Available online at: http://publikasi.mercubuana.ac.id/index.php/ijiem

IJIEM (Indonesian Journal of Industrial Engineering & Management)

ISSN (Print) : 2614-7327 ISSN (Online) : 2745-9063

Quality Control Analysis of Cover Flange Products with Six Sigma Approach at PT. SMI

Sinta Restuasih*, Ayu Nurul Haryudiniarti, Anggita Nafiulana Tri Nurhasanah
Industrial Engineering, Universitas Global Jakarta, Education Park Jl. Boulevard Grand Depok City, Depok Jawa Barat 16412 Indonesia

ARTICLE INFORMATION

Article history:

Received: 29 July 2024
Revised: 11 December 2024
Accepted: 1 February 2025

Category: Research paper

Keywords:
Quality
Control
Six Sigma
5S

DOI: 10.22441/ijiem.v6i2.28622

A B S T R A C T

PT. SMI is a manufacturing company engaged in manufacturing services specializing in heavy equipment components. In the production process activities there are still several factors that cause a product that has been produced not in accordance with predetermined specifications. Therefore, this study aims to determine the types and factors that can cause deffects and provide proposals for improving the Cover Flange at PT. SMI. The method used is the Six Sigma DMAIC method (Define, Measure, Analyze, Improve, Control) which is quality control to minimize the number of defective products. Based on the results of data processing analysis, there are still data that are still outside the control limits. Therefore, the production process still has to be improved in order to improve quality. The DPMO (Defect Per Million Opportunities) value before improvement is 106456 and the sigma value is 2.70. The proposed improvement used in this study is to use the 5S method (Seiri, Seiton, Seiso, Seikersu, Shitshuke) So, the results obtained after applying the 5S method are a reduction in the DPMO value of 51579 and a sigma value of 3.15 with a reduction in the number of defective Cover Flange products, so with the improvement being able to provide changes in the DPMO value and sigma value of PT. SMI.

*Corresponding Author
Sinta Restuasih
E-mail: sinta@jgu.ac.id

1. INTRODUCTION

Along with the times, competition in the globalization era business world can force a company to focus on maintaining quality and increasing productivity. The importance of quality for consumers is also increasing. This can make the quality of product quality and delivery quality an important role for a company. Efforts that must be made by companies to improve quality are to carry out quality control, with this effort a company is able to have competitiveness and can survive in world competition in both the manufacturing and service industries. Six sigma is a way to make improvements and improve the quality of a company, using the Six Sigma method the performance in operations only gets 3.4 defects in one million activities and opportunities (Subahagia Ningsih & Mada, 2018).

PT SMI is a manufacturing company engaged in manufacturing services specializing in heavy equipment components. Cover flange is one of the products of PT SMI. Where the ordering process for this part can be stable every month. Therefore, the production process must always be maintained in quality and in accordance with the standards set by the company. However, in the production process in the field this part cover flange often experiences product defects. So PT. SMI must be more responsive in solving the problems that occur, so that there are no more product defects that can cause losses.

In January to June 2023 there were defects in leaking and sloppy finishing where the maximum target percentage of rejection is 0.5%. The number of defective products produced by the company varies every month. It can be concluded that the quality of a product that has been produced by the company has not reached the predetermined target. This has shown that one of the main causes of defective products or failures in the production process is in the welding section. In the application of six sigma, there are 5 steps that must be considered to improve the performance of a business, namely by using the DMAIC (Define, Measure, Analyze, Improve and Control) concept (Indrawansyah et al., 2019). Thus, a process problem and customer requirements must be kept in check and also updated in every process. Given the importance of improvement, having good quality is one of the company's goals. The objectives in this study to be achieved are as follows: (a) To find out the factors that can cause defects in PT. SMI Cover Flange products, (b) To find out the types of defects in the Cover Flange production process that result in a decrease in quality, (c) To find out the value (Defect Per Million Opportunities) DPMO in the defect rate of PT SMI Cover Flange products, (d) To find out the proposed improvements that will be used to reduce deffects in the production process activities of PT. SMI Cover Flange.

