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Partial Productivity Analysis of Production Divisions By Omax Method

Antonius Setyadi
Economics and Business Faculty, Universitas Mercu Buana, Jakarta, Indonesia, email: setyadi@mercubuana.ac.id

Corresponding Author: Antonius Setyadi

Abstract: This study aimed to analyze the production department's partial productivity measurement using the Objective Matrix (OMAX) method at PT. GMK. The OMAX method's key performance indicators (KPIs) affecting the productivity index must be defined and weighted for each criterion using the Analytical Hierarchy Process (AHP). The study was conducted in the production division of PT. GMK, which produces compound chocolate. The results showed that the productivity of was affected by the partial productivity of raw materials and labor and the electric power's effectiveness. Other factors were the minimization of overtime working hours, labor costs, downtime, as well as defective and semi-finished products. Moreover, this study determined the standard performance in the second semester of 2021. It also conducted a causal analysis using a fishbone diagram to find the cause of employees' low productivity. The analysis showed that the average productivity index increased between January and August 2022.

Keywords: Objective Matrix (OMAX), Analytical Hierarchy Process (AHP), Partial Productivity Index.

INTRODUCTION

The high public health awareness has increased the healthy food industries, including those producing chocolate. As an additional food, chocolate contains anti-oxidant and is very good for the body's health. Chocolate consumption has increased in Indonesia, as seen from its high production.

PT. GMK is a chocolate processing company that increases the added value of processed cocoa beans. It produces chocolate for industrial needs, hotel restaurants and cafes, as well as baking materials for retail and export. Therefore PT. GMK is interested in increasing productivity to compete with international and local markets.

This interest is inversely proportional to the facts on the ground, such as the problems that appeared in the employees' partial productivity in 2021. PT. GMK has not met its

targets, as the average employee productivity is 15.3 kg/manhour, with an achievement of 20 kg/manhour. Data on these productivity declines are presented in Figure 1.

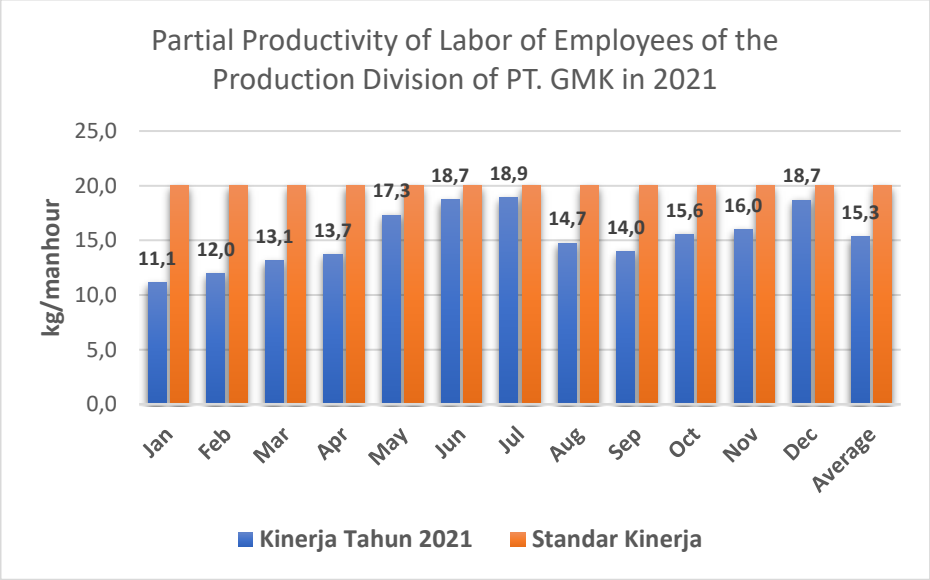


Figure 1. Employee Productivity

This study aimed to determine why employee productivity has not been achieved and to identify the factors describing productivity more accurately, such as KWH electricity used or downtime. Therefore, it analyzed downtime, electricity consumption, and overtime ratios. Measuring productivity using other factors is necessary for decision-making with multicriteria variables.

Wahyuni and Alya (2022) measured productivity on production line performance using the Objective Matrix (OMAX) method. In line with this, Athaillah et al. (2021) measured the efficiency of supply chain performance using the Analytical Hierarchy Process (AHP) and Objective Matrix (OMAX) methods. Oktoriadi (2013) also analyzed production using multicriteria variables with the Objective Matrix (OMAX) method. The three studies are in line with Balkan (2009), which measured productivity using the OMAX method and the Turkish government's emergency service application. Some previous studies showed that the OMAX method provides an overview of the multi-criteria productivity index and the monthly productivity development at PT. GMK.

Based on the description, this study aimed to determine the key performance indicators (KPIs) used to measure the partial productivity index of PT. GMK and weights on each criterion using the OMAX method. It also intended to provide recommendations to increase partial productivity in the production division of PT. GMK.

Productivity refers to the achievement of production, which relates to the results realized. In some cases, production may increase while productivity remains constant. According to Yamin (2007), productivity is grouped into (a) all factors used to produce an output, including raw materials, labor, energy, and production equipment. (b) multifactor, including capital and labor. (c) partial or certain factors, such as raw materials, labor, and energy.

