of operators, it will be difficult to determine corrective actions and direct intervention to operators.

Planning

Based on the *Root cause Analyst fishbone* and the root cause priorities determined, a planning analysis is carried out for the corrective action to be carried out with a root of the problem approach to the corrective action plan (How), the reason for the improvement plan who is doing it (Who), when the repair is carried out (When) and where the corrective action is carried out (Where) and how much costs need to be incurred for the next corrective action in Show in the following table:

Table 1
Corrective action plan

CATEGORY	WHAT The Root of the Problem	HOW Corrective action plan	WHY Reasons for the	More Process KPIs	Who PIC	WHEN Due Date	WHERE Location	HOW MUCH

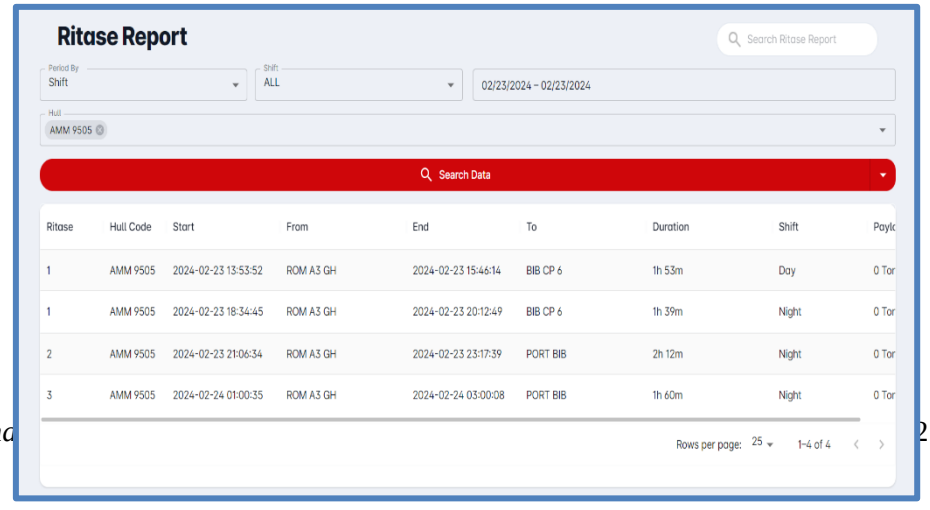
			Repair Plan					Cost
METHOD	The rise monitoring system has not yet been formed	Build a monitoring system and report daily	Productivity reports and operator achievements can be conveyed	Productivity	Iyan; GL Rom	Week 2nd January	Office, Rom A1	
METHOD	No MF control optimization and dedication yet	Using FMS to control queues and change working hours earlier	Reduce unit idle time on the front	Productivity	Iyan; GL Rom	Week 2nd January	Office, Rom A1	
MACHINE	There is no integration system for idle monitoring in real time	Making FMS a trip hauler control system	Improved control of trip haulers	Productivity	Iyan; GL Hauling	Week 2nd January	Office, Rom A1	18 million
MACHINE	There has been no live visual monitoring of the condition and behavior of operators who experience fatigue/fatigue in DT operators.	FMS as a fatigue monitoring tool for DT operators during operation	Becoming control over the behavior of the operator experiencing fatigue	Salvation	Rizal, Rony Gunawan	Week 2nd January	Office, Rom A1	
METHOD	There is no system record and reporting of productivi	Create system records and report productiv	Knowing the Repair Concert	Productivity	Iyan; GL Hauling	Week 2nd January	Office, Rom A1	

	ty problems	ity problems					
METHOD	There is no validation data from the contractor yet	Using FMS as a mutually recognized validator	Overcoming problems that are not recorded by BIB	Productivity	Iyan; GL Hauling	Week 2nd January	Office, Rom A1
MAN	There has been no socialization and briefing related to EST or reducing unproductive time.	Socialize operators about the impact of unproductive time	Increase awareness of productivity	Productivity	Iyan; GL Hauling	Week 2nd January	Office, Rom A1

Implementation of Improvement Ideas

From the problem of the first method, the rise monitoring system has not been helped, the supervisor has not been able to control the operational rise of DT Hauling, training on data collection and FMS data processing is carried out to monitor ritase. There are reports taken from the system Management Fleet data that can be displayed on every shift and every day sent through the group. This is a form of optimizing control on fleet management in FMS.