2. LITERATURE REVIEW

Quality control is a procedure used to achieve company quality and aims to improve product quality and reduce overall costs. Therefore, quality control is expected to reduce deviations and the process can lead to company goals. (Putri Dewi Ayu, 2020). Six Sigma according to Pyzdek (2014) in (Sugiantini & Rahayu, 2022). Six sigma is the application of a quality that has proven to be very effective and has the aim that the company's performance is error-free. So it can be concluded that Six Sigma is a way to improve product quality that focuses on reducing defects. Meanwhile, according to (Harahap et al., 2018) Six Sigma is a quantity that can be used as a measurement process in a company using statistical tools and can reduce product defects so that they are no more than 3.4 (DPMO) and 99.99966 percent in order to focus on customer satisfaction. DMAIC (Define, Measure, Analyze, Improve and Control) is the five stages of Six Sigma with a disciplined approach.

3. RESEARCH METHOD

The research method used is Six Sigma DMAIC, which is used to control the quality of a product. Therefore, using the Six Sigma method can determine the level of product defects whether it is in accordance with the standards owned by the company. The data collection used is by means of observation to obtain information from the parties concerned to find out the problems that occur related to the number of defective products, as well as the occurrence of defects in the product.

Can find out the flow of the Cover Flange production process that has a relationship with the quality of the company. The data used are primary and secondary data which collect several documents such as product data, production defect data for the period January 2023 to June 2023. While in data processing, namely by using six sigma DMAIC (Define, Measure, Analyze, Improve and Control).

1. Define
   It is the main stage in determining the parts and processes to be evaluated. The stages of the define process are to determine CTQ (Critical To-Quality) and create a SIPOC (Supplier-Input-Process-Output-Control) diagram.
2. Measure
   a. Calculate the control map (P-chart) by taking a sample and calculating

the average value (mean).

$$P = \frac{np}{n}$$

Description :
P : Average nonconformity of a product
np : Total overall defects
n : Number of samples

b. Determine the control limits by calculating the values of the upper control limit (UCL), lower control limit (LCL) and liner limit (CL). The CL (Control Limit) formula used is as follows:

$$\text{CL} = p = \frac{\sum \text{np}}{\sum \text{n}}$$

Description:

n : Total overall sample (Product)
np : Total overall defects (products)
p : Average value of defect proportion (product)

c. Determining the upper control limit UCL (Upper Control Limit), the formula that can be used is as follows:

$$\text{UCL} = \frac{p + \sqrt{p\,(1-p)}}{n}$$

Description:
p : Average value of the proportion of defects (products)
n : Total overall sample (product)

d. Determining the lower control limit LCL (Lower Control Limit) The formula used is as follows:

$$\text{LCL} = \frac{p - \sqrt{p(1-p)}}{n}$$

Description:
p : Average value of the proportion of defects (products)
n : Total overall sample (product)

e. Determine the value of DPU (Defect Per Unit), DPMO (Defect Per Million Opportunities) and sigma value. The DPU, DPMO formulas are obtained in the following way :

$$\text{DPU} = \frac{Number\ of\ Defects}{Production\ Quantity}$$

f. DPMO (Deffect Per Million Opportunities) using the formula:

$$\text{DPMO} = \frac{Total\ Defects}{Total\ Production} \text{ x } 1.000.000$$

3. Analyze
Identify the cause-and-effect of defects affecting the Cover Flange by using pareto diagram, fishbone diagram
4. Improve
Suggested corrective actions to reduce product defect Cover Flange
5. Control
The results of the repair are controlled, documented and provide socialization to all employees concerned. all employees concerned and ensure, evaluate that the condition of the Cover Flange product that has been repaired is in accordance with the standard.

4. RESULT AND DISCUSSION

The following is a table "1" of Cover Flange production data from January 2023 to June 2023.

Table 1. Data on total production and total defects of cover flange

No	Month	Production Quantity	Defect Type	
			Leaked	Uneven Finishing
1	January	161	9	1
2	February	58	4	2
3	March	134	7	1
4	April	31	4	1
5	May	183	37	0
6	June	40	2	0
	Total	**607**	**63**	**5**

Source: Primary data

The analysis of the research results is by using the Six Sigma DMAIC method (define, measure, analyze, improve, and control) at PT.SMI as follows:

1) Define, namely determining CTQ (Critical To Quality) and creating a SIPOC diagram (Supplier, Input, Process, Output, Control).

g. Determine CTQ (Critical to Quality) based on table 2 with several problems that occur, there are 2 causes of defects in the Cover Flange product and Figure 1 Types of Leaking Defects and Untidy Finishing which are explained as follow (Table 2).

Table 2. Critical To Quality Cover Flange

No	Critical To Quality	Spesifikasi
1	Leaking Defects	In the 3/8 seat area there is a small hole that causes leakage.
2	Finishing defects	The surface of the 3/8 seat area is not neat, there are blisters from welding.

