JURIT
P-ISSN: 2987-7261
E-ISSN: 2987-7253

JURIT
Jurnal Riset Ilmu Teknik
Journal homepage: https://jurnaljepip.com/index.php/jurit
Vol 1, No. 3, pp;139-150, 2023
DOI: 10.59976/jurit.v1i3.31

Productivity Analysis on Liquid Nitrogen (LIN) and Liquid Oxygen (LOX) Production Using Objective Matrix (OMAX) Method

Desi Fitriani[1]*, Rahmadhani Nasution[2], Nurmala Sari[3]
[1,2,3] Universitas Muhammadiyah Sumatera Utara
Jl. Kapten Muchtar Basri No.3, Glugur Darat II, Kec. Medan Tim., Kota Medan
*E-mail: desifitrianinst@gmail.com

Submitted: 10/22/2023; Reviewed: 11/11/2023; Accepted: 12/28/2023

ABSTRACT

The amount of liquid nitrogen (LIN) and liquid oxygen (LOX) production capacity experienced significant fluctuations, so it took several months before it reached the production target implemented by the company. It is necessary to measure productivity on the production floor. This study aims to determine the level of productivity of the production section, and the results of this measurement can be used to evaluate the company's productivity level. Productivity measurement using the Objective Matrix (OMAX) method. The criteria used in this study are material productivity, energy productivity, labour productivity, and finished product productivity. The highest productivity values achieved during measurements from January to December were 900 in LIN production in July and 790 in LOX production in January. Factors that cause low productivity are workers who are less careful or negligent in handling machine damage, the absence of a quality control system in checking raw materials before being placed in the storage warehouse, the lack of a shut-off valve between pipes, causing free air to enter, causing products to be rejected and also machines that work continuously for 24 hours.

Keywords: Objective Matrix (OMAX), Productivity, Liquid Nitrogen (LIN), Liquid Oxygen (LOX)

INTRODUCTION

The object of research is an industrial gas-producing company producing pure gas, liquid, and packaging. The company only focuses on producing gas in liquid form and distributing it to companies that buy and ship it to the head office as stock. This research was conducted in the production department, where the resulting product is gas in liquid form, Made to Stock. The products produced are Liquid Nitrogen (LIN) and Liquid oxygen (LOX). The production process company Gas processes

free air in several stages to become pure gas in liquid form and is put into storage tanks. Then, the production results are distributed to companies directly. The company's production process focuses on minimizing production costs and maximizing production output, which is the company's primary goal. Still, the company does not yet have a specific productivity measurement for improving and measuring productivity. Productivity measurement is carried out by objectively assessing performance in each part of the company while looking for factors causing productivity decline (Supriyadi and Suryadiredja, 2020).

The problems faced by the company are the production of liquid gas has not met the monthly production target set by the head office, the use of electrical energy and water is high, but the production results have not been met, the Company has a monthly target for each type of gas produced, namely for LIN production of 521,326.67 m^3 / month, for LOX of 343,393.33 m^3 / month. So far, the company only measures the level of productivity based on production output data. Based on the production results data obtained from the company, the output data of production results from January to December, which have been used to measure the level of productivity, are shown in Figure 1.

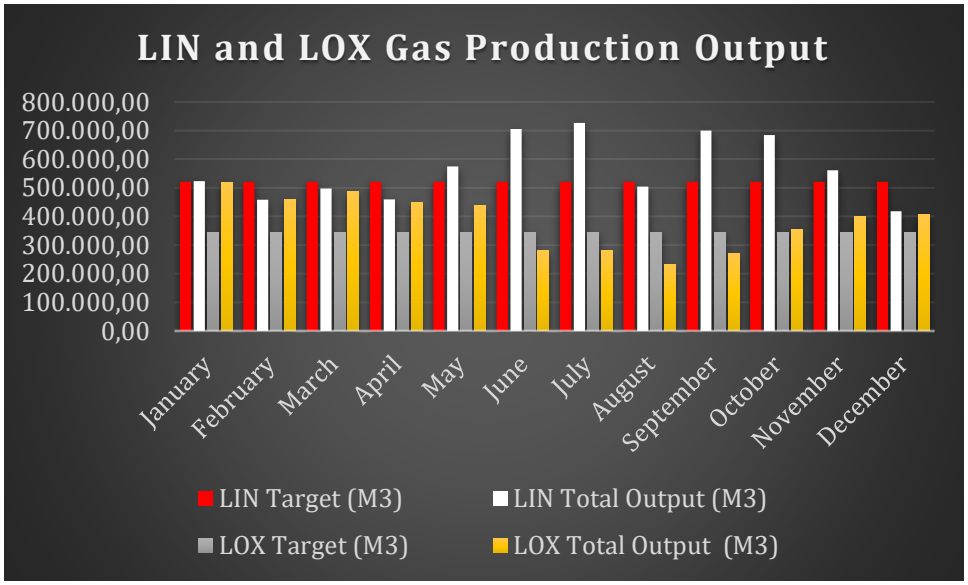

Figure 1. Production of LIN Gas and LOX Gas

Lin and Lox gas production results exceed the company's target for the past 1 year. Lin's production results could not meet targets in the following months: February, March, April, August, and December. Meanwhile, Lox production has not been able to meet the target in June, July, August, and September. The gas production output every month has not met the production target. So far, the company has tried to get a large and stable number of products every month to complete the marks given by the central company. With fluctuations in production output so that production targets are not achieved, companies must improve labor, machinery, materials, and energy productivity to perform monthly production targets.