The Analytical Hierarchy Process (AHP) method could be used to understand a system and make decisions (Fewidarto, 1996). According to Saaty (1993), the method helps structure a system and the environment in interacting parts. These parts are synthesized by measuring and ranking their influence on the system.

OMAX is a system of partial measurement developed to monitor productivity according to the objective. It was developed by James L. Riggs, a professor of productivity from the department of industrial engineering at Oregon state university. The OMAX method was introduced in the 80s in the United States (Nasution, 2006).

METHOD

This is an exploratory and descriptive study that used a problem-solution approach to determine the cause of the problem. It conducted a problem analysis using the AHP to compare the factors contributing to increased productivity of PT. GMK into a priority weight for improvement goals. Furthermore, the OMAX analysis method was used to measure the productivity index partially.

Data Sources

The study used primary data collected by interviewing, observing, and distributing questionnaires in pairs to section heads and production managers. It also used secondary data from a Key Performance Indicator Report from January-December 2021.

Data Collection Techniques

The data collection techniques are described as follows:

1. Primary data were collected through observing and recording by visiting the production division. Face-to-face interviews were conducted through Q&A sessions with the Production Operator, Group Leader, Foreman, Supervisor and Manager regarding the study problem. Furthermore, the study brainstormed with competent resource persons to obtain improvement ideas on increasing the productivity of PT. GMK.
2. Secondary data were obtained from scientific books and other sources related to the study problem. Also, the data were collected from reports on the actual monthly productions, defective products, the use of raw materials, and the number of workers. The aim was to determine the potential benefits and risks in the productivity analysis.

RESULTS AND DISCUSSION

The variable dimensions for productivity were identified through monthly KPI meetings that discuss the achievement and set the targets for the next period. The report showed an evaluation of improving the target in 2022 with an action plan to add other criteria. These criteria included minimizing downtime, overtime work hours, unfinished products, and partial productivity standards for electrical energy. Furthermore, the determination of the standard was monitored with the OMAX. The dimensions of the variables used, as well as their targets and achievements, are shown in Table 1.

Table 1. Variable Dimensions of Production Division Productivity

Variable	Variable Dimensions	The year 2021 Standard	*Performance* Year 20 21	Standard Year 2022
Productivity	Weight of each variable dimension	Questionnaire Survey AHP		
Effectiveness	Material productivity (R1)	98.50%	96.57%	98.50%
	Material productivity (R1)	20	15.31	20
	Partial productivity of electrical energy (R3)	-	-	Evaluated with OMAX
Efficiency	Minimization of overtime work (R4)	-	-	Evaluated with OMAX
	Labor Cost Efficiency	750	904	875

	(R5)			
Quality	Minimization of Downtime (R6)	-	-	Evaluated with OMAX
	Minimization of defective products (R7)	0.50%	0.66%	0.45%
	Minimization of semi-finished products (R8)	-	-	Evaluated with OMAX

The weighting of the AHP method referred to the data processing results from the questionnaire survey with two respondents competent in the production division. The matrix is declared consistent, or the calculation result is correct when the consistency ratio (CR) is less than 0.1 (CR <0.1) or equal to 0.1 (CR=0.1). However, a CR exceeding 0.1 (CR > 0.1) means the paired comparison value on the given performance matrix is inconsistent. Table 2 shows the results of processing AHP weighting data.

Table 2. Paired Matrix

Goal	R1	R2	R3	R4	R5	R6	R7	R8	Eigen Vector	Priority Weights
R1	1	2.5	9	5	5	6.5	3.5	7.5	4.19537	37.85%
R2	0.4	1	7	3.5	3.5	5.5	2.5	5.5	2.67144	24.10%
R3	0.111	0.143	1	0.267	0.2	0.238	0.238	0.533	0.2667	2.41%
R4	0.200	0.286	3.75	1	1.167	0.5	0.267	2.5	0.733	6.61%
R5	0.200	0.286	5	0.857	1	1.75	0.625	4	1.00866	9.10%
R6	0.154	0.182	0.143	2	0.571	1	5.200	4	0.74519	6.72%
R7	0.286	0.400	4.2	3.75	1.6	0.192	1	4	1.10454	9.96%
R8	0.133	0.182	1.875	0.400	0.25	0.25	0.250	1	0.36031	3.25%
Total	2.484	4.978	31.968	16.774	13.288	15.930	13.58	29.033	11.0852	100.00%

The results indicate that partial material productivity (R1) obtained the highest weight of 37.85% and an eigenvector value of 4.19537. This means that the R1 dimension has the main importance value that most affects productivity. Therefore, the weight figure of each criterion was used in the OMAX. The results also show that the consistency ratio is < 0.1, meaning the matrix is consistent.

The OMAX method was used to partially analyze and determine the weighting for the criteria affecting productivity. Measuring the Productivity Index with OMAX used the evaluation data from the criteria in 2021. Table 3 shows the results of determining the ratio of the average, minimum, and maximum criteria.

