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THE ANALIZE OF WASTE ELIMINATION ON SA CONTACT BLOCK TO INCREASED THE OUTPUT BY LEAN MANUFACTURING METHOD (STUDI CASE: PT SCHNEIDER ELECTRIC)

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Abstract

PT. Schneider Electric Manufacturing is a global company leading digital transformation in the fields of energy management and automation. PT. Schneider its prioritizes continuous improvement to control the production process. These include modular and Monoblock sub-assemblies. In controlling effectiveness in a production system it should be a good level on utility (utilization), but after analysed it found low utilization on line production Monoblock many problems with waste from production operators, material transfer and waiting times due to unbalanced processes resulting in less output. (not reaching the target) this has a huge impact on efficiency and productivity. To increase output and utility, use 3 lean manufacturing methods, including Kaizen, Line balancing and Kanban super market to improve overcome problems in the production area. After implementation, utility and output become better.

Keywords: Analysis, utilization, continuous improvement, lean manufacturing, kaizen, line balancing, Kanban super market

1. INTRODUCTION

The development of the world of manufacturing and service industries is currently increasing rapidly so that companies are required to be able to survive and always improve their effectiveness and efficiency in carrying out the production process, PT. Schneider Electric Manufacturing is a global company leading digital transformation in the fields of energy management and automation. PT Schneider itself really prioritizes continuous improvement in the control of its production process, which is divided into various kinds of production lines, power, machines and control methods. Among them are modular and monoblock contact block sub assemblies which will be used as research objects this time.

In controlling effectiveness in a production scope, controlling time or cycle time is the most important, as it has an important role in the production efficiency , a production line should have good utilization. The utilization rate is defined as the percentage of the total employee working hours that been used. productively spent, hours billable to clients. Good utilization generally reaches 80% to 100% but it was found that monoblock production lines have low utilization, many problems with waste from production operators, material transfer and waiting time because the process is considered unbalanced resulting in less output

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(unreached target) currently the average output of monoblocks is 284 pcs / hours but the company's standard output is about 310 pcs / hours , as for modular currently the average output has reached 310 pcs / hour as the company standard of 350 pcs. In this case it has a very rapid impact on efficiency and productivity.

According to Theisens in his book entitled "Lean Six Sigma Green Belt: Mindset, Skill set and Tool set" 2020 Waste can be defined as any work activity that does not provide value added in the process of transforming input into yhr output along the Value stream (process for create, produce and deliver products, both goods and services, to the market). waste is any unnecessary step in the manufacturing process that does not benefit the customer, therefore the customer is unwilling to pay for it. When you eliminate waste, you are left with only the steps necessary to deliver a satisfactory product and high value to customers.

Lean manufacturing is a solution to make continuous improvements to modular and monoblock production lines and conduct research using lean manufacturing methods including Kaizen Blitz to help overcome problems in the production , by carrying out observations to look for problems carried out on the production line in question. The tools used are Gemba walks on modular and monoblock production lines.

2. Research methods

This research has been carried out at PT. Schneider Electric Manufacturing on the contact block production line. with the following stages :

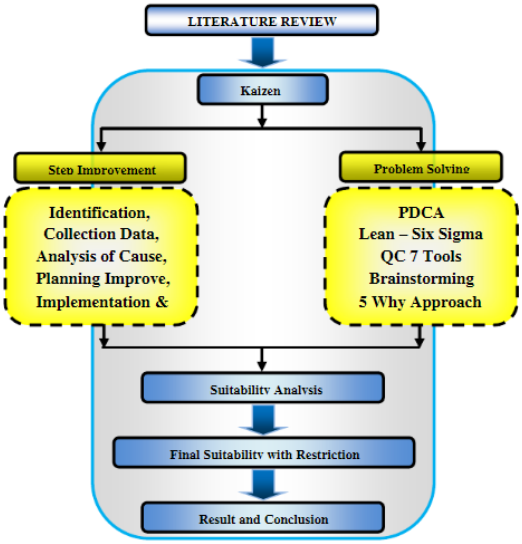


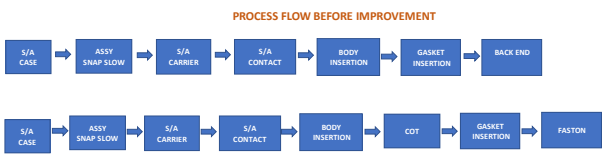
Fig. 1. Study framework

3. RESULT AND DISCUSSION

a) Process Mapping Modular and Monoblock

A process flow map is a diagram that shows the sequence of operations, inspection, transportation, waiting and storage that occur during a process. As per bellow process flow on Monoblock and Modular contacts, Process mapping before improvement is quite complicated, as there are so a lot unused bench capacity, waste in time causes messy process flow, and this is a key problem that companies need to pay close attention to. The mapping process that occurs on modular and monoblock lines is as follows :