Supervisors in the field will get data from FMS and monitor and submit to operators related to achievements every day. The attached evidence is as follows:



From the problem of the second method, there has been no optimization and dedication of MF control. Group Leader hauling gets a supervisory job according to the setting by the BIB Owner. The loading position of DT AMM Coal is determined by the BIB owner for the ROM position, which is not always the same as the supervisory position of the AMM Hauling Group Leader. Then at the beginning of the shift, the traffic is always congested with other partner DT units belonging to BIB, both of which will load in ROM and dump in the port area.

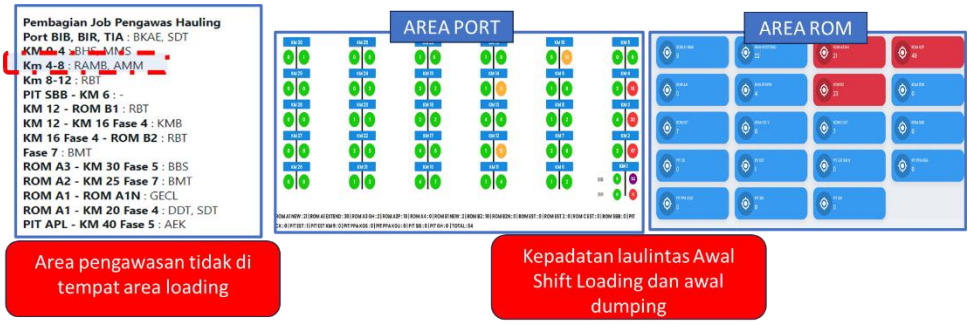


Figure 2 BIB supervisory settings and traffic conditions monitored by FMS

To unravel so that the DT unit is not stuck in the queue in the ROM loading area and dumping area at the Port, socialization, and change of operator working hours from 7 o'clock to 6 o'clock was carried out. Then at the end of the shift before the change of the DT unit operator is given a coal load, when starting the shift the unit directly leads to the dumping area to unravel the queue at the beginning of the shift in the loading area. It was found that the DT unit change was not too long idle in the queue.

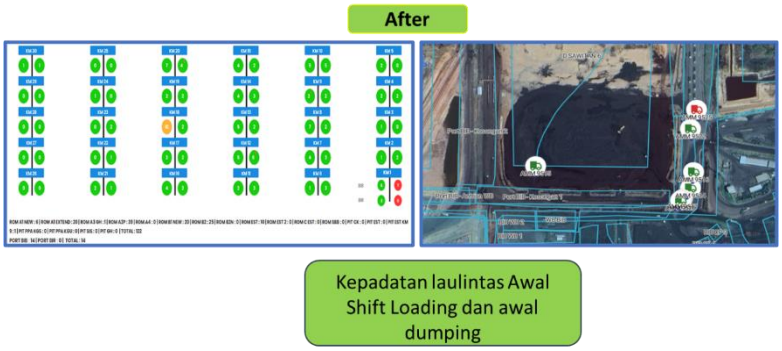


Figure 3 Socialization process, load condition, and traffic condition

From the machine problem, the idle time of the DT unit has not been identified and the monitoring of the position of the DT unit is still manual by making contact via radio. With the condition of the division of tasks of the group leader hauling AMM and the loading position of the DT unit determined by the BIB, this makes it difficult to supervise the position of the DT unit. The next step is to install FMS by Minergo, share with BIB owners regarding its use, and train group leaders on its use. From the installation of the FMS, there is a live trip control that can display the position of the DT unit and the density of the hauling road.