Table 3. Recapitulation of Criteria and Determination of Minimum, Average and Maximum Criteria

Month	R1	R2	R3	R4	R5	R6 (%)	R7 (%)	R8 (%)
Jan-21	0.9831	11.12	0.9546	0.1338	1,026.20	11.81%	0.90%	26.96%
Feb-21	0.9762	11.96	1.1086	0.0862	1,181.44	4.75%	0.31%	8.97%
Mar-21	0.9546	13.14	1.1261	0.1166	855.96	14.01%	2.41%	4.78%
Apr-21	0.9663	13.72	1.0817	0.1473	1,017.18	6.88%	0.50%	16.65%
May-21	0.9542	17.31	1.3346	0.2192	611.46	4.32%	1.24%	1.66%
Jun-21	0.9582	18.70	1.3369	0.2134	684.93	5.72%	0.62%	10.31%
Jul-21	1.0008	18.93	1.3940	0.1803	768.26	11.94%	0.08%	3.53%
Aug-21	0.9466	14.73	1.1799	0.1459	1,034.91	1.70%	0.46%	5.61%
Sep-21	0.9518	13.95	1.2367	0.1522	958.71	3.74%	0.00%	2.92%
Oct-21	0.9554	15.55	0.9407	0.0763	897.83	4.67%	0.97%	6.85%
Nov-21	0.9658	16.00	1.1958	0.1803	802.48	4.59%	0.26%	18.01%
Dec-21	0.9691	18.66	1.1854	0.2085	1,006.96	5.08%	0.47%	0.78%
Min ratio.	0.9466	11.122	0.9407	0.2192	1181.44	14.01%	2.41%	26.96%

Month	R1	R2	R3	R4	R5	R6 (%)	R7 (%)	R8 (%)
Average Ratio	0.9652	15.315	1.1729	0.1550	903.86	6.60%	0.69%	8.92%
Max ratio.	1.0008	18.934	1.3940	0.0763	611.46	1.70%	0.00%	0.78%

The difficulty of achieving performance for each criterion was determined using a scaling process with the OMAX model. The level used as a reference point consisted of the following:

Level 0 : Determined based on the lowest ratio value.
Level 3 : Determined based on the initial stage values.
Level 10 : Determined based on the target value.

An example of calculating the increase of each scale on criterion 1 is:
Level 0 : 0.9466
Level 3 : 0.9652
Level 10 : 1.0008
Level 1 to level 2 on criterion 1:
Level 1 = Level 0 + (level 3 – level 0)/3
Level 1 = 0.9466 + (0.9652-0.9466)/3 = 0.9528
Level 2 = level 1 + (level 3 – level 0)/3
= 0.9528 + + (0.9652-0.9466)/3 = 0.9590
Level 4 to level 9 on criterion 1:
Level 4 = level 5 + (level 10 – level 3)/7
= 0.9652 + (1.0008 – 0.9652)/7 = 0.9703
Level 5 = level 4 + (level 10 – level 3)/7
= 0.9703 + (1.0008 – 0.9652)/7 = 0.9754
Levels 6,7,8,9, and 10 use the same calculations.

The weight of the criteria used was obtained from the ratio using the AHP method.

Each criterion's OMAX standard performance value was entered into the matrix in the definition block. The aim was to calculate the value and weight of each level and criterion, respectively. Additionally, the productivity index was obtained by multiplying the score from the current performance by the weight of the criteria and summing the results.

The standard performance was calculated in the second semester of 2021 to determine the target to be achieved in the following year. Management aims to increase the productivity index in 2021 by 10% from the 2021 average presented in Table 4.