Fig 2 .Process flow before Improvement



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b. cycle Time and Out put

The measurement of data used in this processing data is MTM, bellow data of measurement time method of modular and monoblock.

A. cycle time and out put on Monoblock

Table .1 Process Out Put and MTM on Monoblock

Process	Out put	Dt MTM	MTM Actual
S/A Case	382	9.42	7.4
Assy Snap Slow	325	5.8	8.8
S/a Carrier	300	17.86	17.2
S/a Contact	237	23.34	22.21
Body insertion	230	11.28	8.86
Gasket Insertion	230	14.4	11.12
Total :	**1704**	**82.1**	**75.59**
Average :	**284**	**13.7**	**12.6**

as per table above, the total output on the monoblock production line only reached around 1,704 pcs / day or an average of 282 pcs / hour. as The company's output target is 1,860 pcs / day or 310 pcs / hour.

B. cycle time and out put on Modular

Table .2 Process Out Put and MTM on Modular

Process	Out put	Dt MTM	MTM Actual
S/A Case	382	9.42	7.4
Assy Snap Slow	325	5.8	8.8
S/a Carrier	315	17.86	17.2
S/a Contact	300	23.34	22.21
Body insertion	290	11.28	8.86
COT	288	16.3	15.55
Gasket Insertion	270	14.4	11.12
Total :	**2170**	**98.4**	**91.14**
average:	**310**	**14.1**	**13.02**

as per table above it can be seen that the total output on the modular production line only reached 2,170 pcs per day or an average of 310 pcs / hour. as The company's target is 2,450 pcs / day or 350 pcs / hour.

c. Kaizen Blitz Application in continuous improvement

on this research, the method used is the Kaizen five step plan, this step plan is an approach to implementing Kaizen used by Japanese companies. This step can be mentioned as the 5-S movement which is the initials of the Japanese words that start with the letters 5S : Seiri, Seiton, Seiso, Seiketsu, Shitsuke. In this research, a kaizen implementation tool was used in the form of DMAIC which is summarizes as follows.

1. Define

Define is the step where determining a problem that occurs in the production area, observations are carried out to collect information about operators carrying out excessive processing activities or what is called NVA/VA, initial observations are by taking videos and carried out with motion studies to find out whether operators are carrying out NVA/VA activities, as follows is a graphic image results from video process analysis of SA Contact Modular and Monoblock.

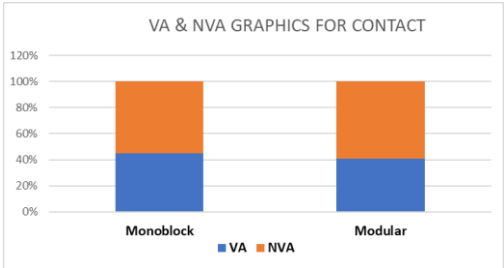

Fig 3 . VA & NVA GRAPHICS FOR CONTACT

From the data above, it shows that S/A contact Modular has the longest duration of non-value added activities compared to S/A contact blocks during the assembly process. The impact of the large number of NVA reduces the effectiveness of this

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production line and the costs incurred are not commensurate with the expected output.

Table .3 Modular and Monoblock Data Recap

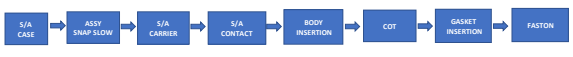
Modular and Monoblock Data Recap after video capture				
VA/NVA	*Monoblock*	presentase	*Modular*	presentase
VA	00.35.34	45%	00.25.00	41%
NVA	00.28.42	55%	00.35.23	59%
Value added average	48%			

The table above is a summary of the average VA activities of each operator, these results show that the percentage of carrying out VA and NVA activities from these activities is that Monoblock operators carry out NVA activities as much as 55% and Modular operators carry out NVA activities as much as 59% which is quite low compared to the percentage level above. fairly good, namely 70%.