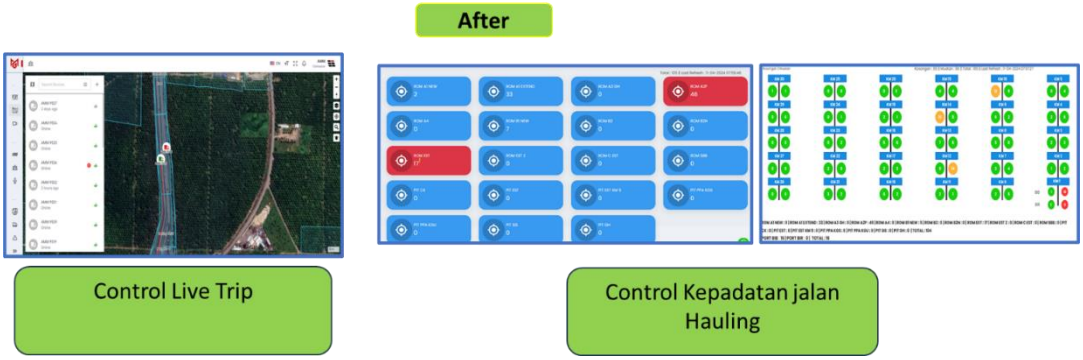


Figure 4 FMS Installation, Socialization, and Live Display Process

Furthermore, the problem with loading and dumping activities that take up a distance of approximately 30 KM and the supervisor does not monitor live visual conditions and operator behavior in the cabin of the DT unit which has the potential for fatigue during the operation of the unit. By installing FMS cameras with DMS cameras and Dome cameras in the cabin of the DT unit, the activities of the operator in the cabin of the unit can be monitored by the server. In FMS monitoring, it will notify FMS operators of indications of closing their eyes for a moment and yawning as one of the indications of fatigue that occurs in DT operators. When the FMS provides the notification, the FMS operator can conduct a 2-way communication with the DT operator to ask about the condition. FMS operators also provide information to group leaders hauling to ensure the condition of operators by conducting fatigue checks and health checks. If fatigue is found, the operator is required to rest first until the condition grows fit again.

Figure 5
Steps to take if there is a finding of fatigue

In the problem of the method, where there is no system record and constraints on productivity, so the supervisor does not monitor and take corrective actions on the problem. From these problems, improvements were made, monitoring the results of cargo reporting and HM, processing data, and making master data as review material. The results of the problem can be monitored through the live camera on the FMS and the results of data processing are reported to the supervisory group as a follow-up in the field.