Table 4. Matrix OMAX Standard Value Production Division

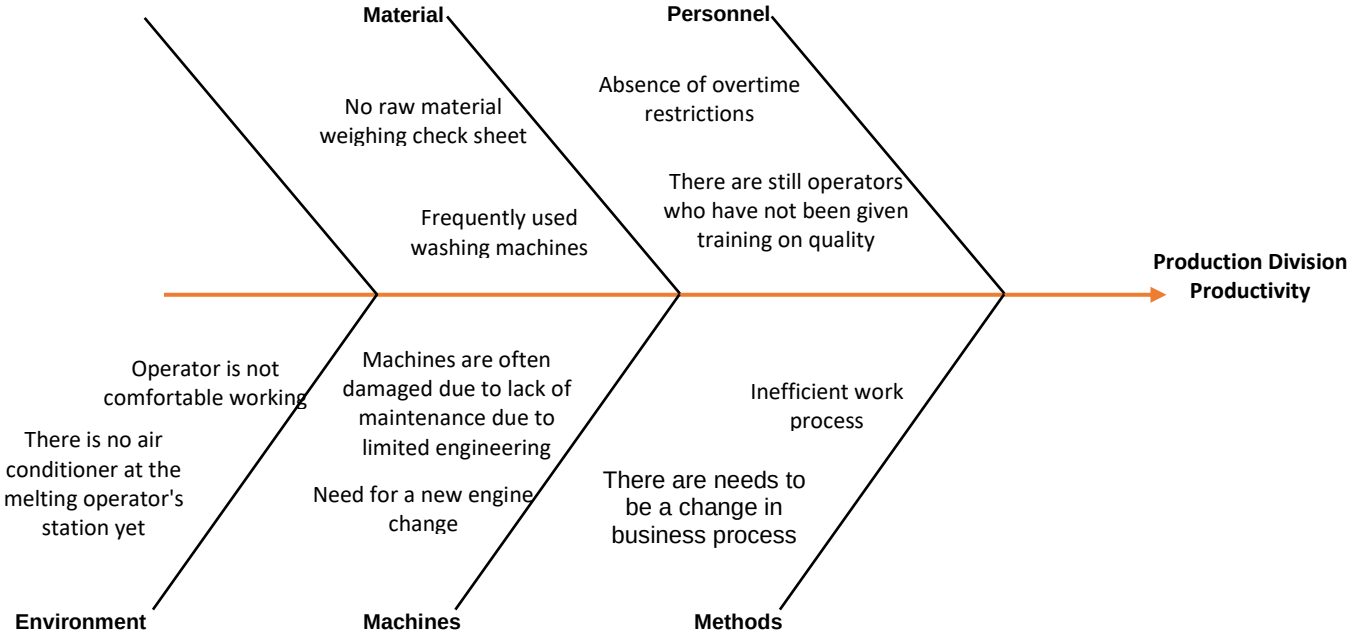
	R1	R2	R3	R4	R5	R6 (%)	R7 (%)	R8 (%)	Performance Criteria
Semester II 2021	0.9649	16.3048	1.1888	0.1573	911.5252	0.0529	0.0037	0.0628	
Max ratio.	1.0008	18.93	1.3940	7.63%	611.46	0.02	0.00%	0.78%	10
	0.9957	18.42	1.3624	8.76%	653.23	0.02	0.10%	1.94%	9
	0.9906	17.90	1.3308	9.88%	695.00	0.03	0.20%	3.10%	8
	0.9855	17.38	1.2992	11.00%	736.77	0.04	0.29%	4.27%	7
	0.9804	16.87	1.2677	12.13%	778.54	0.05	0.39%	5.43%	6
	0.9754	16.35	1.2361	13.25%	820.32	0.05	0.49%	6.59%	5
	0.9703	15.83	1.2045	14.38%	862.09	0.06	0.59%	7.75%	4
Average Ratio	0.9652	15.31	1.1729	15.50%	903.86	0.07	0.69%	8.92%	3
	0.9590	13.92	1.0955	17.64%	996.39	0.09	1.26%	14.93%	2

	0.9528	12.52	1.0181	19.78%	1,088.91	0.12	1.83%	20.95%	1
Min Ratio	0.9466	11.12	0.9407	21.92%	1,181.44	0.14	2.41%	26.96%	0
	2	4	3	2	2	4	6	5	Score
From AHP	37.85%	24.10%	2.41%	6.61%	9.10%	6.72%	9.96%	3.25%	Weight
	0.76	0.96	0.07	0.13	0.18	0.27	0.60	0.16	Value
Semester II Year 2021	3.14								Index
The year 2021	3.00								Index
	1.05								Increase

The partial productivity index in the second semester of 2021 was 3.14, indicating a 5% increase. This value should be increased in 2013 because management assesses an improvement opportunity. Also, the gap between target and performance is below the standard, as shown in the 2021 KPI report.

Fishbone Analysis

The next step was to find the cause of the productivity problems at PT. GMK using the fishbone analysis shown in Figure 2.



Fiture 2. Diagram *Fishbone*

The fishbone analysis and the criteria weight from the data processing results showed that productivity increased by making the improvements proposed in Table 5.

Table 5. Proposed Improvements

Cause	Solution
Human Factors	
a. There are no overtime restrictions due to a lack of KPIs to limit overtime work time. b. Some operators have not been trained in quality.	a. High overtime should be limited by associating KPIs about minimizing overtime working hours by the production head. b. This needs to be fixed by procuring quality problem training by the Head of R&D and Head of Production.
Raw Material Factors	
a. There is no raw material weighing check sheet,	c. The weighing of products or materials should

	making the weighing process less controlled. b. Frequent washing of the machine due to quality concerns	be controlled by the manufacture of weighing check sheets by the production supervisor. d. There is no production research without washing the machine. It is necessary to request research from the head of the production department
	Method Factors	
a.	The work process is inefficient due to long process times. This is caused by unbalanced work sequences carried out alternately. Another cause is waiting time due to unimproved business processes.	a. The Production Division should repair the process conducted alternately to ensure that the quality checking and adjustment processes are carried out simultaneously with the transfer process from the ball mill to the storing.
	Machine factors	
a. b.	Machines have often been damaged due to a lack of maintenance caused by limited engineering personnel. This is because job vacancies in the engineering department have not been filled. The machine should be replaced to make the process faster. This requires purchasing a new machine.	a. This needs to be fixed by filling vacancies by making employee requests by the Head of State. b. Immediately propose to replace the unfit machine.
	Environmental Factors	
a.	The lack of effectiveness of the melting fat part work post with temperatures higher than 35 degrees Celsius leads to uncomfortable working conditions.	a. There is no air conditioner in the melting room yet. It is necessary to purchase an air conditioner.

Improvement Results

The results showed an improvement in the production process from 63 to 55 manhours and 308 to 304 total manhours. This was due to business improvement by advancing the checking and adjustment processes.