The company's productivity needs to be analyzed so that the level of production capability can be known [1]. One method to analyze productivity in industry is OMAX (Objective Matrix), where the OMAX method is a partial productivity measurement system developed to monitor productivity in elements contained in the company [2].

The OMAX method has been widely used by previous studies, such as research by [3], which analyzed productivity on the production floor of beverage bottle companies where beverage bottle companies in the Banten area had difficulty achieving production targets, which caused the company's overall productivity to decrease, so based on data processing that has been carried out, it is

known that the cause of the decline in productivity is due to the existence of ratios that have a critical value [4]. In addition, research using the OMAX method was conducted by Effendy et al. in 2021, who measured and analyzed productivity in PDAM Gorontalo Regency. This study aims to evaluate the company's performance level and can be used as a guideline for future improvements. After an evaluation, it is known that the weight set by the company influences the cause of the decline in productivity [5][6].

METHOD

Data Collection

Data collection is collecting and measuring information used as the object of research [7]–[10]. Data collection aims to enable someone to answer the research questions, test hypotheses, and evaluate the results [11]–[14]. The data needed in this study are primary data and secondary data, namely:

1. Primary Data: Primary data is obtained directly from the research object. This study's primary data were obtained from interviews with production staff in the LIN and LOX liquid gas production sections.
2. Secondary Data

a. Company Output Data.

b. Company input data, such as labor requirements, materials, machine hours, number of defective products, and energy [15]–[18].

Data Processing

The stage after data collection is to process data. This data processing is carried out to process raw data so that it can be analyzed and solutions can be proposed. The data processing carried out in this study is as follows [19]–[21]:

1. Establish the productivity criteria used: raw materials or materials, labor, machine hours, and energy. Next is the creation of questionnaires for weighting and importance ratios. The questionnaire will be given to the production manager to fill in according to the company's interests. After determining the importance of the balance, calculate the ratio value, which will later be multiplied by the results on each criterion to get results in the form of performance values for each measure.
2. Calculates standard performance values and performance scales.
3. Calculate the ratio value to determine the value of the company's productivity index.
4. After all the calculation results are done, the values obtained will be entered into the objective matrix table.
5. Perform productivity analysis using a causal diagram (fishbone). This analysis is carried out to find out what factors affect the level of company productivity.
6. After the analysis, the researcher provides recommendations for proposed improvements to the company to increase the productivity and quality of the company's production.