2. Measure

Measure is detailing the activities in the process carried out on the 2 Monoblock and Modular lines. The following is the process flow data on the Modular and Monoblock production lines and Out put data as well as MTM (measurement time method) data which is a system for determining the initial standard time which is carried out manually. indirect and developed based on the study of work movement images from an industrial work operation.

a. *S/A monoblock*
The process stages in monoblocks consist of: S/A case, Slow snap assembly, S/A Carrier, S/A Contact, Body Insertion, Gasket insertion, and back end. It has a straight flow as per below picture :



FiFig 4.6 S/A Monoblock process flow

The following is Process, Output and MTM data on S/A monoblock

Table .4 mtm Monoblock

Process	Out put	Dt MTM	MTM Actual
S/A Case	382	9.42	7.4
Assy Snap Slow	325	5.8	8.8
S/a Carrier	300	17.86	17.2
S/a Contact	237	23.34	22.21
Body insertion	230	11.28	8.86
Gasket Insertion	230	14.4	11.12
Total:	**1704**	**82.1**	**75.59**
Average:	**284**	**13.7**	**12.6**

the average output from Moblock is 284 but the current output target is 330.

b. Modular
The modular itself has types 22, 26, 33, 40, 41 and 52. The process stages in modular consist of: S/A case, Slow snap assembly, S/A Carrier, S/A Contact, Body Insertion, Gasket insertion, and back end. It has a straight flow like the picture below:

Fig 4.7 Modular process flow

The following is Process, Output and MTM data on Modular

Table .5 mtm Modular

Process	Out put	Dt MTM	MTM Actual
S/A Case	382	9.42	7.4
Assy Snap Slow	325	5.8	8.8
S/a Carrier	315	17.86	17.2
S/a Contact	300	23.34	22.21
Body insertion	290	11.28	8.86
COT	288	16.3	15.55
Gasket Insertion	270	14.4	11.12
Total:	**2170**	**98.4**	**91.14**
Average:	**310**	**14.1**	**13.02**

the average out put from Moblock is 310 but the current out put target is 350.

3. analize

On the analysis step, the Gemba walk method is used, a method that is a search carried out while walking through the

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production area, as a way to understand the operator. And by carrying out this analysis the author got the following results :

1. Messy material flow, material jumping from one bench to another distant bench
2. There are more benches available in production than required
3. Unbalanced process design
4. Waiting time of the SA contact process

4. Improve

At this stage, we provide solutions to problems that have been discovered in the previous gemba walk. The results of improvements in the process flow are as follows: simplifying this process can increase the capacity and movement of operators better so that output can be achieved well.

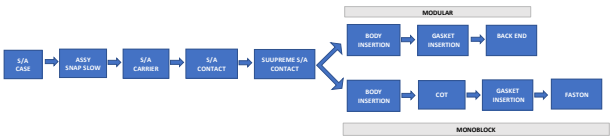

Fig 4.8 process flow after improvement

5. Control

control is the most important step in every continuous improvement, after doing alla of step of DMAIC on kaizen Control will be the final step on it.

Improvement

Before the improvement was carried out, the author found that the NVA activity was quite high, because it reached 55%, which was an excessive process such as repeated checking, causing the NVA activity to be quite high and the VA process to be said to be very low, reaching only 45%. And after the average it only reached 47%, but after improvements were made the data rose significantly to 73% for monoblock and 74% for modular. As in the diagram below**.**

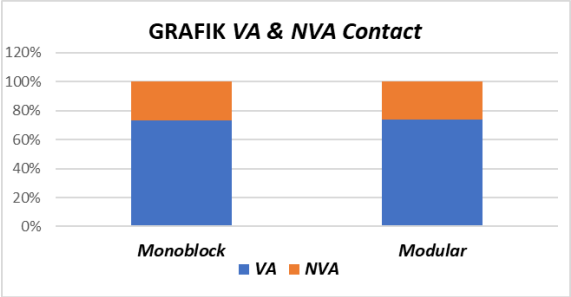

Fig 4. VA & NVA Graphic after improvement

Table .5 VA and NVA sumary after improvement

Data Modular and Monoblock after improvement						
operator contact	monoblock			modular		
VA/NVA	before	after	result	before	after	result
VA	28:42	43:34	+14:52	34:50	45:45	+ 10:55
NVA	35:34	15:55	- 19:39	28:13	16:13	- 12:00
VA average	45%	73%	+ 29%	55%	74%	+ 19%

