DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453

https://jurnal.pelitabangsa.ac.id/index.php/deal

Application of Continuous Improvement to Increase Productivity Line Cam Housing Assy C With PDCA Method

Wiharti Wiharti[1], Ristiyaningsih Ristiyaningsih[2], Fransiskus Gea[3], Roni Suryo Suwarno[4], Tri Ngudi Wiyatno[5]
Universitas Pelita Bangsa
Email: wiharti2605@gmail.com

Abstract
This study aims to determine the effect of the application of continuous improvement on the productivity of the Cam Housing Assy C line using the PDCA method. It is known that for the period of July 2021~November 2021, the achievement of the Cam Housing Assy C line productivity is the lowest. This research is a qualitative descriptive study and data collection techniques using interviews, documentation, and literature study. The Line Cam Housing Assy C has 7 man power with an average per shift producing 408.9 pcs, but there is still losstime. The most influential losstime on productivity is when preparing hatsumono (3.5%). To reduce the losstime, it is necessary to make improvements in the form of increasing efficiency by increasing the number of pcs/hour by each man power. Methods of data analysis using PDCA tools and Analysis of Muda, Mura, Muri. The results of this study were able to increase productivity from 8.43 Man.min/pcs to 6 Man.Min/pcs and increase the production line capacity from 408.9 pcs/shift to 470 pcs/shift. The research focuses specifically on the productivity line of Cam Housing Assembly C, providing insights and solutions tailored to this particular manufacturing process. While PDCA (Plan-Do-Check-Act) is a widely used methodology, its application in this specific context has not been extensively explored

Keyword: Productivity, kaizen, muda, mura and muri, balancing job

INTRODUCTION

Today it has entered the era of the global economy where trade competition is not only within the country but already between countries. At the same time, technological developments have entered the industrial era 4.0 where manual work has begun to shift to automation on production lines. Realizing the increasingly fierce competition, companies must be able to take advantage of the ability to win the competition (competitive adventage) and obtain the maximum possible profit, which is one of the goals of establishing the company.

The automotive component industry in Indonesia is currently experiencing critical phases that determine the sustainability of the company in the future. The component industry is required to be able to compete fiercely in terms of Quality, Cost, Productivity and Delivery to survive in the global economic era. This is a big challenge that must be answered by companies to create innovation by implementing excellent lean because with lower costs it can produce quality green products. In response to these conditions, PT OTICS INDONESIA carries out strategies by making continuous and continuous improvements by implementing a good and consistent management system. One example is the application of continuous improvement.

Continuous Improvement can be interpreted as continuous improvement that involves all workers, both upper management to lower level management (Hitoshi Takeda, 2006: 82). Kaizen or continuous improvement always goes hand in hand with Total Quality Management (TQM). Even

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

before this TQM philosophy is implemented or before the quality system can be implemented in a company, this philosophy will not be implemented so that continuous improvement (Just in time) is an inherent effort to the TQM philosophy itself. So that Kaizen can also be a comprehensive and integrated unified view that has the characteristics of customer-oriented, total quality management, robotics, quality control groups, suggestion systems, automation, workplace discipline, productivity maintenance, kanban, quality improvement and improvement, timely, flawless, small group activities, cooperative relationships between managers and employees and new product development.

PT OTICS INDONESIA (OI) is an automotive manufacturing company whose one of its jobs is the manufacture of Cam Housing Assy spare parts. Realizing the number of new competitors emerging, to be able to grow and develop in the era of the global economy, it must be able to turn challenges into opportunities, realize one way must continue to make continuous improvements so that it can compete and become the best in Asia. The following is the productivity data of the Cam Housing Assy line for the November 2021 period:

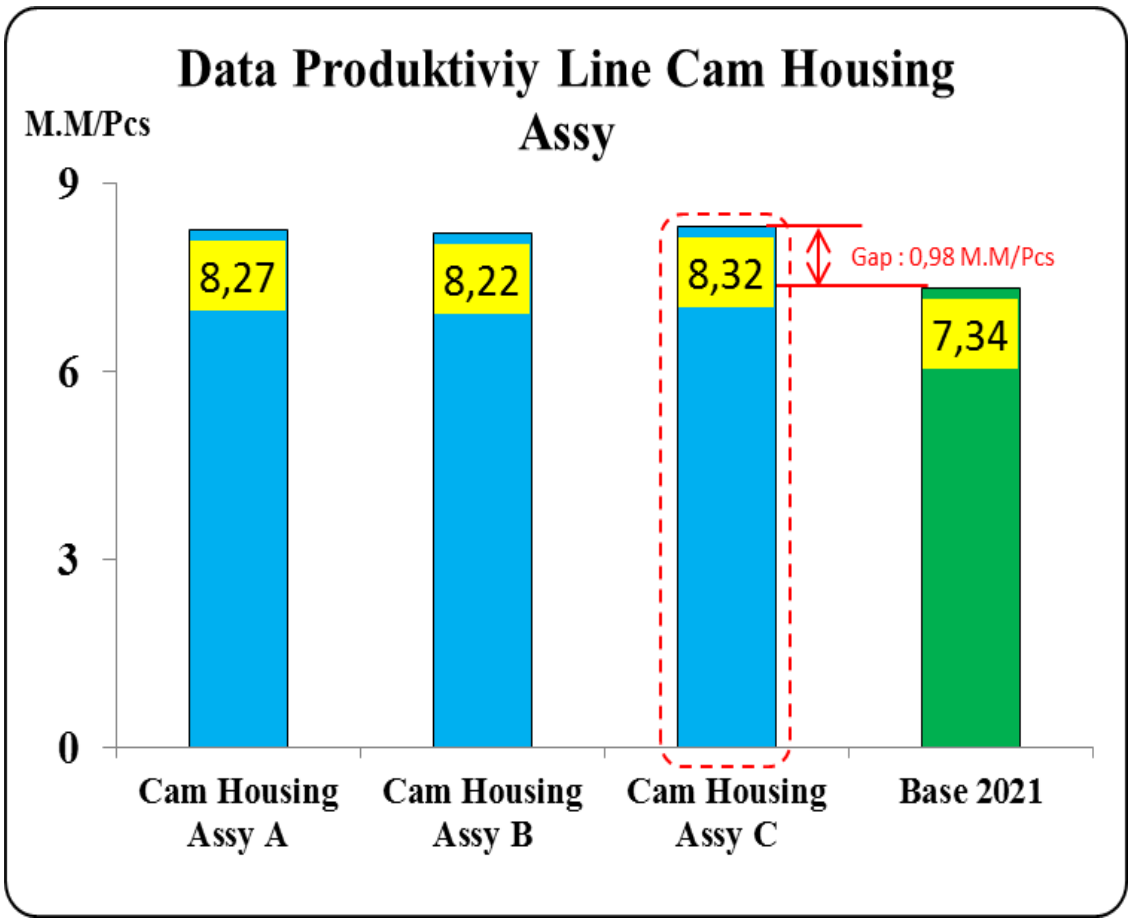

Figure 1 Grafik Productivity line Cam Housing Assy
Source : Researcher Data

Based on the data and graphs above, it shows that the Cam Housing Assy C line in terms of productivity is not achieved and is the worst, which is still at 8.32 M.M/Pcs.