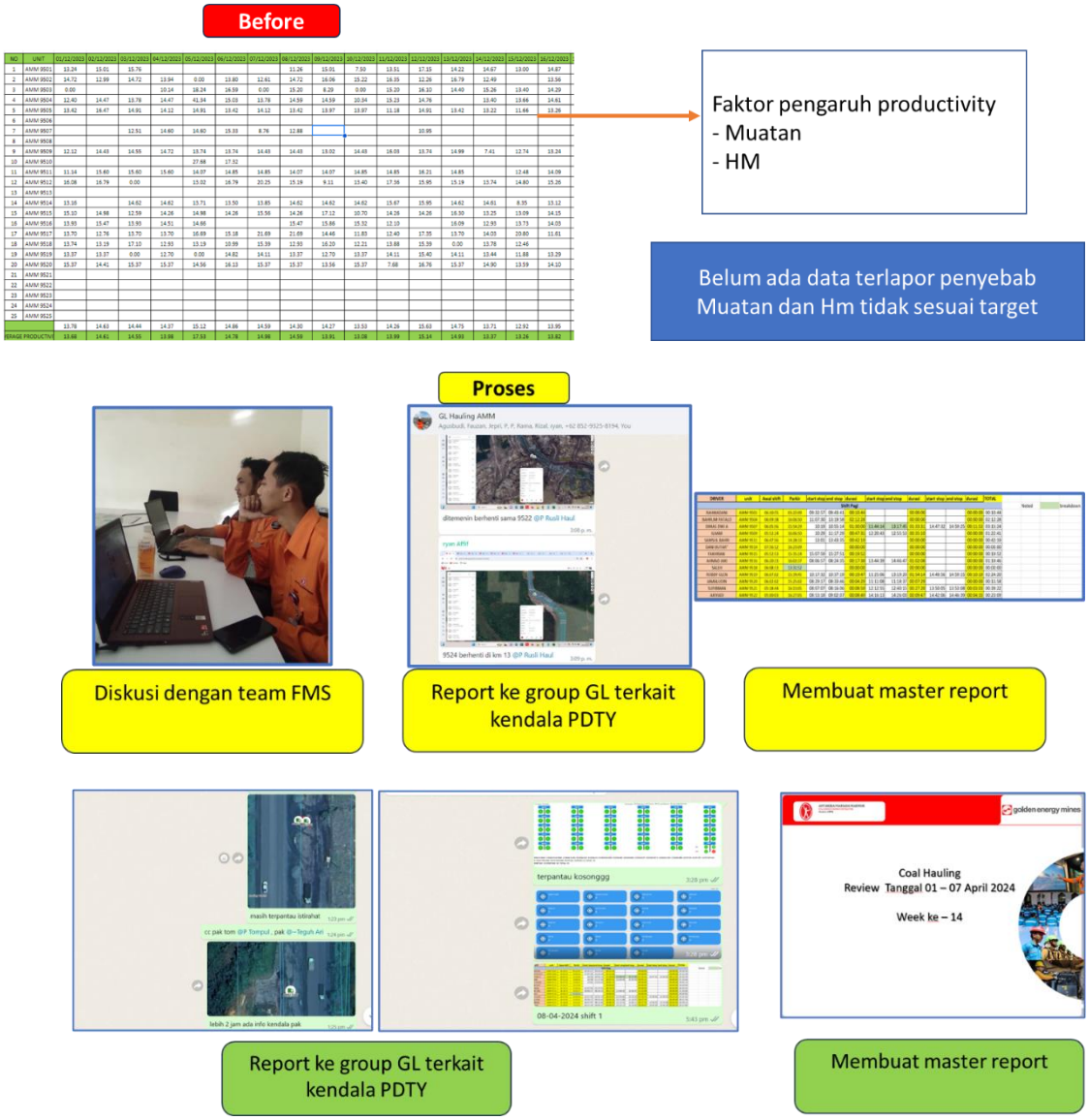


Figure 6 Implementation of PDTY hauling problem data monitoring

Furthermore, Man's problem is that there has been no socialization and direction related to EST or reducing unproductive activities by socializing the impact of unproductive time, conducting periodic reminders both through P5M, 2-way communication through radio, and WhatsApp groups. If there is no fruition within the

specified time, summons and coaching counseling are carried out so that behavior changes can be more productive.

Figure 7 Steps to improve EST socialization or unproductive time

Evaluate Results

Based on the results of the evaluation, there has been an increase in the productivity of hauler units in the Rom to Port Area for the period of January – April 2024. However,

for February it decreased due to stock accumulation and congestion on the road towards the port. On average, productivity projects are achieved.

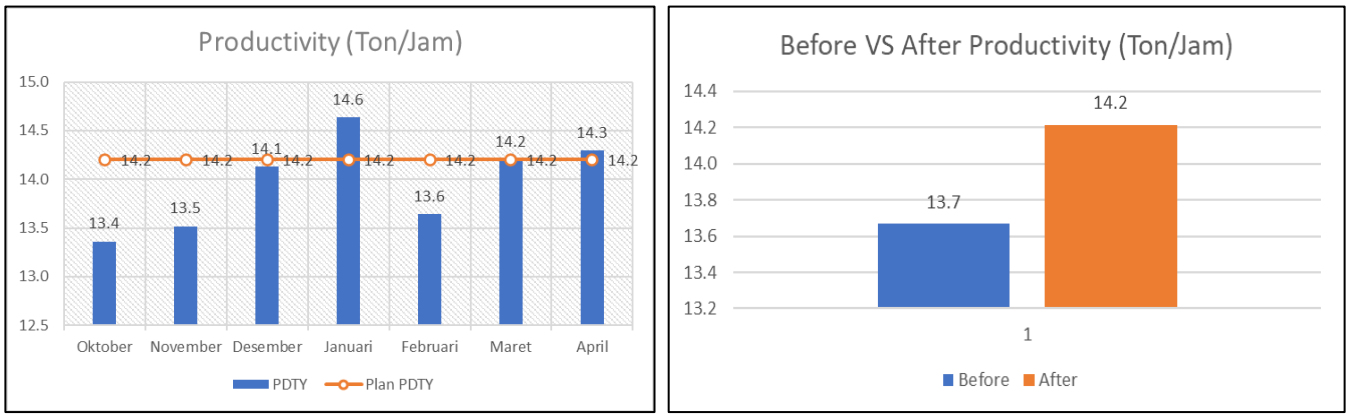


Figure 8 Productivity Hauler Achievement Chart

Another impact of the success of productivity achievement is the increase in production per ton, which was previously 197,259 tons to 285,347 tons. The increase in production was 80,077 tons.