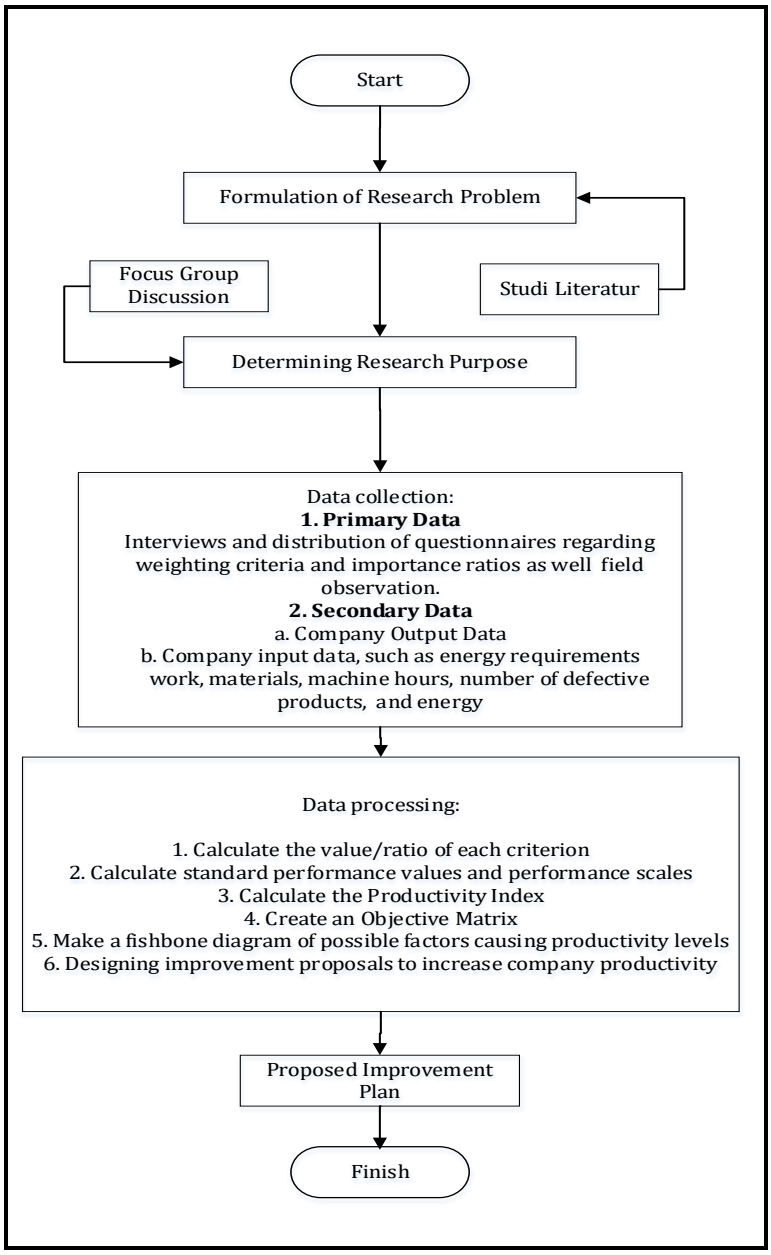

Figure 2. Research Stage Diagram

RESULTS AND DISCUSSION

Calculation of Productivity Criteria Weighting Results

The weighting result for each criterion must have a consistency ratio value smaller than or equal to 0.1 for the weighting result to be consistent. The calculation of the weight of each criterion and consistency ratio can be seen in Table 1.

Table 1. Paired Matrix Calculation Results

	Material Productivity	Energy Productivity	Labor Productivity	Finished Product Productivity
Material Productivity	1	0.333	3	0.2

Energy Productivity	3	1	5	0.333
Labor Productivity	0.333	0.2	1	0.2
Finished Product Productivity	5	3	5	1
Total	9.333	4.533	14	1.733

The productivity criterion of the finished product that has the most significant weight, Criterioninfluential in the company's productivity level. As for the consistency ratio in the weighting results, a value of 0.0745, smaller than 0.1, is obtained so that the weighting results of the questionnaire meet the consistency ratio limit.

Ratio of Each Criterion

The ratio for each productivity criterion is carried out as a guideline to determine the level of productivity each month. Each measure is calculated as a ratio, which will be calculated for 2 types of gas products, namely LIN and LOX.

Table 2. Productivity Measurement Criteria

Potential Objectives	Measurement Criteria
Material Ratio	Total Net Production (m^3)/Total Materials (m^3)
Energy Ratio	Total Net Production (m^3)/Total Energy (IDR)
Labor Ratio	Total Net Production (m^3)/Total Working Hours (Hours)
Finished Production Ratio	Total Net Production (m^3)//Total Production (m^3)

Table 3. LIN Gas Productivity Ratio Calculation Results

Moon	Material Ratio	Energy Ratio	Power Ratio Work	Finished Production Ratio
January	285.367	0.000661655	696.158	0.9890863
February	278.454	0.000638897	672.13	0.9767627
March	328.253	0.000646468	685.971	0.9820713
April	313.168	0.000630565	699.425	0.9850991
May	755.878	0.000748424	790.426	0.9921627
June	375.92	0.000935308	984.931	0.9882968
July	732.267	0.000953261	1018.18	0.9973643
August	388.626	0.000896056	986.805	0.9977841
September	530.943	0.000965533	1,040.522	0.9975414
October	725.731	0.000893250	954.108	0.9975291
November	517.547	0.000753007	791.107	0.9871196
December	393.134	0.000612265	682.846	0.9673421

Table 4. LOX Gas Productivity Ratio Calculation Results

Moon	Material Ratio	Energy Ratio	Power Ratio Work	Finished Production Ratio
January	283.321	0.000656911	691.166	0.9922521

February	281.557	0.000646016	682.69	0.9897487
March	322.55	0.000635235	677.855	0.9858572
April	305.42	0.000614964	682.121	0.986466
May	565.673	0.000560094	593.995	0.9756154
June	150.017	0.000373251	395.85	0.9945464
July	276.866	0.000360423	391.009	0.9802637
August	176.446	0.000406832	449.798	0.99113
September	202.325	0.000367934	395.919	0.986179
October	369.736	0.000455082	488.135	0.981727
November	366.822	0.000533709	566.377	0.9790674
December	382.795	0.000596164	670.542	0.9728975

Level OMAX

This calculation is carried out to determine the level to be entered into the OMAX matrix. The classes are divided into 11 parts, with levels 0 to 10. Determine that level 0 is obtained from the lowest possible value achieved by the company. Level 3 is obtained from the average value of the company's achievements during the measurement process, and level 10 is obtained from the highest weight or target to be achieved by the company. Groups other than 0.3 and 10 are obtained by calculating the formula available to find the interval at that level.