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

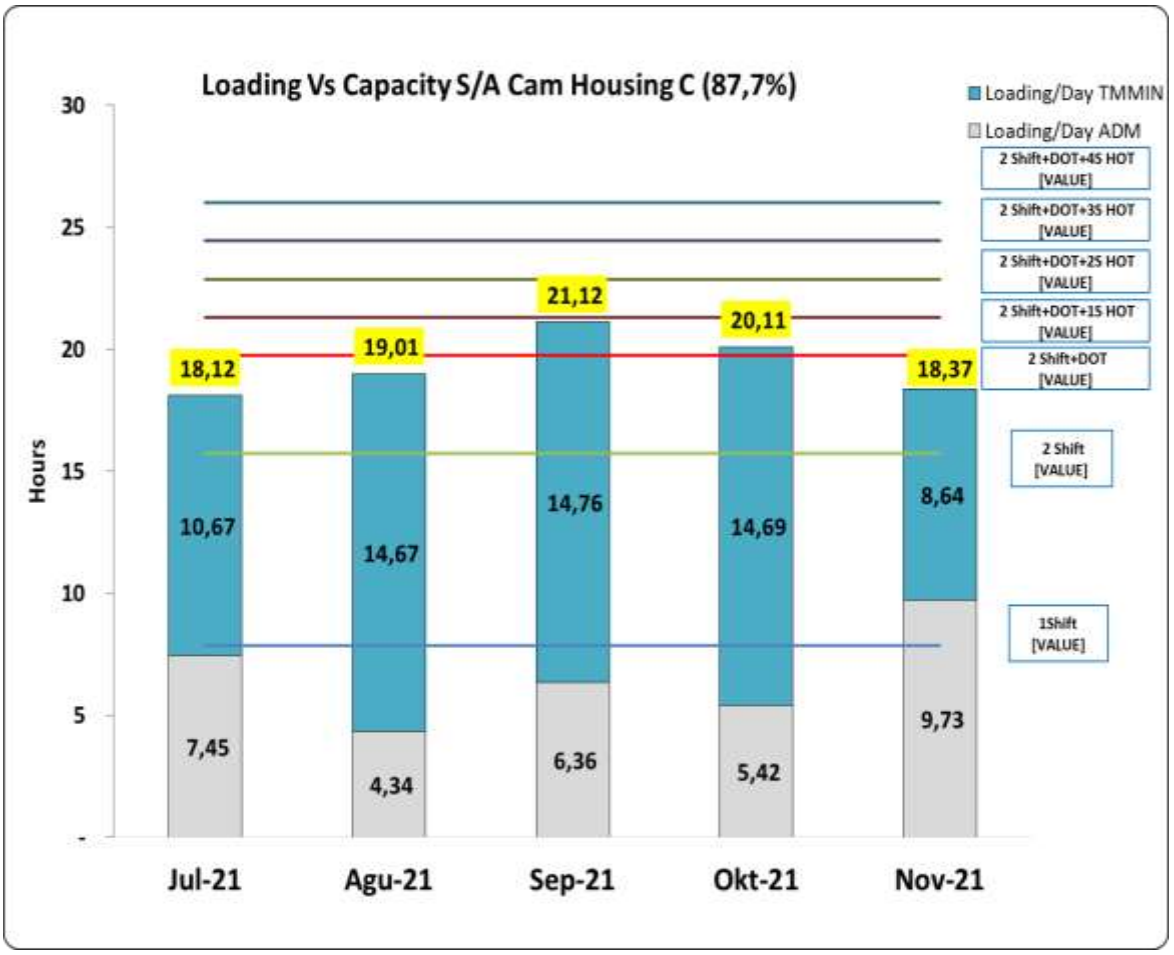

Figure 2 Grafik Loading vs capacity line Cam Housing Assy C
Source : Researcher (2021)

Based on the data and graphs above, loading vs capacity for the Cam Housing Assy C line exceeds the process line capacity in 2 shifts, which is above 15.7 hours / day of production process time. Plus at the beginning of 2022 for the Cam Housing line there is the addition of a new part model D05E. With these conditions, productivity problems in the Cam Housing Assy C line must be eliminated immediately.

RESEARCH METHOD

The approach taken in this study is to use a qualitative descriptive approach. Where the population of this study is all man power processes in the Cam Housing Assy C line, with a saturated sample of 16 people. The reason why the author uses a qualitative approach is because it gets a real picture of "the application of continuous improvement to increase the productivity of the Cam Housing Assy C line with the PDCA method. The research design taken is a qualitative research design starting by technically talking about each part, while the following is the research design:

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

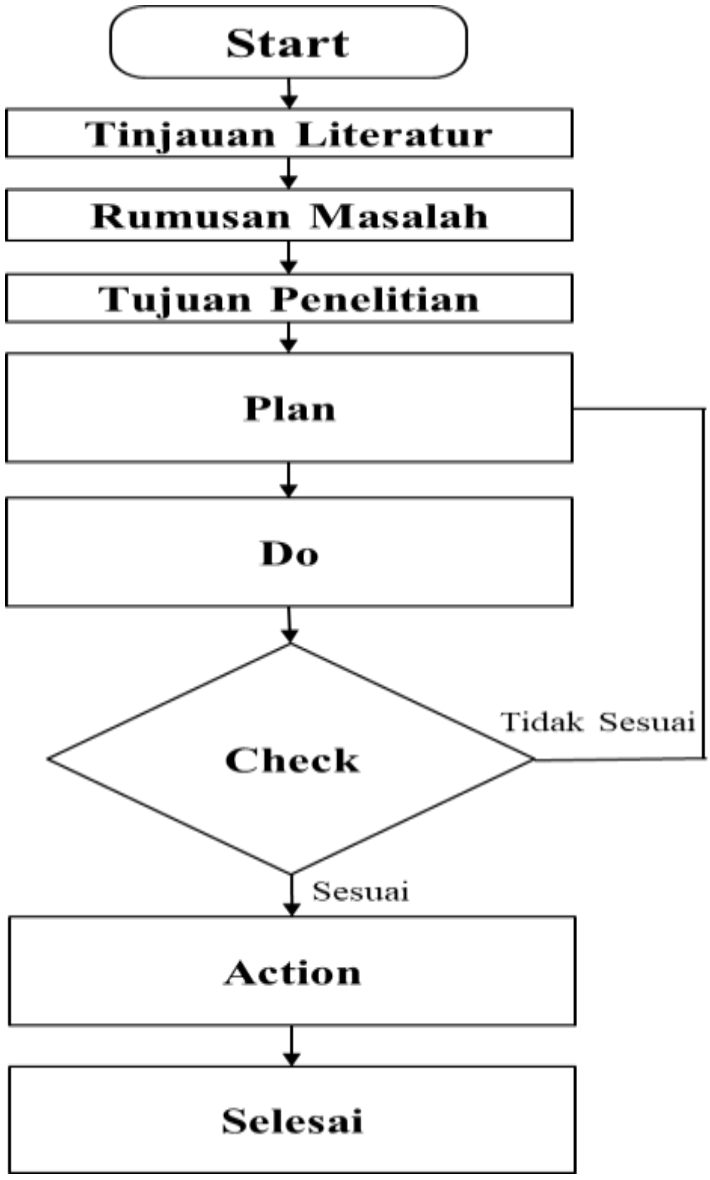

Figure 3 Concept Outline
Source : Data maintained by the author 2021

Data analysis in this case uses qualitative data analysis, then in data analysis during the field researchers use the Spradley model, which is a data analysis technique that is adjusted to the stages in the research, starting from collecting data with observation techniques, statifying data, making Combination Work Standard Tables, and making yamazumi charts to find problems that occur. After completing the data collection, immediately apply the PDCA method to solve problems that occur in the Cam Housing Assy C line

To avoid ambiguous interpretations of the variables used in the study. The following constraints or definitions must be applied to each variable. Research variables are everything in the form of anything that researchers set to be studied so that information is obtained about it, then conclusions are drawn (Sugiyono, 2014).

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

Table 1 Operational Variables

Variable	Definisi	Indicator	Scale
Waste	According to Gasperz (2007) Waste is all activities in the production process that do not provide value in the process starting from input to output throughout the Value Stream stream.	Unplanned losstime	Ratio
PDCA	PDCA is a cycle to test and implement changes to improve product quality.	Kaizen implementation	Nominal

RESULTS AND DISCUSSION

Phase Plan

After collecting data, an analysis was then carried out related to the application of the Continuous Improvement concept to increase the productivity of the Cam Housing Assy C line based on the PDCA (Plan-Do-Check-Action) stage.

Create a Combination Work Standard Table (CWST)

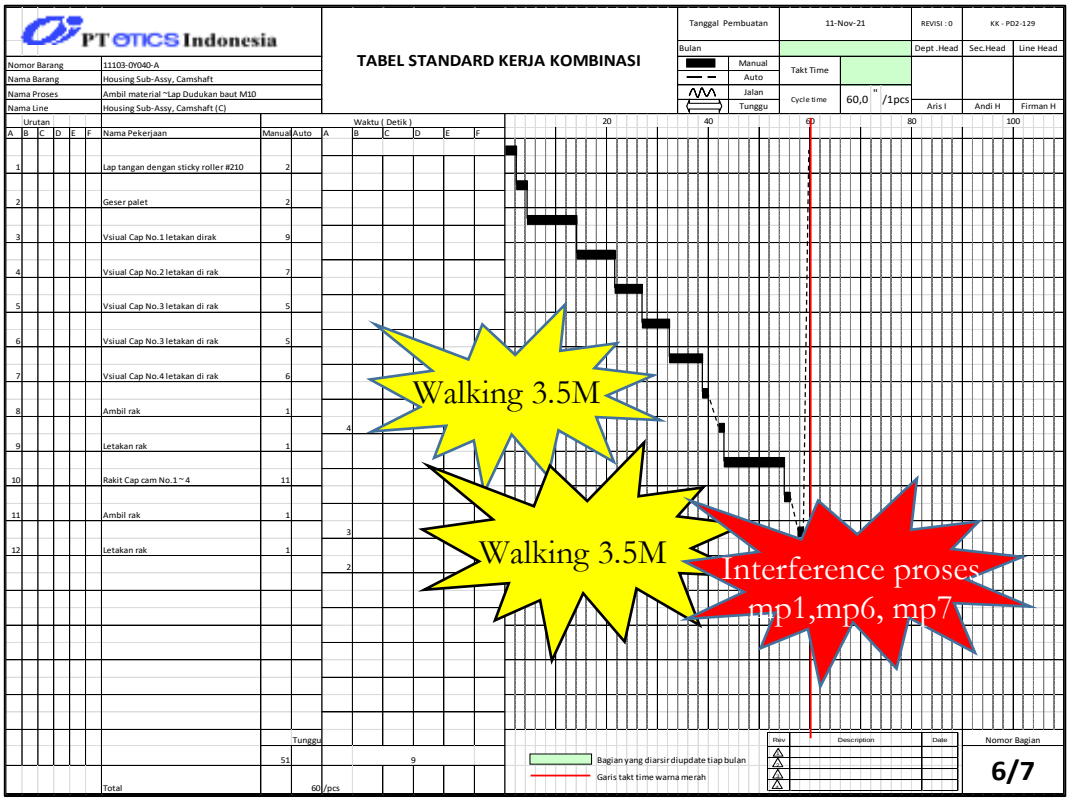

Figure 4 CWST line Cam Housing Assy C
Source : Researcher (2021)

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

Based on TSKK data, MP 6 Cycle Time is the longest at 60 seconds. After making TSKK, researchers can find out the capacity of the Line and find problems if there is a difference between TSKK and the actual Cycle Time of man power in the Line Assy C. From the TSKK data, the capacity of Line Cam Housing Assy C can be calculated, which is = (Loading Time: Cycle Time / MCT is the highest) x Line Efficiency = 817 pcs / day.