Production layout before and after improvements are carried out

Before the improvement was carried out, the layout showed a straight flow but was too complicated because the process was messy and made activities slow down. and summarized as follows :

d. Messy material flow, material jumping from one bench to another distant bench
e. There are more benches available in production than required
f. Unbalanced process design
g. Waiting time of the SA contact process

However,after improvements have been made, the layout shows the flow with the processes of S/A Contact, slow snap assembly, S/A carrier, S/A Contact, supermane snapslow into one process and separated based on each model, here is a summary after improvements were made to the production line This.

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- Improve material flow
- Store necessary benches only based on customer request
- Design the balance process
- Implementation of Supermarket SA to eliminate waiting times
- Saving costs after making improvements

This improvement also minimizes the costs that the company incurs thereby providing better profits. Before the company made improvements to the line, monoblock and modular, it required 24 people in one working day, 12 for modular and 12 for monoblock so it can be calculated at around IDR 1,296,041,472 / year for 24 operators. However, after improvements were made, the modular and mobnoblock lines only required 22 people a day, namely 11 monoblocks and 11 on the modular line, so the company only spent IDR 1,188,038,016 / year and the company could save costs of around 108,003,456 / year. The following is the saving projection that the company has made for its modular and monoblock lines.

After making improvements to the modular and monoblock line process flow, material flow and production processes became neater and better, thereby increasing efficiency in output, process flow and material flow became better, and output increased to be better as in the table below:

a. Mono block

Table .6 output result before and after monoblock

S/A Monoblock		
Process	**Before**	**After**
S/A Case	382	390
Assy Snap *Slow*	325	370
S/a *Carrier*	300	360
S/a *Contact*	237	350
Body insertion	230	350
Gasket Insertion	230	340
average	**1,704**	**2,160**
	284	**360**

As per table mentioned the average out put from Moblock is 284, but the current standard out put is 350 and it was increased to 360 pcs / hour.

b. *Modular*

Table .7 output result before and after modular

Modular		
Process	**Before**	**After**
S/A Case	382	450
Assy Snap *Slow*	325	440
S/a *Carrier*	315	410
S/a *Contact*	300	390
Body insertion	290	375
COT	288	375
Gasket Insertion	270	360
Total	**2,170**	**2,800**
	310	**400**

As per table mentioned the average out put from Moblock is 310 , but the current standard out put is 350 and it was increased to 400 pcs / hour.

Summary

Based on research conducted by researchers at PT. Schneider Electric on monoblock and modular lines, it can be concluded that:

a. To find out how much production output can be increased, from the results of previous monoblock output research, it has increased rapidly by 20%

Tabel 8 output Monoblock

S/A Monoblock		
Process	**Before**	**After**
S/A Case	382	390
Assy Snap *Slow*	325	370
S/a *Carrier*	300	360
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Tabel 9 output Modular

Modular		
Process	**Before**	**After**
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S/a *Carrier*	315	410
S/a *Contact*	300	390
Body insertion	290	375
COT	288	375
Gasket Insertion	270	360
Total	**2,170**	**2,800**
	310	**400**

2. Minimize costs to avoid wasting costs.
Before the company made improvements to the line, monoblock and modular, it required 24 people in one working day, around IDR 1,296,041,472 / year. However, after improvements were made, the modular and mobnoblock lines only required 22 people a day, namely 11 monoblocks and 11 on the modular line, so the company only spent IDR 1,188,038,016 / year and the company could save costs of around 108,003,456 / year. The following is the saving projection that the company has made for its modular and monoblock lines.

3. To reduce the duration of NVA on the contact block production line.

Data Modular and Monoblock after improvement						
operator contact	monoblock			modular		
VA/NVA	before	after	result	before	after	result
VA	28:42	43:34	+14:52	34:50	45:45	+ 10:55
NVA	35:34	15:55	- 19:39	28:13	16:13	- 12:00
VA average	45%	73%	+ 29%	55%	74%	+ 19%

Suggestion

The sugestion that the author gives is to monitor improvements that have not been implemented, the sooner they are implemented, the more NVA can be reduced on modular and monoblock production lines, maintain improvements that have been made to get better results and increase utility on modular and monoblock production lines.