Source: Primary data

Figure 1. Types of leaking defects and untidy finishing
Source: Primary data

h. Create a SIPOC (Supplier, Input, Process, Output, Control) Diagram.

SIPOC diagram is one way that can be used to create a work flow. Starting from ordering materials, the production process, until the Cover Flange product reaches the customer. What are the processes that are passed and the output results that will be achieved to achieve customer satisfaction and needs. The SIPOC diagram of the Cover Flange production process of PT. SMI can be seen in Figure 2.

2) Measure

Measure is the measurement stage which has been divided into 2 stages, namely as follows:

a) Calculating the control map (P-Chart)

The data taken is the Cover Flange product from PT SMI. The number of products that have been produced from January 2023 to June 2023 is 607 pcs with the number of defective products amounting to 68 pcs with product defects leaking and sloppy finishing. Based on the data that has been obtained, we can calculate the control map (P-Chart).

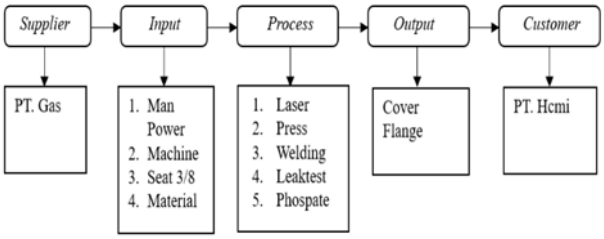

Figure 2. SIPOC cover flange diagram
Source: Primary data

i. Calculate the average value of non-conformity of defective products (Mean).

January = p : $\frac{10}{161}$ = 0,06211

February = p : $\frac{6}{58}$ = 0,10344

March = p : $\frac{8}{134}$ = 0,05970

Dst.

ii. Calculating the Linear limit (CL)

$$CL = P\ \frac{68}{607} = 0{,}1120$$

iii. Calculating the upper control limit (UCL)

$$\text{UCL} = \frac{0{,}1120 + \sqrt{0{,}1120\ (1 - 0{,}1120)}}{607}$$

$$= 0{,}150$$

iv. Calculating the LCL (Lower Control Limit) lower control limit.

$$\text{LCL} = \frac{0{,}1120 - \sqrt{0{,}1120\ (1 - 0{,}1120)}}{607} = 0{,}074$$

Table 3. Calculation of CL, UCL and LCL

No	Month	Production Quantity	Number of defects	P	CL	UCL	LCL
1	January	161	10	0,06	0,112	0,150	0,074
2	February	58	6	0,10	0,112	0,150	0,074
3	March	134	8	0,06	0,112	0,150	0,074
4	April	31	5	0,16	0,112	0,150	0,074
5	May	183	37	0,20	0,112	0,150	0,074
6	June	40	2	0,05	0,112	0,150	0,074
	Total	**607**	**68**				

Source: Primary data

b) Calculate DPU, DPMO and sigma values.

- Calculate DPU (Deffect Per Unit)

January = DPU $\frac{10}{161}$ = 0,062

February = DPU $\frac{6}{58}$ = 0,103

March = DPU $\frac{8}{134}$ = 0,059

- Calculate DPMO (Deffect Per Million Opportunities)

January = DPMO $\frac{10}{161}$ x 1.000.000

= 62.111

February = DPMO $\frac{6}{58}$ x 1.000.000

= 10.344

March = DPMO $\frac{8}{134}$ x 1.000.000

February = DPMO $\frac{6}{58}$ x 1.000.000

= 10.344

March = DPMO $\frac{8}{134}$ x 1.000.000

= 59.701

- Calculating Sigma Value

Value DPMO = NORMSINV

((1.000.000-106456)/1.000.000) + 1.4

= 2,70

The calculation results in Table 4 show that the production of Cover Flange at PT.SMI has a Sigma value of 2.70.

Table 3. Calculation of DPU, DPMO and sigma value

No	Month	Production Quantity	Number of defects	DPU	DPMO	Sigma
1	January	161	10	0,0621	62112	2,94
2	February	58	6	0,1034	103448	2,66
3	March	134	8	0,0597	59701	2,96
4	April	31	5	0,1613	161290	2,39
5	May	183	37	0,2022	202186	2,23
6	June	40	2	0,0500	50000	3,04
	Total	**607**	**68**			
	Average				**106456**	**2,70**

Source: Primary data

3) Analyze

❖ Pareto Diagram As for the analyze stage is to process the pareto diagram to find out the type of product that will be rejected.