Creating Yamazumi Chart Line Cam Housing Assy C

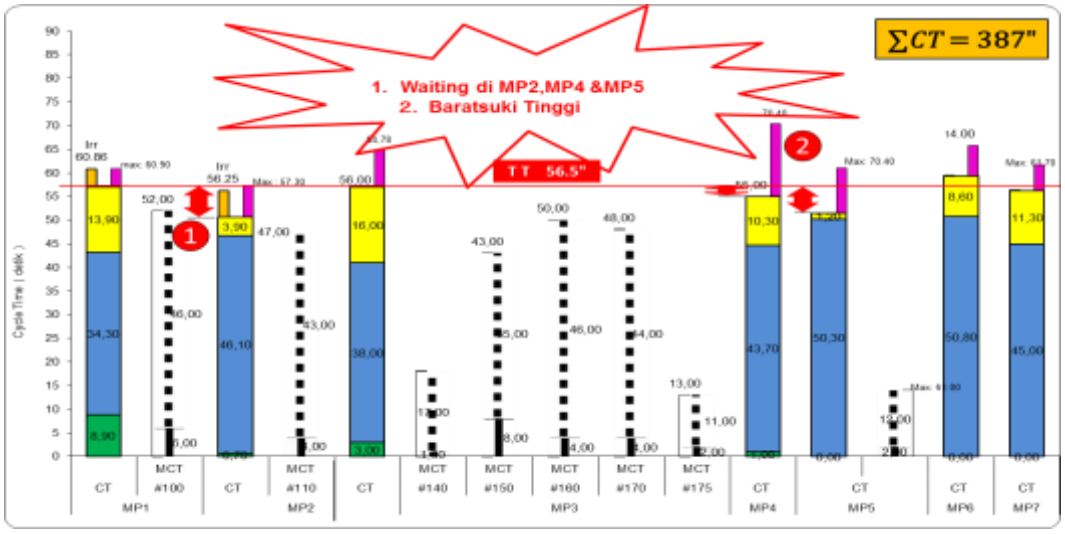

Figure 5 Yamazumi Chart Cam Housing Assy C
Source : Observation data

Based on yamazumi chart data, 2 problems were found, the first is Young waiting in MP2, MP3, and MP5. The second problem is the operator's cycle time up and down. After making the yamazumi chart, the author made direct observations to the production line to analyze productivity achievements in the Cam Housing Assy C line.

Analyzing the Productivity of Line Cam Housing Assy C

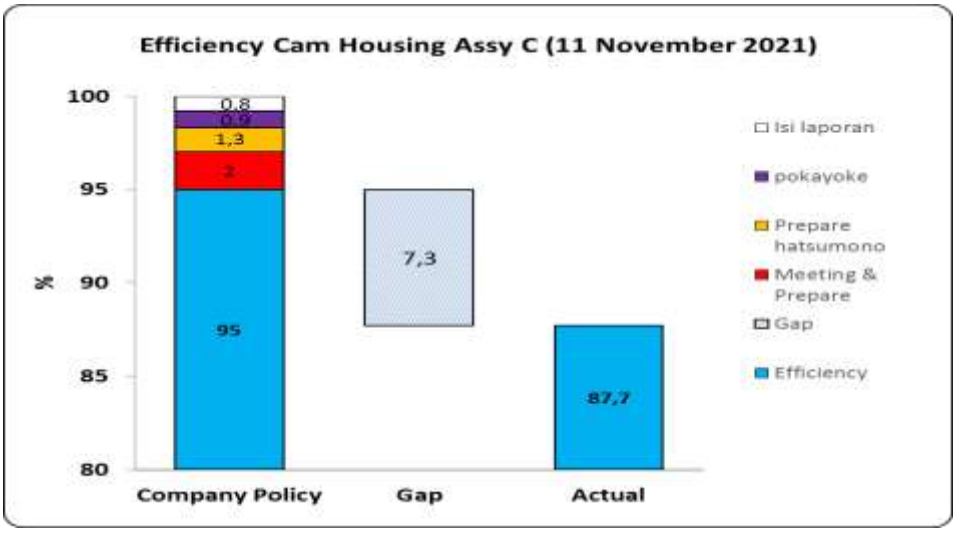

Figure 6 Results of Line productivity analysis Cam Housing Assy C

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

Source : Observation data

From the results of the analysis on November 11, 2021, productivity in the Cam Housing Assy C line has not been achieved, namely there is still a gap of 7.3% due to problems in the line coupled with regular loss time such as report content, pokayoke, prepare hatsumono, prepare PPE and meeting box. With these conditions, the problem in the Cam Housing Assy C line must be addressed immediately.