All the ratios in 2022 increased, including the partial productivity ratio of raw materials, labor, and minimization of overtime work. Table 6 shows the 2022 OMAX matrix data analysis results.

Table 6. OMAX Matrix Production Division in 2022

	R1	R2	R3	R4	R5	R6 (%)	R7 (%)	R8 (%)	Criteria Performance
Jan-August 2022	0.9918	20.76	1.0930	5.73%	1,007	0.0710	0.39%	0.2075	
Ratio max.	1.0008	18.93	1.3940	7.63%	611.46	1.70%	0.00%	0.78%	10
	0.9957	18.42	1.3624	8.76%	653.23	2.40%	0.10%	1.94%	9
	0.9906	17.90	1.3308	9.88%	695.00	3.10%	0.20%	3.10%	8
	0.9855	17.38	1.2992	11.00%	736.77	3.80%	0.29%	4.27%	7
	0.9804	16.87	1.2677	12.13%	778.54	4.50%	0.39%	5.43%	6
	0.9754	16.35	1.2361	13.25%	820.32	5.20%	0.49%	6.59%	5
	0.9703	15.83	1.2045	14.38%	862.09	5.90%	0.59%	7.75%	4
Average ratio.	0.9652	15.31	1.1729	15.50%	903.86	6.60%	0.69%	8.92%	3
	0.9590	13.92	1.0955	17.64%	996.39	9.07%	1.26%	14.93%	2
	0.9528	12.52	1.0181	19.78%	1,088.91	11.54%	1.83%	20.95%	1
Ratio min.	0.9466	11.12	0.9407	21.92%	1,181.44	14.01%	2.41%	26.96%	0
	8	10	1	10	1	2	5	1	Score
From AHP	37.85%	24.10%	2.41%	6.61%	9.10%	6.72%	9.96%	3.25%	Weight
	2.99	3.45	0	1.04	0.18	0.17	0.46	0.04	Value
Index 2022				6.88					Total

Index value for semester II Year 2021	3.14	Total
	2.19	Increase

The OMAX method obtained a weighted average score of 6.88 from January to August 2022. It means a 219% increase in scores from the second semester of 2021. This increase is significant due to improvements in several factors affecting productivity.

Another factor affecting the productivity of PT. GMK is a business process improvement. Companies that survive increasingly fierce competition understand and meet the needs of a constantly changing market. For this reason, businesses must match customer needs and eliminate inefficient processes (Adlan, Denny Michels. 2005). The inefficient process is accelerated with business improvement.

The partial productivity of raw materials is a determining factor that contributes by 37.85% in the production division. The management policy of increasing partial productivity at the beginning of 2022 was quite successful, as shown by the increase from an average score of 3 to 8. Furthermore, the results show an improvement in material productivity from 96.52% in 2021 to 98.98% in 2022. This figure exceeds the standard set by management, which is 98.5%, as shown in Figure 3.

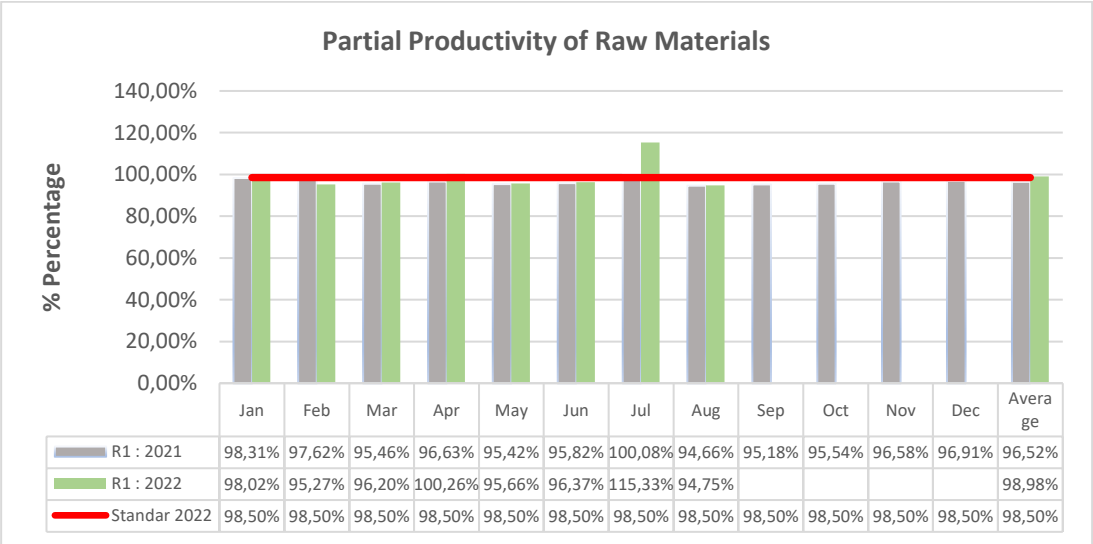
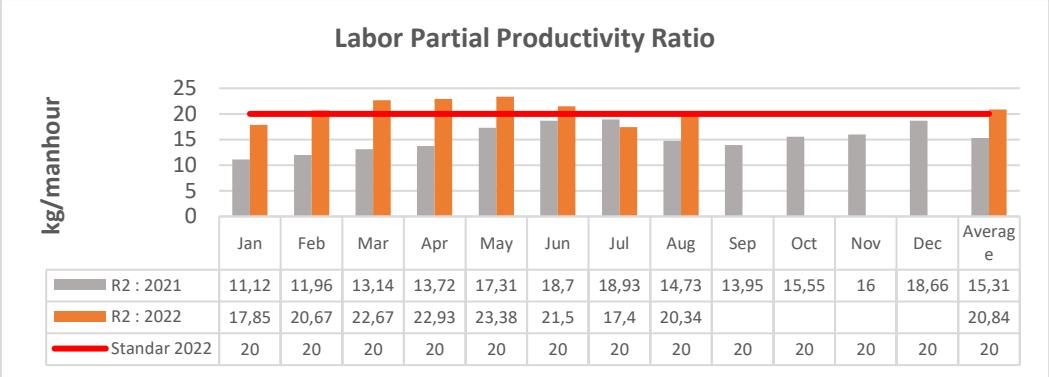