Table 5. OMAX matrix of LIN gas products

Performance	Ratio 1	Ratio 2	Ratio 3	Ratio 4
10	755.878	0.000965533	1.040.522	0.99778
9	714.863	0.000938727	1.010.955	0.99641
8	673.848	0.000911921	981.387	0.99504
7	632.833	0.000885115	951.82	0.99367
6	591.818	0.000858309	922.253	0.9923
5	550.804	0.000831503	892.685	0.990924
4	509.789	0.000804697	863.118	0.98955
3	468.774	0.000777891	833.551	0.98818
2	405.334	0.000722682	779.744	0.98123
1	341.894	0.000667474	725.937	0.97429
0	278.454	0.000612265	672.13	0.96734
Weight	13	27	7	53

Table 6. OMAX matrix of LOX gas products

Performance	Ratio 1	Ratio 2	Ratio 3	Ratio 4
10	565.673	0.000656911	691.166	0.994546
9	528.714	0.000636955	672.017	0.99313
8	491.755	0.000616998	652.868	0.99172
7	454.796	0.000597042	633.718	0.9903
6	417.837	0.000577086	614.569	0.98889
5	380.878	0.00055713	595.42	0.98747

4	343.919	0.000537174	576.271	0.98606
3	306.961	0.000517218	557.121	0.98465
2	254.646	0.000464953	501.751	0.98073
1	202.332	0.000412688	446.38	0.97681
0	150.017	0.000360423	391.009	0.9729
Weight	13	27	7	53

Productivity Index

The productivity index is the sum of the productivity values of all ratios used. Productivity that occurs is stated to change; some go up, and some fluctuate. The Productivity Index (IP) against previous performance is the value obtained from calculating total productivity. The IP is now minus the previous IP divided by the earlier IP multiplied by 100%. So this Productivity Index shows changes that occurred in the last month to the next month, whether there was an increase or decrease in productivity compared to previous months.

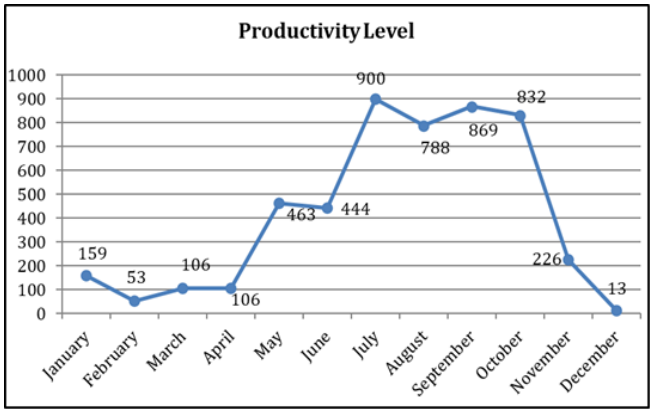

Figure 3. LIN Gas Productivity Rate Graph

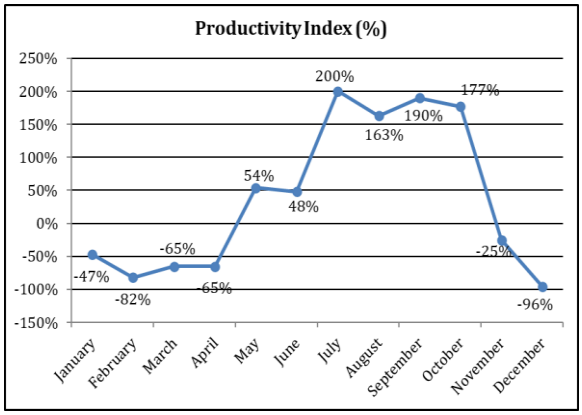

Figure 4. Productivity Index for LIN Gas Production

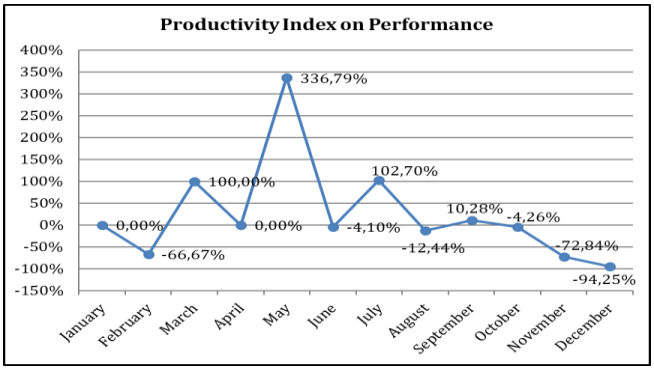

Figure 5. LIN Gas Productivity Index

Figure 3 shows a graph of productivity levels from January to December 2021, and the highest productivity occurred in July, with a value of 900. This is because the score values of all criteria were above the average this month. In this month, the production process went smoothly. The lowest productivity occurred in December with a value of 13, due to the score value of 3 criteria being at an inferior level of 0.

Figure 4 shows a graph of indicators of the rise and fall of productivity against performance standards. The highest increase in productivity occurred in July with a value of 200%, while the lowest decrease in performance occurred in December with a discount of -96%.