The results of the Pareto diagram in Figure 2.

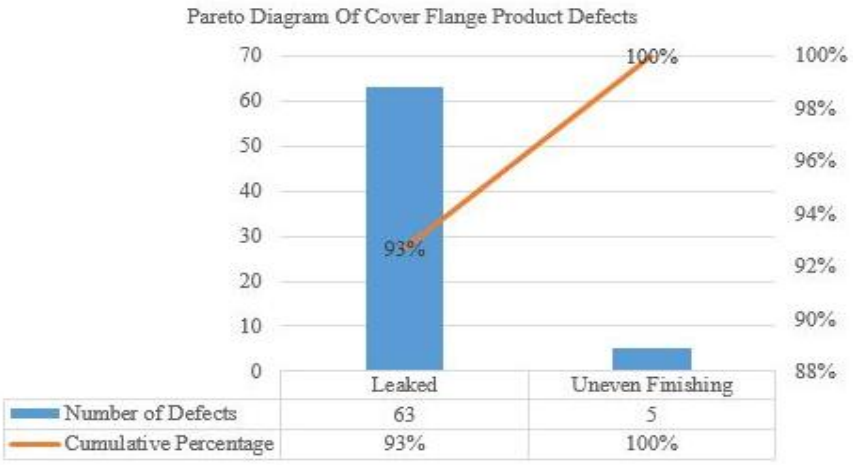

Figure 3. Pareto diagram of cover flange product defect

Source: Primary data

cause of the defect, namely leakage and sloppy finishing so that the percentage of these products is getting bigger.

Therefore, the quality control of Cover Flange product defects needs to be improved and Percentage of Cover Flange Defects table 5.

Table 5. Percentage of cover flange defects

No	Type of Damage	Frequency (Units)	Presentage	Cumulative Percentage
1	Leaked	63	93%	93%
2	Finishing	5	7%	7%
	Total	**68**	**100%**	

Source: Primary data

❖ Cause and Effect Diagram

In the next stage, analyze the factors that cause defective products to leak into the form of a cause-and-effect diagram in Figure

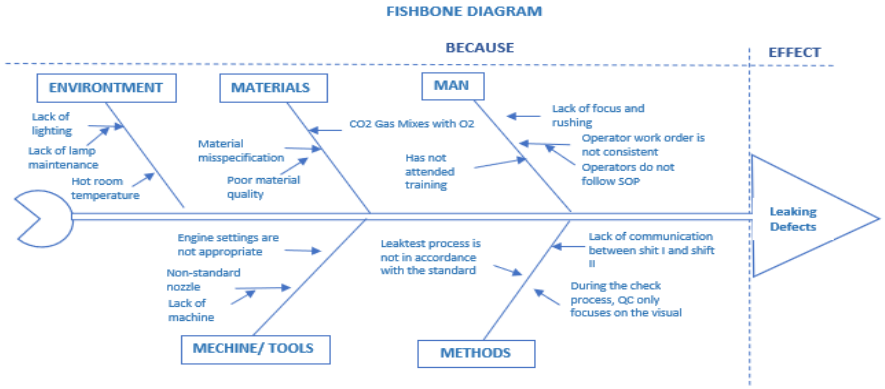

Figure 4. Fishbone diagram

Source: Primary data

4) Improve

After knowing the factors and causes of the types of product defects, the next stage is the improvement stage, which is a plan for making improvements in table 6 in order to reduce the number of defective Cover Flange products and

improve quality sigma. Therefore, here are some recommendations regarding proposed improvements using the 5S method (seiri, seiton, seiso, seikersu, shitshuke) in reducing the number of defective Cover Flange products.

Table 6. Proposed improvements

5S	Proposed Improvements	Before Improvement	After Improvement
Seiri (Summarize)	Discard unused materials.		
Seiton (Neat)	Changing the place used so that it is not piled up which can cause the product to cause damage		
Seiso (Clean)	Conduct socialization before work so that 5S can run well.		
Seiketsu (Care)	Perform maintenance of tools after checking by making a checklist.		
Shitsuke (Diligent)	Getting workers used to cleaning tools and products.		

Source: Primary data

5) Control

The control stage is the final stage of DMAIC where it is necessary to monitor the results of the improvements that have been implemented by PT SMI. With the improvement, it is hoped that it can be a success in reducing Cover Flange product defects. In addition, the company also needs to improve several guidance documents such as SOP (Standard Operating Procedures) and Work Instruction so that control can run perfectly. To find out any changes with the improvement, then recalculate the DPU value, DPMO and sigma value.