Figure 3. Partial Productivity Development of Raw Materials in 2022

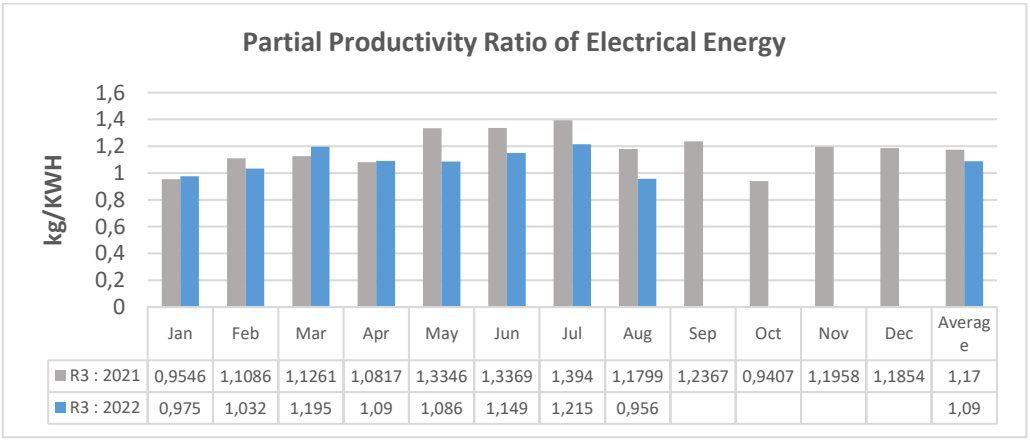
Partial labor productivity is the second determining factor in increasing productivity because it contributes 24.10%. The management policy to increase partial labor productivity at the beginning of 2022 was quite successful. This is because it increased the ratio from 15.31 kg/manhour, with a score of 3 in 2021, to 20.84 kg/manhour in 2022, with a score of 10. The results exceeded the companies' set acquisition standard of 20 kg/manhour, as indicated in Figure 4.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
R2 : 2021	11,12	11,96	13,14	13,72	17,31	18,7	18,93	14,73	13,95	15,55	16	18,66	15,31
R2 : 2022	17,85	20,67	22,67	22,93	23,38	21,5	17,4	20,34					20,84
Standar 2022	20	20	20	20	20	20	20	20	20	20	20	20	20

Figure 4. Development of Labor Partial Productivity Ratio

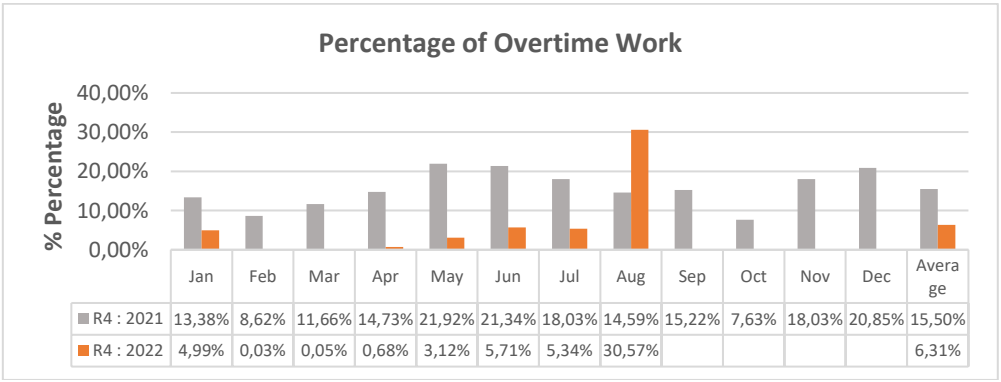
The partial productivity of electrical energy is the eighth determining factor in increasing the partial productivity of labor. It has a contribution of 2.41% in the partial productivity. The management policy to replace manual with machine processes reduced the ratio from 1.17 kg/KWH with a score of 3 to 1.09 kg/KWH with a score of 1, as shown in Figure 5.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
R3 : 2021	0,9546	1,1086	1,1261	1,0817	1,3346	1,3369	1,394	1,1799	1,2367	0,9407	1,1958	1,1854	1,17
R3 : 2022	0,975	1,032	1,195	1,09	1,086	1,149	1,215	0,956					1,09