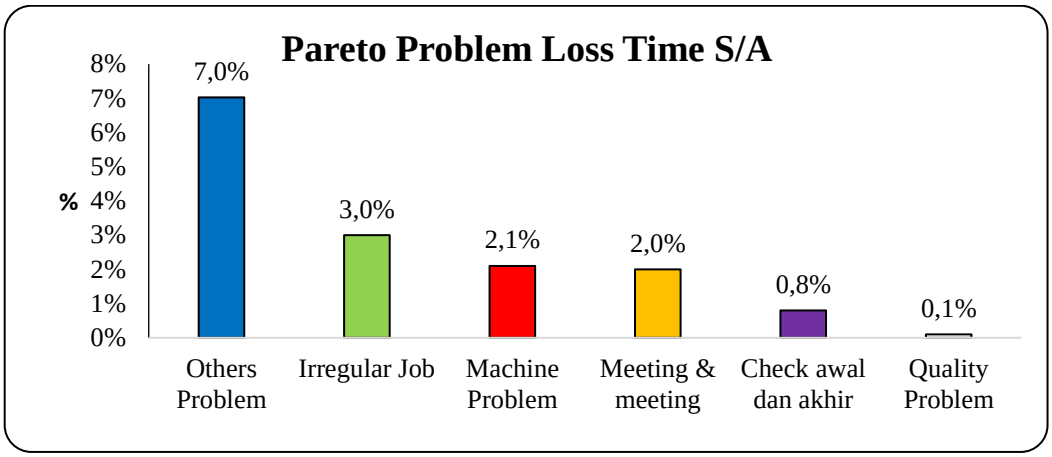

Figure 7 Pareto Loss time in line Cam Housing Assy C
Source : Researcher Data

Phase DO
Repair Planning

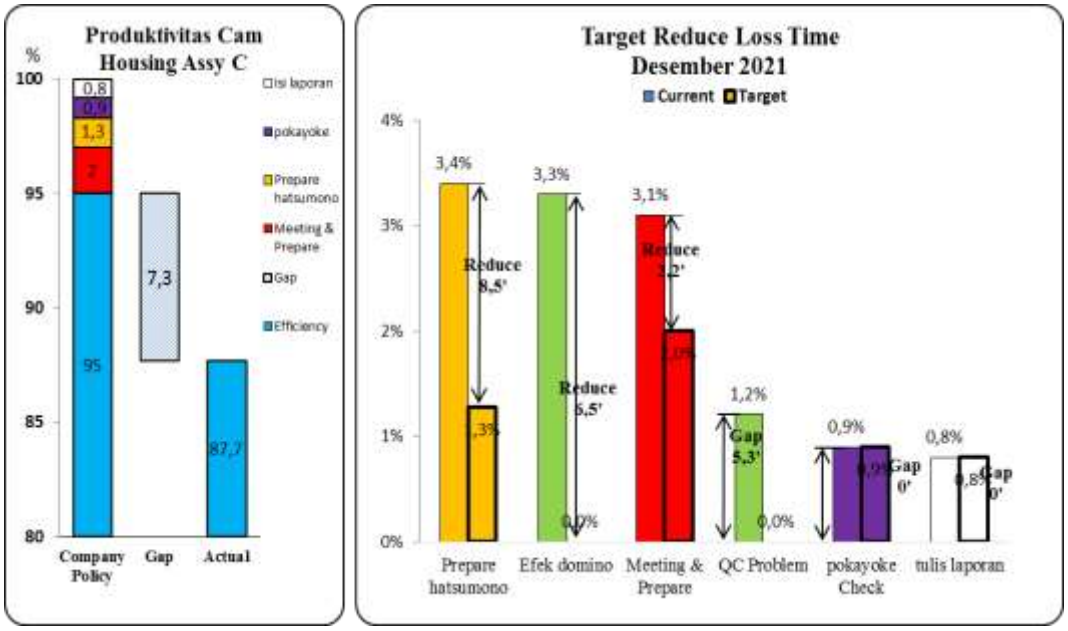

Figure 8 Target Reduce Loss time in line Cam Housing Assy C
Sumber : Data Peneliti

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

After analyzing the loss time data, researchers immediately made an improvement plan and set a target to increase productivity in the Cam Housing Assy C line, so that when there is a New Model (D05E) in 2022, the line is ready for the production process.

Implementation of Improvements

Improvement activities need to be carried out to support the achievement of targeted productivity. The activities carried out in this study were reducing Hatsumono prepare time, reducing the time of waiting effects (interference processes), reducing Muda Prepare PPE (Personal Protective Equipment), reducing Baratsuki (NVA), decreasing irregular time, and decreasing walking time. Here is the yamazumi chart after making repairs. Where there is still a waiting time.

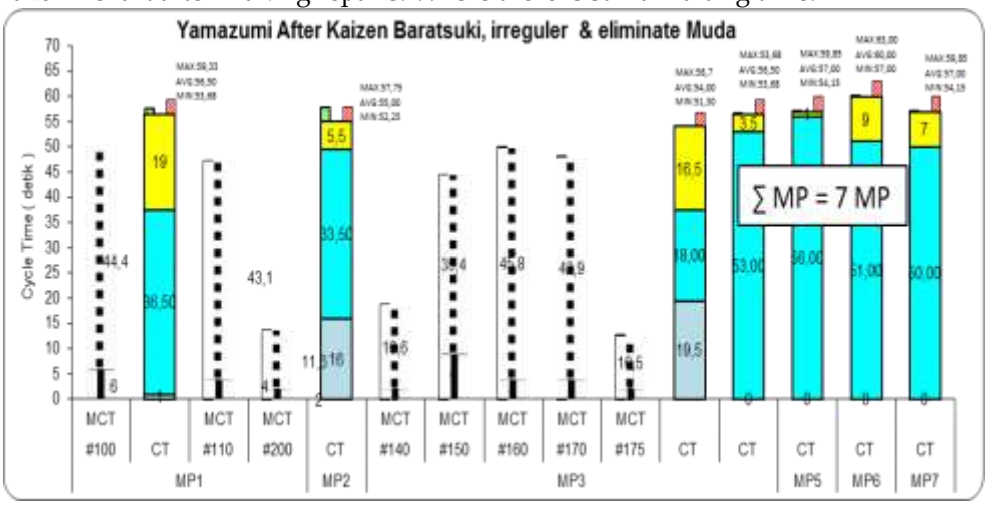

Figure 9 Yamazumi after kaizen
Source : Researcher Data

Balancing Job

Based on cycle time data after line repairs, it has the potential to be balanced loading or balancing workload by analyzing existing conditions. The following is a balancing activity where the work of MP 2 is transferred to another MP.

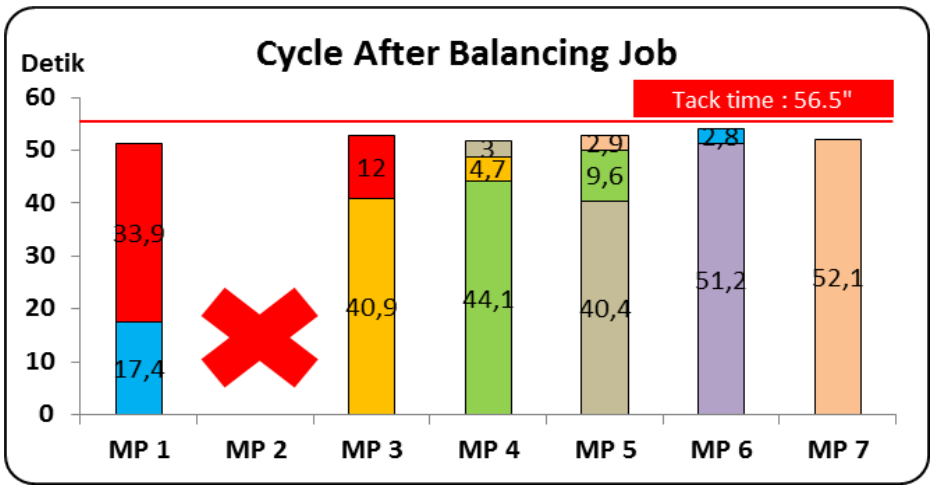

Figure 10 Job Balancing Activities
Source : Researcher Data

Table 1 Balance Sheet

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

No	Item kerja	MP1	MP2	MP3	MP4	MP5	MP6	MP7
	Before cycle time	20,2	46,6	45,6	53,7	43,4	51,2	55
1	Loading Unloading #110,pemasangan c/c dr no1 s/d no4 dan pemasangan baut M-7 (3pcs) (dr Mp2 ke Mp1)	33,9	-33,9					
2	Pemasangan baut M-10 (12 pcs) (dr Mp2 ke Mp3)		-12,7	12,7	-9,6	9,6		
3	Loading Unloading #170, #175 dan pelepasan baut M-10 (dr Mp3 ke Mp4)			-4,7	4,7			
4	Pelepasan baut M-10 (dari Mp4 ke Mp5)				3	-3		
5	Pengecekan Visual cek finish good dan pengisi-an material #100 (dr Mp1 ke Mp6)	-2,8					2,8	
6	Penambahan pengecekan baut M-7 (5 pcs) dan cek ketinggian baut (dr Mp6 ke Mp7)					2,9		-2,9
∑CT : 323,2	After cycle time	54,1	0	58,3	51,8	52,9	54	52,1

Source : Researcher data

Check Phase

Evaluation of Results

After completing improvement activities, the next step for researchers to evaluate, serves to find out the impact or changes before and after improvement. The following is the losstime data after the repair:

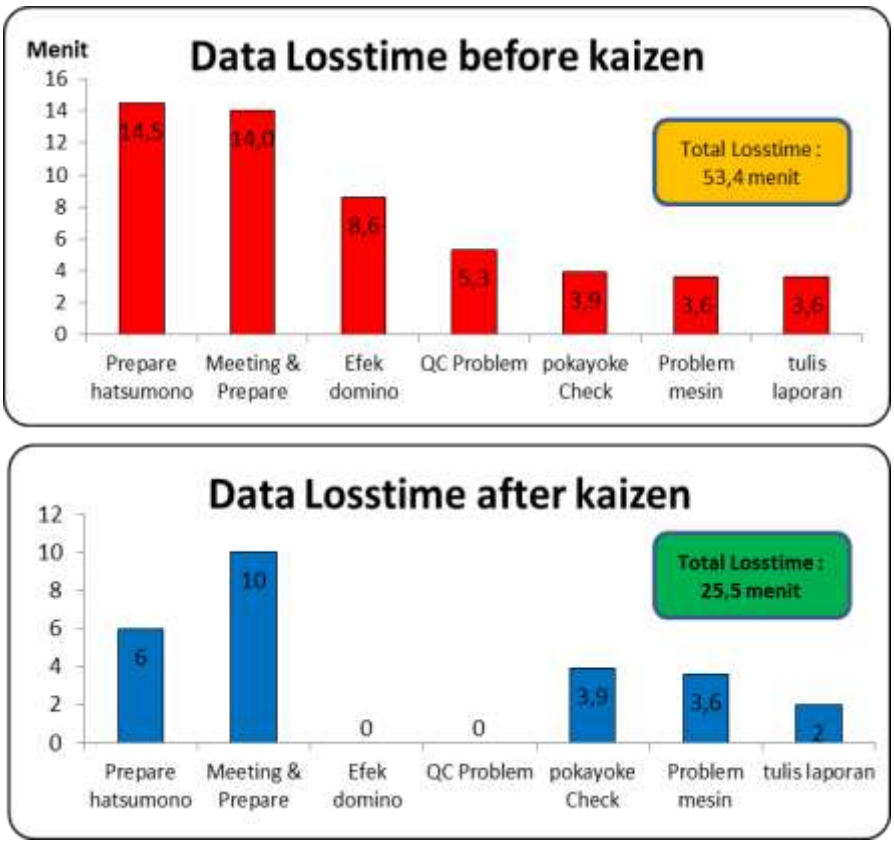

Figure 11 Data Losstime before vs after kaizen
Source : Researcher Data

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

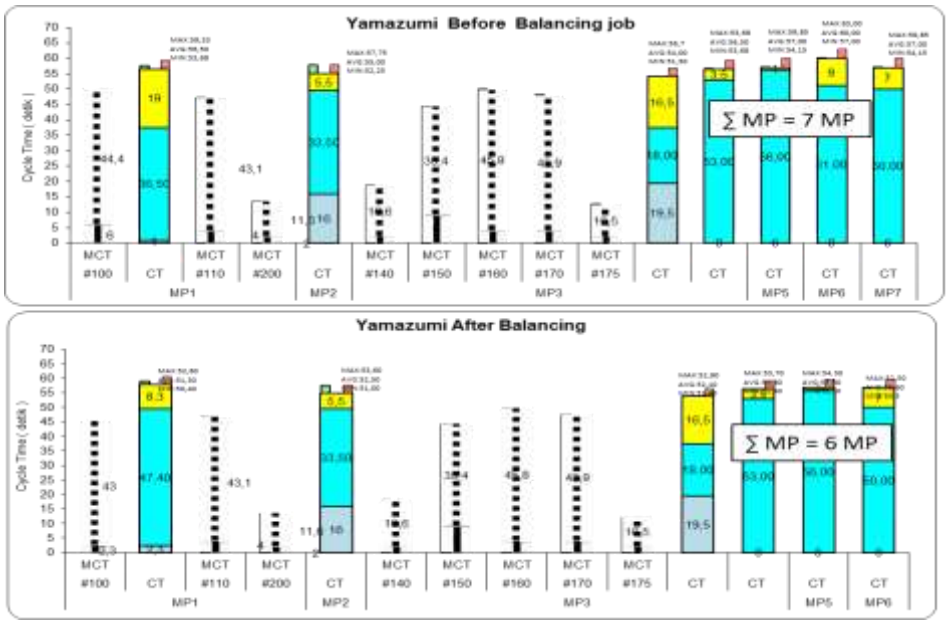

Figure 12 Yamazumi before vs after balancing job
Source : Researcher Data

Table 2 Data Cycle time line Cam Housing Assy C After Kaizen

NamaMP	Before (detik)	Balancing Job (detik)	After (detik)
MP 1	20.2	51.3	51.3
MP 2	46.6	(Balancing job)	52.9
MP 3	45.6	52.9	51.8
MP 4	53.7	51.8	52.9
MP 5	43.4	52.9	54
MP 6	60	54	52.1
MP 7	55	52.1	