Figure 5 shows the highest monthly performance increase occurred in May at 336.79%, due to a significant increase in productivity compared to the previous month. The lowest decline occurred in November at -94.25% because the level of productivity had decreased from the last period.

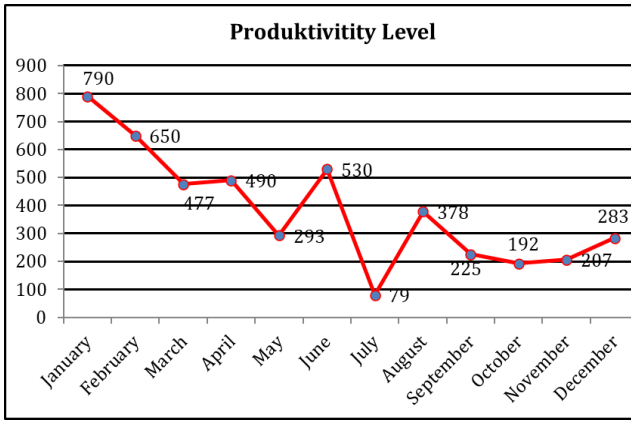

Figure 6. LOX Gas Productivity Rate Graph

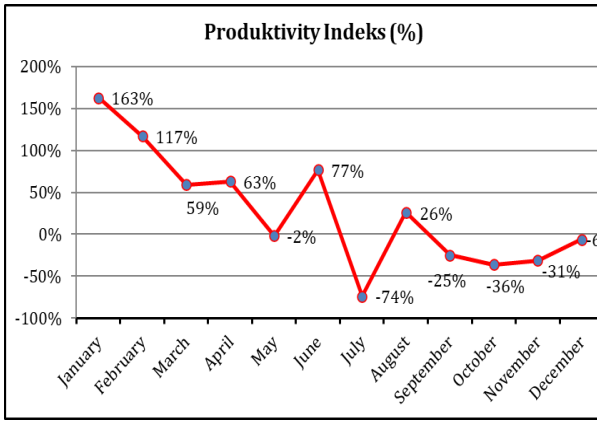

Figure 7. Productivity Index for LOX Gas Production

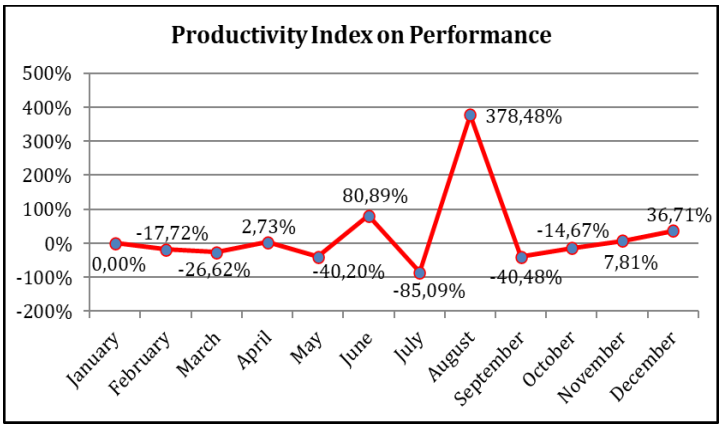

Figure 8. LOX Gas Productivity Index

Figure 6 is a graph of the level of LOX productivity from January to December 2021, and the highest productivity occurred in January with a value of 790. This is because this month, the score values of the ratio of 2 and 3 were above average. This month, the production process went smoothly. The lowest productivity occurred in July with a value of 79, due to the score value of ratios 2 and 3 being at an inferior level of 0.

Figure 7 is a graph of productivity indicators against performance standards, showing the ups and downs of productivity. The highest increase in productivity occurred in January with a value of 163%, while the lowest decrease in performance occurred in July with a discount of -74%.

Figure 8 The highest increase in performance occurred in August at 378.48%, and this was due to a significant increase in productivity compared to the previous month. The lowest decline occurred in July, which was -85.09% because the productivity value decreased from the last period in this month.