Figure 5. Development of Partial Productivity Ratio of Electrical Energy

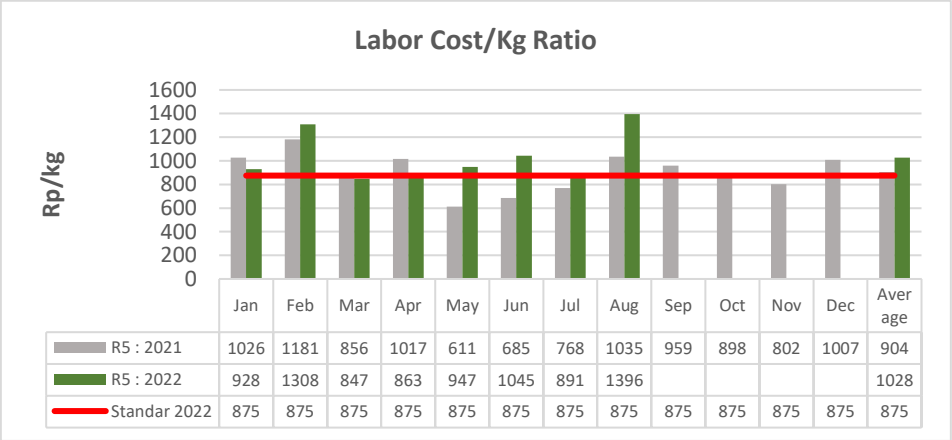
Minimizing overtime work is the sixth determining factor in increasing the partial productivity of labor. It has a contribution of 6.61% in the partial productivity. Therefore, the management's policy to reduce overtime work at the beginning of 2022 lowered the ratio from 15.5%, with a score of 3, to 6.31%, with a score of 10. The working group should be increased to four shifts to ensure that Saturdays and Sundays are overtime working days, as depicted in Figure 6.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
R4 : 2021	13,38%	8,62%	11,66%	14,73%	21,92%	21,34%	18,03%	14,59%	15,22%	7,63%	18,03%	20,85%	15,50%
R4 : 2022	4,99%	0,03%	0,05%	0,68%	3,12%	5,71%	5,34%	30,57%					6,31%

Figure 6. Development of Minimization of Overtime Working Time Percentage

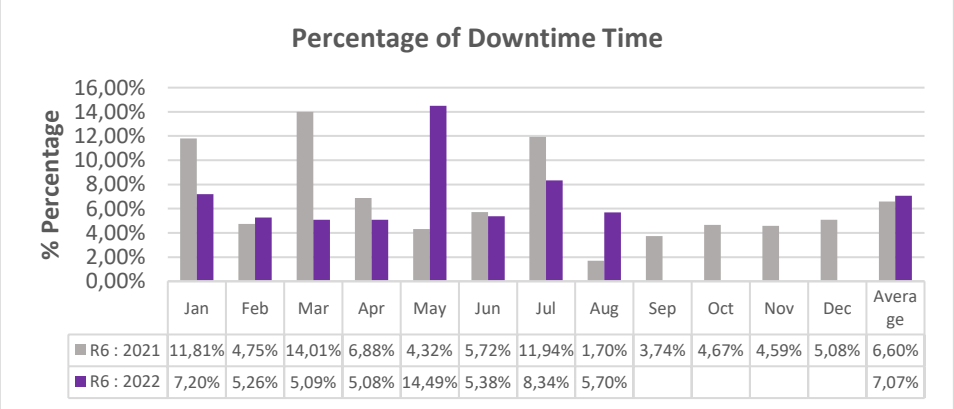
Minimizing labor costs is the fourth determining factor in increasing partial labor productivity. This factor has a 10% contribution to partial productivity in the production division. Therefore, the management policy for minimizing labor costs in early 2022 increased the ratio from 904 rupiah/kg with a score of 1 to 1028 rupiah/kg with a score of 1. This increase exceeded 14%, making the effect of decreasing the ratio invisible, as shown in Figure 7.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
R5 : 2021	1026	1181	856	1017	611	685	768	1035	959	898	802	1007	904
R5 : 2022	928	1308	847	863	947	1045	891	1396					1028
Standar 2022	875	875	875	875	875	875	875	875	875	875	875	875	875