REFERENCES

[1] Alba-Baena, N. (2023). Lean-Sigma as a Strategy in Supply Chain Management During the COVID-19 P*and*emic Crisis-*Les*sons Learned. In Supply Chain Management Strategies *and* Methodologies: Experiences from Latin America (pp. 123-147). Cham: Springer International Publishing.

[2] Al Faritsy, A. Z. (2013). Meningkatkan Kualitas dengan Metode Lean Sigma dan Kaizen.

[3] Anggraini, W., Hutagalung, M., Nofirza, & Nurainun, T. (2018). *Value* Stream Mapping Pada Proses Produksi Plywood. Seminar Nasional Teknologi Informasi Komunikasi dan Industri, (pp. 507-516).

[4] Arrizal, L. T., Sudiarso, A., & Herliansyah, M. K. (2021, November). MINIMALISASI WASTE PADA PROSES PRODUKSI BATIK CAP MENGGUNAKAN PENDEKATAN LEAN MANUFACTURING. In

[5] Barbara, C., & Agnieszka, Z. 2014, Elemination of waste in *Production* enterprises –case study. ISSN 2083-4942, Vol.4 No.2 , pp 157 – 166.

[6] Denish, B.M, & Hemant, T. 2014. Lean thinking : Reduction of waste, lead time, Cost through Lean

Sigma Teknika, Vol. 7, No.2: 286-293
November 2024
E-ISSN 2599-0616
P-ISSN 2614-5979

manufacturing tools *and* technique. ISSN 2250 – 2459,ISO 9001 : 2008 Certified Journal,Volume 4,Issue 3,March 2014)

[7] Gaspersz, V. (2012). All-in-one *Production and* Inventory Management For Supply Professional Strategi Menuju World Manufacturing. Bogor: Vinchristo Publication.

[8] Guntoro, R. C., & Adhiana, T. P. (2020, June). Identifikasi Waste Menggunakan Metode Waste Assessment Model. In Prosiding Seminar Nasional LPPM Unsoed (Vol. 9, No. 1).

[9] Kholil, M., Rudini, M. 2016. Minimasi waste dan usulan peningkatan efisiensi proses produksi MCB (Mini Circuit Breaker) dengan pendekatan sistem Lean manufacturing (di PT. Schneider Electric Indonesia).Jurnal PASTI, Vol.VII No.1, halaman 44-70.

[10] Lestiana, F., Rachmawaty, D., & Munang, A. (2022). Minimasi Waste Pada Proses Produksi PT. Astra Honda Motor (AHM) Dengan Konsep Lean Manufacturing. Jurnal Ilmiah Teknik Industri, 10(1), 48-56.

[11] Majid, M. (2018). Identifikasi Dan Pengurangan Waste Pada Proses Produksi Minuman Herbal Instan Menggunakan *Value* Stream Mapping.

[12] Nurlaila, Q., Yuniawati, R. I., Susanti, L., & Cahyati, A. (2023). LEAN MANUFACTURING. Penerbit Widina.

[13] Prosiding Seminar Nasional Industri Kerajinan dan Batik (Vol. 3, No. 1, pp. D- 02).

[14] Ristyowati, T., Muhsin, A., & Nurani, P. P. (2017). Minimasi Waste Pada Aktivitas Proses Produksi Dengan Konsep Lean Manufacturing (Studi Kasus di PT. Sport Glove Indonesia). Jurnal Optimasi Sistem Industri, X(1), 85-57.

[15] Sherif, M., & Jantanee, D. 2015, Waste elimination for manufacturing 73 sustainability. Procedia manufacturing 2 (2015), Halaman 11-16.

[16] Wijayanto, B., Saleh, A., & Zaini, E. (2015). Rancangan Proses Produksi Untuk Mengurangi Pemborosan Dengan Penggunaan Konsep Lean Manufacturing Di PT. Mizan Grafika Sarana. Jurnal Online Institut Teknologi Nasional, III(1), 120-121.