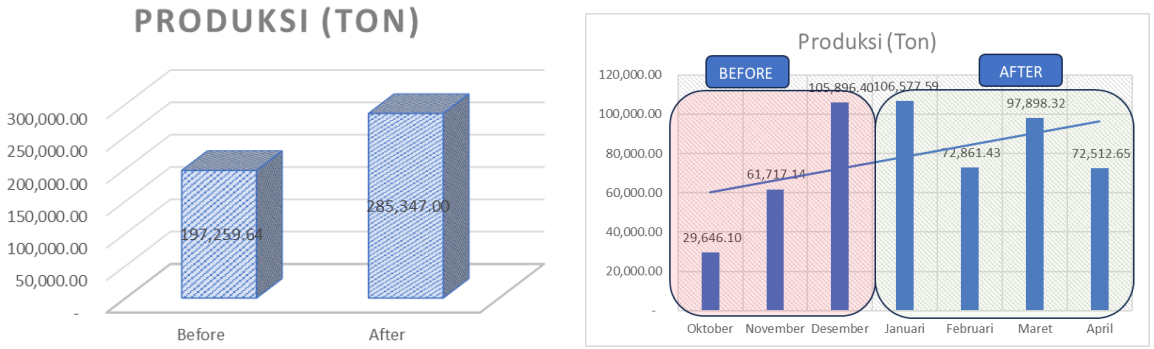


Figure 9 Percentage Increase in Production

Another impact obtained was the Empty Stop Time (EST) of the hauler unit which decreased by 38%.

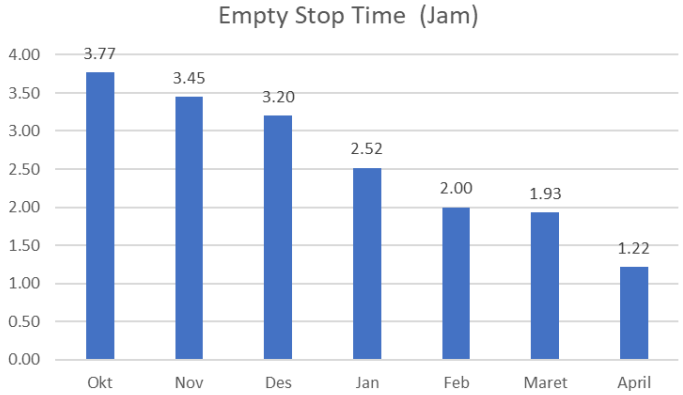


Figure 11 Empty Stop Time Decline Chart

The impact of the safety aspect in the use of FMS is zero incidents due to the behavior of operators who experience fatigue or fatigue in operating the DT ROM unit to the Port. Another benefit is knowing the behavior of the operator when in the cabin, whether it is the use of seatbelts, the operation of mobile phones, or other activities that cause congestion disturbances to disappear. This also avoids incidents of collisions with vessels or consecutive incidents in the BIB hauling road area.

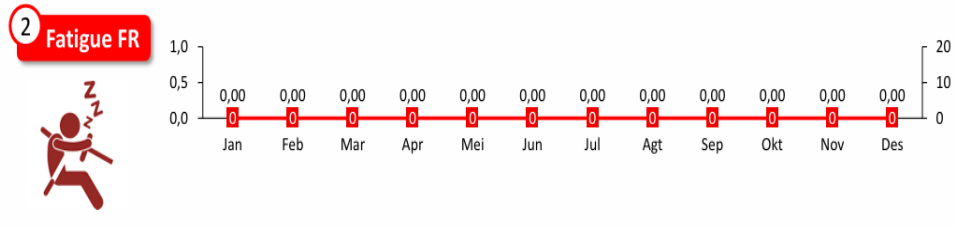


Figure 12 Statistical graph of incidents due to fatigue

Therefore, some of the following evaluation results get the benefits obtained from this improvement from various sides, namely:

a) Quality

Saving wasted coal in the *drainage area* by 0.2% of the runoff water volume Increasing the actual Productivity value by an average of 13.7 to an average of 14.2 Tons/hour in December – February 2024 by reducing the value of Unproductive Time with FMS Optimization

b) Cost

By increasing Productivity, there is an increase in benefit costs from IDR 709,485,258.75 to IDR 1,049,845,950 or an increase of IDR 340,360,691.25 for 3 months

c) Delivery

Delivered at P5M and conducted coaching counseling for operators who have not yet achieved and understand the importance of productivity

d) Safety

Using FMS can improve control over fatigue and misoperation

e) Moral

Raising awareness of the importance of Productivity

Conclusion

The implementation of increasing productivity hauler by using the Fleet Management System (FMS) digitization system and the implementation of mining

operational safety through the planning stage to the implementation evaluation can see changes in various aspects of quality, cost, safety, delivery, and morale. The results of the increase show positive results on increasing productivity and are more optimal in terms of safety or safety to increase supervision related to fatigue and operational errors. The implementation of mineral and mineral conservation starts from the planning stage to implementation.

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