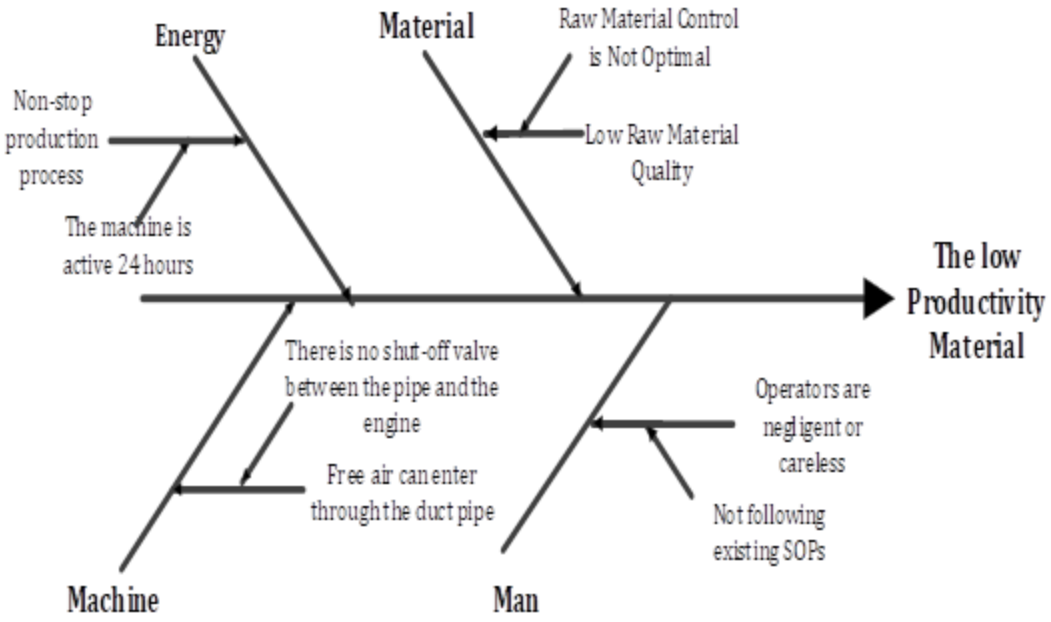

Figure 9. Causal Diagram of Decreased Productivity

Based on the factors that affect the decline in productivity above, a solution design is carried out to determine the efforts that can be made to increase productivity.

Table 7. Design Solutions to Increase Productivity

Cause	Proposal	Practical Solutions
Machine		
Free air enters the storage pipe.	Adding a shut-off valve to each pipe between the engine and the tube that connects to the storage tank is necessary.	Add a pipe shut-off valve that connects the pipe and engine to the storage tank so that outside air cannot enter when the plant is not operating, causing the production to be contaminated with free air and becoming a rejected product. 
Energy		

PLN Outage	There needs to be a generator to overcome the problem of PLN power outages so that the plan can continue to produce	The generator used has a power of 500 KVA with an operating time of 3280 hours. 
Materials		
Quality of raw materials	Checking the purchase of quality raw materials	A quality control system is needed to check before raw materials are placed in the storage warehouse to ensure that raw materials are of the required quality.
Human		
Less responsive to machine breakdowns	Provide checklist sheets to operators about damage to the machine used	Ensure workers fill out the SOP checklist sheet

DISCUSSION

The highest score achievement in LIN production is found in a ratio of 4 (finished product productivity) with a score of 55. The higher the score, the higher the level of partial productivity achievement of each criterion. While the lowest score is found in a ratio of 1 (material productivity) with a score of 39, this shows that the effectiveness of material use has not been maximized. Quality materials are essential in the smooth production process [22]. While the highest score achievement in LOX production is found in ratio 3 (labor productivity) with a score of 54, and the lowest score is found in ratio 1 (material productivity) with a score of 35, this shows that the productivity of material use has not been maximized [23]. The highest productivity value in LIN production occurred in July with a value of 900 because all criteria were above average, and the lowest value occurred in December with a value of 13. The highest productivity value in LOX production occurred in January, with a value of 790, and the lowest in July.

The productivity index shows an increase and decrease in company productivity in percentage terms. Table 4.14 of LIN production shows the highest productivity index in July at 200% and the lowest in December at -96%. In Table 4.15 for LOX production, the highest productivity index in January reached 163%, and the lowest in July with a value of -74%. Analysis of the LIN production productivity index shows that the influence of ratio 4 becomes dominant because the finished product has the highest weight in other levels of importance. In this case, material inventory must be further increased so that the production level is higher [24]. In the analysis of the LOX production productivity index, it can be seen that the ratio of 3 is very influential and becomes dominant because the workforce has worked optimally, and LIN production and material productivity must be paid more attention to [25].

The value of the productivity score on the material usage efficiency criterion fluctuates wildly. The highest score for LIN production was achieved in May at level 10, as the company produced a net output of 575,195.75 kg/m3 using 755kg of material. The efficiency of material use is better at 755,878. Achievement occurs from January to April at level 0. This is because the amount of

product produced is not maximum with the material used, so it is said that material productivity is still low [21]. The highest value in the productivity score of material use in LOX production was achieved in May, namely at level 10, because the company produced a net output of 427,082.76 kg / m3 using 755kg of material. Material use efficiency is quite good from other periods, namely 565,673. The lowest achievements occurred in June and August, namely at level 0. This is also because the material used is not the maximum with the product produced. The highest productivity value in the production year in the study [26] occurred in period 7, with a value of 455.7, while the lowest productivity value occurred in period 1, with a weight of 196.35. The criterion that does not contribute to productivity and needs to be improved is the production efficiency criterion because the criterion value indicates substandard performance.

Meanwhile, the effectiveness criteria and inferential criteria (machine working hours) show deals that tend to be good. The effects found in ratio 1 show values still in good productivity condition. Still, in ratio 2, it can be said that this indicator shows that the cause of decreased productivity is frequent damage to the machine, resulting in the production process being disrupted [27].