Source : Researcher Data

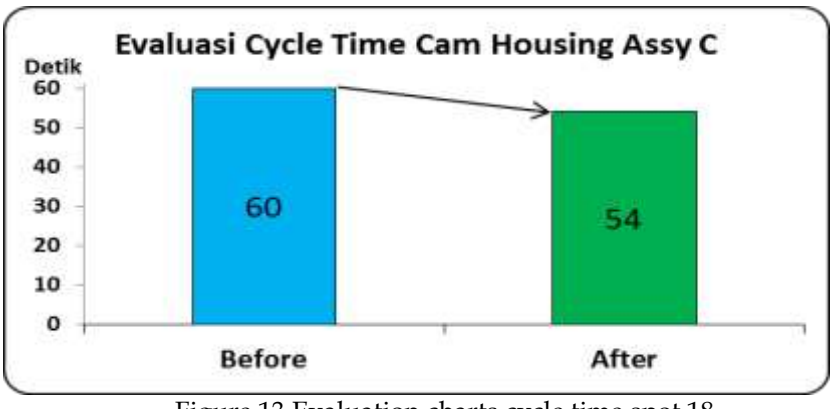

Figure 13 Evaluation charts cycle time spot 18
Source : Research data

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

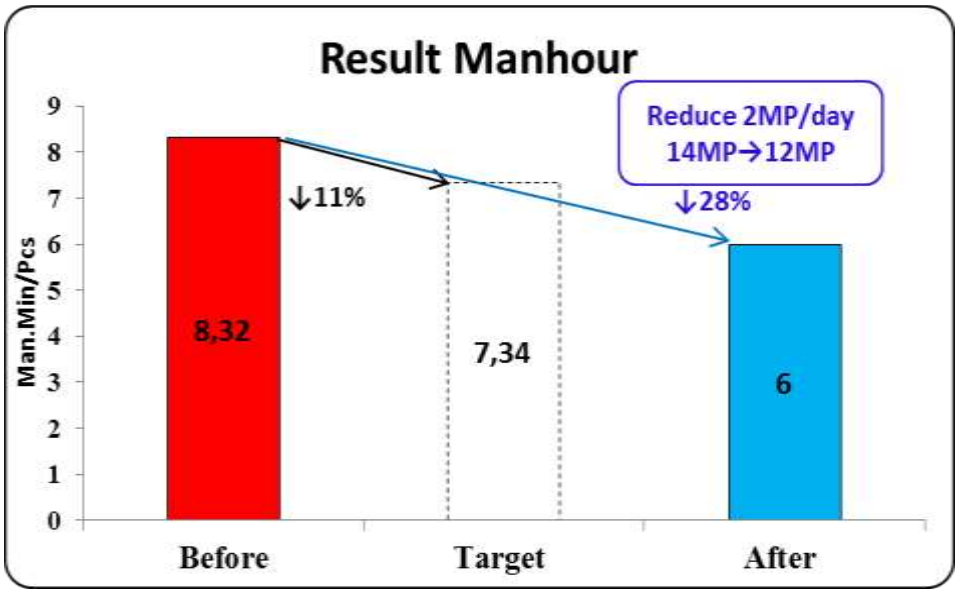

Figure 14 Manhours Achievements
Source : Research data

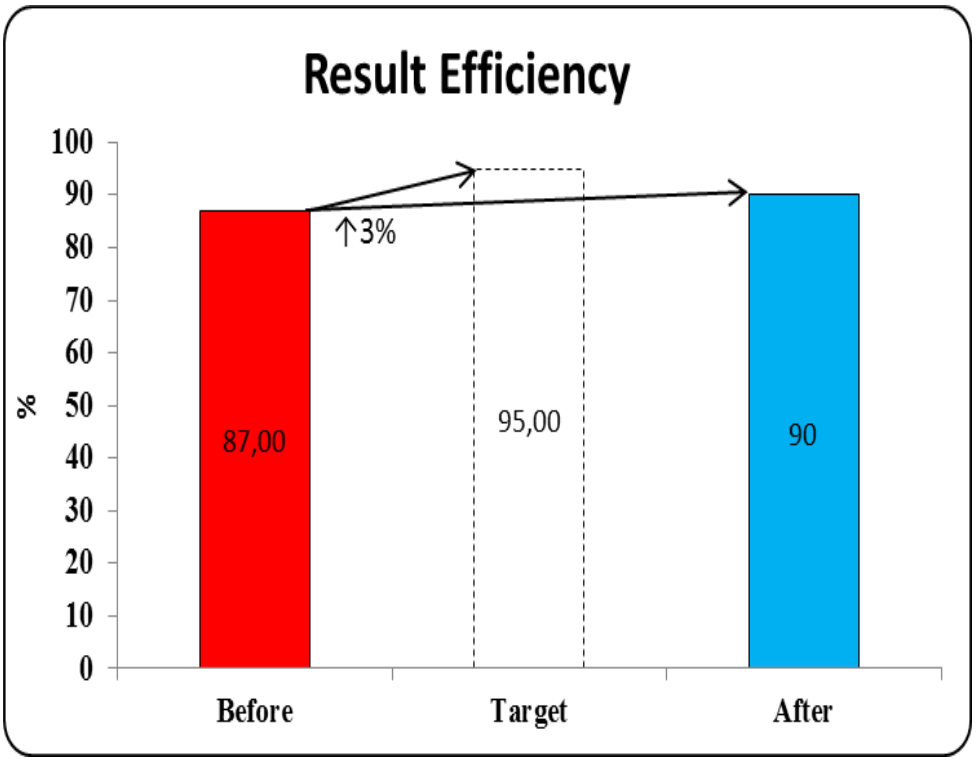

Figure 15 Efficiency achievement
Source : Research data

DEAL: International Journal of Economics and Business
Volume 02 No 01 April 2024
E-ISSN: 3026-2453
https://jurnal.pelitabangsa.ac.id/index.php/deal

Action Phase

So that the same problem is not repeated, then standardization is carried out with changes to TSKK.

Table 3 CWST Standardization

DAFTAR INDUK DAN DISTRIBUSI					
DOK.LEVEL IV - T S K K					
Divisi :PD 2		Judul Dokumen	Rev		
No.	Nomor Dokumen		Tgl		
110	KK-PD2-100	Tabel Standar Kerja Kombinasi - Housing Sub-Assy, Camshaft Assembly, 5-Cap, Cam Shaft Bearing	0	1	2
			17 Des '14	17 Des '17	17 Des '21
111	KK-PD2-101	Tabel Standar Kerja Kombinasi - Housing Sub-Assy, Camshaft Assembly, Bolt 5-M7, 15-M10	0	1	2
			17 Des '14	17 Des '17	17 Des '21
112	KK-PD2-102	Tabel Standar Kerja Kombinasi - Housing Sub-Assy, Camshaft Internal Deburring, Marking Deburring	0	1	2
			17 Des '14	17 Des '17	17 Des '21
113	KK-PD2-103	Tabel Standar Kerja KombinasiHousing Sub-Assy, Camshaft Inspection Inside Diameter	0	1	2
			17 Des '14	17 Des '17	17 Des '21
114	KK-PD2-104	Tabel Standar Kerja Kombinasi Housing Sub-Assy, Camshaft Loosen Bolt 5-M7, 15-M10	0	1	2
			17 Des '14	17 Des '17	17 Des '21
115	KK-PD2-105	Tabel Standar Kerja Kombinasi - Housing Sub-Assy, Camshaft 5-Cap, Camshaft Bearing Removed	0	1	2
			17 Des '14	17 Des '17	17 Des '21
116	KK-PD2-106	Tabel Standar Kerja Kombinasi Housing Sub-Assy, Camshaft Inspection (Journal)	0	1	2
			17 Des '14	17 Des '17	17 Des '21
117	KK-PD2-107	Tabel Standar Kerja Kombinasi - Housing Sub-Assy, Camshaft Tighten (Bolt5-M7), Visual Inspection	0	1	2
			17 Des '14	17 Des '17	17 Des '21

Source : Research data

Discussion

From the results of productivity analysis in the Cam Housing Assy C line, the factors that become productivity problems are regular loss time such as report content 0.8%, machine pokayoke 0.9%, prepare hatsumono 3.5%, prepare PPE 3.1% and meeting box 2%. After analyzing the loss time data, the main factor that became a productivity constraint in the Cam Housing Assy C line was preparing Hatsumono with a percentage of 3.5%.