Figure 7. Development of the Labor Cost Ratio per Month

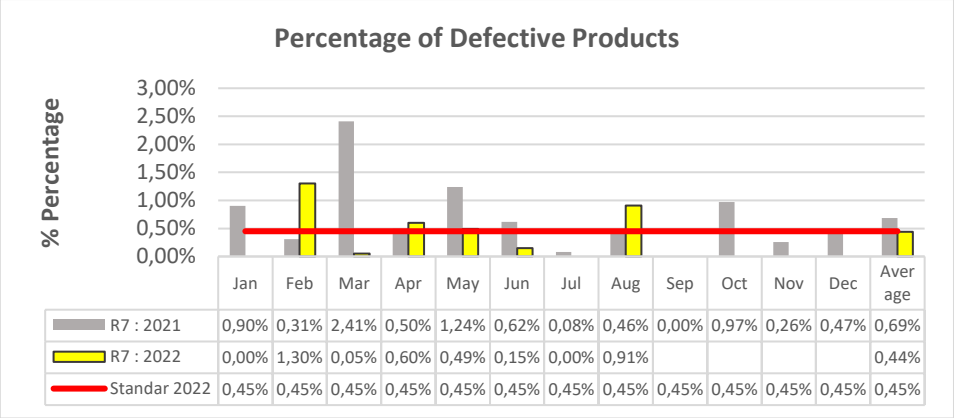
Minimizing downtime is the fifth determining factor in increasing the partial productivity of the production division, with a contribution of 6.72%. The downtime percentage increased from 6.6% with a score of 3 to 7.1% with a score of 2. This is because the engine is too old and needs more time for maintenance, as presented in Figure 8.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
R6 : 2021	11,81%	4,75%	14,01%	6,88%	4,32%	5,72%	11,94%	1,70%	3,74%	4,67%	4,59%	5,08%	6,60%
R6 : 2022	7,20%	5,26%	5,09%	5,08%	14,49%	5,38%	8,34%	5,70%					7,07%

Figure 8. Downtime Percentage Growth per Month

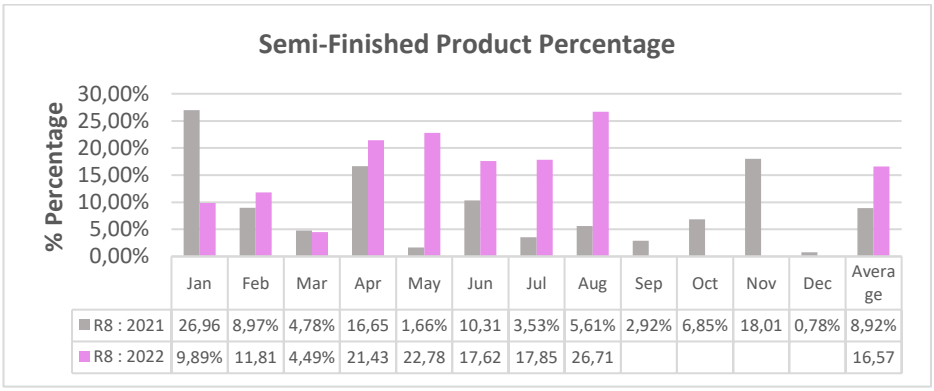
The minimization ratio of defective products is the third determining factor in increasing the partial productivity of labor. It contributes 9.96% to the partial productivity of the production division. The percentage of defective products decreased from 0.69% with a score of 3 in 2021 to 0.44% with a score of 5 in 2022. The increase exceeds the standard set by the companies' management of 0.45%. This is due to adding a personal adjustment section that controls in-process activities, eliminating product defects, as shown in Figure 9.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
R7 : 2021	0,90%	0,31%	2,41%	0,50%	1,24%	0,62%	0,08%	0,46%	0,00%	0,97%	0,26%	0,47%	0,69%
R7 : 2022	0,00%	1,30%	0,05%	0,60%	0,49%	0,15%	0,00%	0,91%					0,44%
Standar 2022	0,45%	0,45%	0,45%	0,45%	0,45%	0,45%	0,45%	0,45%	0,45%	0,45%	0,45%	0,45%	0,45%

Figure 9. Percentage of Defective Products Every Month

The ratio of *minimization of unfinished* products is the determining factor in increasing partial productivity. It has a contribution of 3.25% in the partial productivity of the production division. The percentage of unfinished products increased from 8.92% with a score of 3 to 16.57% with a score of 1. This is due to caution in the packaging process, minimizing product defects and increasing the percentage of unfinished products, as indicated in Figure 10.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
R8 : 2021	26,96	8,97%	4,78%	16,65	1,66%	10,31	3,53%	5,61%	2,92%	6,85%	18,01	0,78%	8,92%
R8 : 2022	9,89%	11,81	4,49%	21,43	22,78	17,62	17,85	26,71					16,57

Figure 10. Unfinished Product Percentage Ratio Development

CONCLUSION

The data processing and analysis were concluded as follows:

1. The results showed the factors affecting the productivity of the production division of PT. GMK and the weight of the data processing. These include the criteria for the productivity of (a) Raw material at 37.85%, (b) labor at 24.10%, and (c) electrical power efficiency at 2.41%. Other criteria were the minimization of (d) overtime work by 6.61%, (e) labor costs by 10%, (f) downtime by 6.72%, (g) defective products by 9.96%, and (h) unfinished products by 3.25%.
2. The OMAX method used for January to August 2022 showed that PT. GMK has a productivity index of 2.19, following a 119% increase.
3. The cause-and-effect fishbone analysis showed that improvements based on the existing problem include (a) Making material weighing check sheets to ensure they are controlled, (b) Reducing overtime by increasing the number to four, (c) Improving the process sequence to make it faster, (d) Reducing machine washing by estimating the remaining products to be included in the next formula, and (e) Setting new and higher targets for the next period.

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