CONCLUSION

Productivity during the measurement period from January to December tends to fluctuate compared to standard productivity; the highest level of productivity in LIN occurs in July at 900, and the highest level of productivity in LOX occurs in January at 790. 4 factors affect the level of productivity, namely material productivity, energy productivity, labor productivity and finished product productivity. Of the four factors, the lowest ratio is material productivity, which is caused by three things, namely workers who are less careful or negligent in handling machine damage, the absence of a quality control system in checking raw materials before being placed in the storage warehouse, the absence of a shut-off valve between pipes causing free air to enter, causing the product to be rejected and also machines that work continuously for 24 hours. Efforts that can be made to improve material productivity provide checklist sheets or SOPs to workers in case of machine failure. The quality control system for checking raw materials before being stored in the storage warehouse is sampling checking by studying the physical condition of the packaging and packaging seals. Buy and use a pipe shut-off valve that connects to the storage tank and a generator set to solve the problem of PLN power outages so the plan can continue producing.

REFERENCES

[1] J. Niu, "Design method of FOPID controller based on rotating Hankel matrix and multi-objective particle swarm algorithm," *Proceedings of SPIE - The International Society for Optical Engineering*, vol. 12716. 2023. doi: 10.1117/12.2685501.

[2] G. Nathania, "Improved company productivities based on supply chain management performance measurement using Objective Matrix (OMAX) method," *AIP Conference Proceedings*, vol. 2772. 2023. doi: 10.1063/5.0115146.

[3] L. L. Rodrigues, "Predictive Incremental Vector Control for DFIG with Weighted-Dynamic Objective Constraint-Handling Method-PSO Weighting Matrices Design," *IEEE Access*, vol. 8, pp. 114112–114122, 2020, doi: 10.1109/ACCESS.2020.3003285.

[4] H. T. M. Nguyen, "Rules of Change of Weight Matrix in objective Function in Model Predictive Control in order to Consider Stability for Twin Rotor MIMO System Based on Bellman's Dynamic Programming Method," *SSRG Int. J. Electr. Electron. Eng.*, vol. 7, no. 2, pp. 29–33, 2020, doi: 10.14445/23488379/IJEEE-V7I2P106.

[5] N. Aliafari, "Productivity analysis on batik production line using objective matrix (OMAX) method," *Ind. Eng. Manag. Syst.*, vol. 18, no. 4, pp. 726–734, 2019, doi: 10.7232/iems.2019.18.4.726.

[6] C. Basumerda, "Warehouse server productivity analysis with objective matrix (OMAX) method in passenger boarding bridge enterprise," *IOP Conference Series: Materials Science and*

Engineering, vol. 673, no. 1. 2019. doi: 10.1088/1757-899X/673/1/012106.

[7] E. Rifa'i, R. Hidayat, and U. B. Shalihah, *Productivity analysis and improvement of the production department at PT. Pojur-Madura using the objective matrix (OMAX) method*. techniumscience.com, 2023. [Online]. Available: https://techniumscience.com/index.php/technium/article/view/10096

[8] D. Pangestu and A. J. Nugroho, *… Geo Ettana PRODUCTIVITY MEASUREMENT OF POWDERED GOAT MILK PROCESSING UMKM USING THE OBJECTIVE MATRIX METHOD Case Study: UMKM …*. eprints.uty.ac.id, 2023. [Online]. Available: http://eprints.uty.ac.id/13150/

[9] D. Irwansyah, C. I. Erliana, F. Fadlisyah, M. Ula, and ..., "Increasing Productivity in CPO Production Using The Objective Matrix Method," *Int. J. …*, 2022, [Online]. Available: https://ijesty.org/index.php/ijesty/article/view/232

[10] M. N. Sopacua, *APPLICATION OF THE OBJECTIVE MATRIX METHOD IN ANALYZING THE PRODUCTIVITY OF FROZEN CHAYOTE VEGETABLES AT PT PLASMA USAHA MITRA …*. repository.president.ac.id, 2022. [Online]. Available: http://repository.president.ac.id/handle/123456789/11344

[11] O. Kustiadi, "Measuring productivity index with objective matrix (OMAX) method in the diecasting aluminum industry," *Int. J. Mech. Prod. Eng. Res. Dev.*, vol. 9, no. 3, pp. 13–22, 2019, doi: 10.24247/ijmperdjun20192.

[12] H. Rumapea, "Customer Relationship Management by Using Objective Matrix Method to Survey Customer Satisfaction," *2019 International Conference of Computer Science and Information Technology, ICoSNIKOM 2019*. 2019. doi: 10.1109/ICoSNIKOM48755.2019.9111622.

[13] K. Singh, "Matrix maxima method to solve multi-objective transportation problem with a pareto optimality criteria," *Int. J. Innov. Technol. Explor. Eng.*, vol. 8, no. 11, pp. 1929–1932, 2019, doi: 10.35940/ijitee.K2134.0981119.