After analyzing the loss time data, an improvement plan was carried out and set a target to increase productivity in the Cam Housing Assy C line. From this improvement when hatsumono does not have to go out of line to save parts, so the road time is reduced from 60 seconds to 10 seconds. The second improvement relayout the line and changed the MP1, MP6, and MP7 cycles. The result is no interference in the MP1, MP6, and MP7 process areas so that cycle times are smoother.

The third activity is making equipment to store operator PPE in each area. So the operator does not have to wait and walk to the glove holder. The result of this improvement is that PPE preparation time can be reduced from 5 minutes to 3 minutes. The fourth activity makes the buffer for the M10 storage box close to the operator's position, so the operator feels more comfortable when picking up bolts. The result of this improvisation is also baratsuki can go down and the bolt retrieval time from 2 seconds drops to 1 second.

The fifth improvement activity is to replace the cam cap box so as to increase the quantity of parts per box, previously the capacity of the cam cap part was 5 pcs / box the condition is now 36 pcs / box so that the box storage baratsuki is reduced. The sixth repair activity modified the conveyor to be straight, with the previous length of 6 meters to 1.7 meters. So that it can reduce operator fatigue and the road cycle time is reduced from 5 seconds to 1.5 seconds. The seventh improvement activity is the application of karakuri, where the work in MP 6 is reduced, so that it can reduce cycle time by 3 seconds.

From several kaizen that have been done, the application of continuous improvement when preparing hatsumono, is able to increase productivity on the Cam Housing Assy C line from 8.32 Man.Min/pcs to 6 Man.Min/pcs and has exceeded the desired target of 7.43 Man.Min/pcs. The results of repair activities were also able to increase efficiency in the Cam Housing Assy C line. The achievement before the research was carried out was 87%, after the research activity rose to 90%.

CONCLUSION

Based on the results of the analysis that has been done, it can be known that the main factor that can affect productivity is the method factor. From the method factors that contribute to the inhibition of productivity increase, namely when preparing hatsumono by (3.5%). Based on the analysis data that has been done, the application of continuous improvement is able to increase productivity on the Cam Housing Assy C line from 8.32 Man.Min/pcs to 6 Man.Min/pcs and has exceeded the desired target of 7.43 Man.Min/pcs. The results of repair activities were also able to increase efficiency in the Cam Housing Assy C line. The achievement before the research was carried out was 87%, after the research activity rose to 90%. The results of research in the Cam Housing Assy C line can be applied in lines that have the same characteristics. This research demonstrates that the PDCA method is a powerful tool for driving continuous improvement and increasing productivity in manufacturing settings. By addressing specific inefficiencies, engaging employees, and leveraging data-driven techniques, organizations can achieve significant operational enhancements and align their productivity goals with quality and sustainability objectives.

LIMITATIONS AND FUTURE WORKS

Based on the results of research that has been conducted at PT Otics Indonesia. Researchers provide several suggestions that are expected to provide benefits for the company including: (1) In carrying out improvement activities in the company must involve all elements or direct support from all parties. So that repair activities can be completed immediately and the benefits can be immediately felt both for employers and their employees. (2) Applying TSK and TSKK as standards in production activities and can be used as a reference in making work instruments. (3) Socialization and conduct comprehensive training on unit heads, group heads and man power on 19 young view points to find out the importance of work containing young elements, mura and muri. (4) Conduct training or training for all employees on kaizen culture or improvement in the hope of being able to take part or contribute to advancing the sustainability of the company starting from the smallest improvements. (5) The author hopes that this research can be useful as a reference for other research with different concepts and the expansion of material and methods in this research in the future.

References

Achad Hasta Mohamad (2018). Meningkatkan Kapasitas Produksi Rear Axle Assy Menggunakan Metode Penyeimbangan Beban Kerja Operator di PT Inti Ganda Perdana

Arief Fatkhurrohman, Subawa. Penerapan Kaizen Dalam Meningkatkan Efisiensi Dan Kualitas Produk Pada Bagian Banbury PT Bridgestone Tire Indonesia ADMINISTRASI KANTOR, Vol. 4, No.1, Juni 2016

Azwir, Hamdi, H., & Setyanto, Kurniawan. (2017) Analisis penerapan lean manufacturing pada penurunan cacat Feed Roll menggunakan metode PDCA (studi kasus PT. XYZ) Jurnal Rekayasa Sistem Industri Vol 6 No.2:p.105-117.

Brunet, A.P., & New, S. (2003), Kaizen in Japan :an emprirical Study, International of Journal of Operations & Production Management, Vol. 23 No. 12, pp. 1426-1446.

Dian Trihastuti. (2012) Studi Literatur Penerapan Continuous Improvement System (Kaizen) di Jepang, Cina, Inggris. EKSEKUTIF Volume 9 No. 2 Desember

Ekoanindiyo FA. 2013. Pengendalian Kualitas Menggunakan Pendekatan Kaizen. Jurnal Manajemen, hal 1- 10.

Gaspersz V. 2006. Total Quality Management (TQM) Untuk Praktisi Bisnis Dan Industri. Jakarta: Gramedia Pusaka Utama.

H. Hartono and F. Fatkhurozi. (2021). Penerapan Kaizen Untuk Mengurangi Loss Time Dalam Peningkatan Produktivitas Mesin Infrared Welding (Studi Kasus Pt. Mitsuba Indonesia) Journal Industrial Manufacturing Vol. 6, No. 1

Hayu Kartika. (2020). Penerapan Kaizen untuk Meningkatkan Produktivitas Line Painting pada Bagian Produksi Automotive dengan Metode PDCA. Jurnal Sistem Teknik Industri (JSTI) Vol.22, No. 1

Hery Hamdi Azwir, Heru Satriawan. (2018) ANALISIS JAM KERJA EFEKTIF DALAM UPAYA PENINGKATAN PRODUKTIVITAS TENAGA KERJA DENGAN METODE PDCA DI PT NMI Spektrum Industri, Vol. 16, No. 1, 1 – 110

Imai, M. (1997), Gemba Kaizen : a Commonsense, Low-Cost Approach to Management, McGraw-Hill, New York.

Imai, M. (2001), Kaizen Kunci Sukses jepang dalam Persaingan, PPM, Jakarta.

Imai, M. (2008), The Kaizen Power, Diva Press, Jakarta.

Kemp, PMP., S. (2006), Quality Management Demystified, McGraw-Hill, New York.

Liker, J.K. (1997), Becoming lean: Inside Stories of U.S. Manufacturers, Productivities press, Portland.

Smalley A, Isao K. 2011. Toyota Kaizen Methods. Jakarta: Gradien Mediatama.