[14] P. Rajpoot, "Matrix Method for Non-Dominated Sorting and Population Selection for Next Generation in Multi-Objective Problem Solution," *Proceedings of the 8th International Conference Confluence 2018 on Cloud Computing, Data Science and Engineering, Confluence 2018*. pp. 670–676, 2018. doi: 10.1109/CONFLUENCE.2018.8442879.

[15] K. Sinaga, K. Lie, N. Williams, and ..., "Productivity Analysis Of Filling Machine With The Objective Matrix (OMAX) Method," *ABDIMAS Talent. J …*, 2021, [Online]. Available: https://talenta.usu.ac.id/abdimas/article/view/5444

[16] A. Muzaki and R. E. Nugroho, "Productivity Measurement using Objective Matrix (Omax) Method and Efforts to Improve Ready Mix Concrete Industrial in Batching Plant," *… VOLATILES Essent. OILS Journal| NVEO*, 2021, [Online]. Available: http://www.nveo.org/index.php/journal/article/view/1289

[17] E. Pradiatama, "Productivity analysis using objective matrix method," *Operations Management and …*. download.garuda.kemdikbud.go.id, 2021. [Online]. Available: http://download.garuda.kemdikbud.go.id/article.php?article=2352782&val=22675&title=Productivity analysis using objective matrix method

[18] E. Supriyadi and H. Oktaviani, "Analysis of Rtrto60K16 Pkx Yarn Production Process With Objective Matrix (Omax) Method. 59–67." 2021.

[19] E. Supriyadi, J. Junaedi, and H. Oktaviani, "Analysis of Rtrto60K16 Pkx Yarn Production Process With Objective Matrix (Omax) Method," *SINTEK J. J. Ilm. …*, 2021, [Online]. Available: https://jurnal.umj.ac.id/index.php/sintek/article/view/7669

[20] D. E. Putra and K. M. Mursid, "Application Of Objective Matrix (OMAX) Method For Measuring Productivity Of Prol Tape Processing In Ud Purnama Jati," *J. Pangan dan Agroindustri*, 2021, [Online]. Available: https://jpa.ub.ac.id/index.php/jpa/article/view/688

[21] I. Prakoso, "Productivity Analysis Of Split Stone Production Using Objective Matrix (Omax) Method (A Case Study)," *J. Ind. Eng. Halal Ind.*, [Online]. Available: https://ejournal.uin-

suka.ac.id/saintek/JIEHIS/article/view/3498

[22] B. Shrivastavaa, B. Agrawalb, and S. Kumarc, "Computation of Multi-Objective Linear Programming Problem by Matrix Inversion Method," *researchgate.net*. [Online]. Available: https://www.researchgate.net/profile/Dr-Agrawal-12/publication/372890434_Computation_of_Multi-Objective_Linear_Programming_Problem_by_Matrix_Inversion_Method/links/64cc8d81d394182ab3a14d56/Computation-of-Multi-Objective-Linear-Programming-Problem-by-Matri

[23] W. Rahmawati and M. Wahyudin, "Productivity Analysis on Black Tea Processing Process Using Objective Matrix (OMAX) Method at PT Perkebunan Nusantara VIII Kebun Pasirmalang," *Agroindustrial J.*, [Online]. Available: https://journal.ugm.ac.id/agroindustrial/article/view/89934

[24] N. Damariandini, B. A. Harsojuwono, and I. K. Satriawan, "… OF UD. ARYA PUTRA 'SAGO' TEMPEH CHIPS PRODUCTION USING OBJECTIVE MATRIX (OMAX) METHOD ANALISIS PRODUKTIVITAS PRODUKSI …," *ojs.unud.ac.id*. [Online]. Available: https://ojs.unud.ac.id/index.php/jtip/article/download/103768/51739

[25] S. Zabolotnii, "APPLICATION OF THE MATRIX FACTOR ANALYSIS METHOD FOR DETERMINING PARAMETERS OF THE OBJECTIVE FUNCTION FOR TRANSPORT RISK MINIMIZATION," *Inform. Autom. Pomiary w Gospod. i Ochr. Sr.*, vol. 11, no. 1, pp. 40–43, 2021, doi: 10.35784/iapgos.2578.

[26] G. Ramayanti, G. Sastraguntara, and S. Supriyadi, "analisis produktivitas dengan metode objective matrix (OMAX) di Lantai Produksi Perusahaan Botol Minuman," *J. INTECH Tek. Ind. Univ. Serang Raya*, vol. 6, no. 1, pp. 31–38, 2020.

[27] S. Sudiman and W. A. Fahrudin, "Perancangan Efektivitas dan Efisiensi untuk Peningkatan Produktivitas Lini Produksi Wellhead dengan Metode Objective Matrix," *J. INTECH Tek. Ind. Univ. Serang Raya*, vol. 7, no. 1, pp. 15–22, 2021.