- Calculate DPU (Deffect Per Unit)
  - July DPU $\frac{1}{20}$ = 0,0500
  - August DPU $\frac{2}{35}$ = 0,0571

- September DPU$\frac{1}{24}$ = 0,0416

- Calculate DPMO (Deffect Per Million Opportunities)
  - July DPMO = $\frac{1}{20}$ x 1.000.000 = 50000
  - August DPMO = $\frac{2}{35}$ x 1.000.000 = 57143
  - September DPMO = $\frac{1}{24}$ x 1.000.000 = 41667

- Calculating Sigma Value
  - July DPMO NORMSINV((1.000.000-50000)/1.000.000) + 1.4 = 3,04
  - August DPMO =NORMSINV((1.000.000-57143)/1.000.000) + 1.4 = 2,98
  - September DPMO = NORMSINV ((1.000.000-41667)/1.000.000) + 1.4 = 3,15

Table 7. DPU, DPMO and sigma value after improvements

No	Month	Production Quantity	Number of defects	DPU	DPMO	Sigma
1	July	20	1	0,0500	50000	3,04
2	August	35	2	0,0571	57143	2,98
3	September	24	1	0,0417	41667	3,13
4	October	34	1	0,0294	29412	3,29
5	November	16	2	0,1250	125000	2,55
6	December	160	1	0,0063	6250	3,90
	Total	**289**	**8**			
	Average				**51579**	**3,15**

Source: Primary data

In Table 7, it can be seen that there is a change in quality improvement in the Cover Flange production process of PT SMI, which originally had a DPMO value of 106456 and a sigma value of 2.70 to a DPMO value of 51579 and a sigma value of 3.15 with a reduction in the number of defective Cover Flange products, so with the improvement being able to provide changes in the DPMO value and sigma value of PT SMI. So, it can be concluded that the improvements that have been made can provide some changes that are better than before. This is because the increase in sigma value means that a product quality control in a system can be better than before.

Based on the results of the analysis of changes in DPMO values and sigma values before and after improvement can provide significant changes. As in previous research conducted by Abdullah Merjani, Novia Irena Br Siahaan, (2022) entitled "Quality Control with the Six Sigma DMAIC Method on Top Body Cover Fast 5280 Products to reduce customer complaints (Case study: PT. Batam Xingrui Teknologi)" the research used is to use Six Sigma DMAIC. The results in this study are based on the analysis of the results of research factors that affect the cause of Reject Scratches are derived from labor in a hurry, the movement of conveyor machines that are too fast and the mixing of new materials with recycled materials. Then after being implemented with the DMAIC approach to product quality control reject scratches DPMO level has decreased which previously amounted to 113445 can be reduced to 20224 DPMO. So that there are no more customer complaints about the same product. The equation in previous research with current research is about quality control that can reduce several defective products. While in the second equation, the method used also uses Six Sigma DMAIC. As for the differences between previous research and current research, previous research focused on Reject products from customers while current research focuses on internal deffect products.

Research conducted by Rahmad Fajri Anasrul (2022) entitled "Application of Six Sigma and 5S Methods to Improve Productivity and Effectiveness in Brick Production (Case Study of XYZ UMKM)". This study aims to identify the factors that cause defective products and what improvements are needed in the

workplacearea. The method used in this research is Six Sigma with the DMAIC approach (Define, Measure, Analyze, Improve, and Control) for quality improvement and business strategies that do not produce defective products, and the 5S method (Seiri, Seiton, Seiso, Seiketsu, and Shitsuke) for workplace quality improvement. The results of this study indicate that MSMEs have a total number of brick defects of 47 out of 2,135 units consisting of cracked and broken defects. With the number of defects per unit of 0.022, defects per million opportunities (DPMO) of 11,000 in 1 million brick products produced, and a Sigma quality level of 3.79. The previous research equation with the current research is the method used using Six Sigma and improvements in the work area using 5S. The difference between previous research and current research is the location used, in previous research it was located at UMKM XYZ in the Special Region of Yogyakarta, while the current research is at PT SMI Bekasi, West Java.

5. CONCLUSION

Analyze the cause of the deffect has been done some analysis of welding leaks caused by human factors that are less focused and in a hurry, method factors due to lack of communication between shift I and shift II, machine factors with inappropriate settings and operators do not understand the SOP, material factors that are with wrong specifications due to the impromptu ordering process. Based on the production process at PT SMI in the deffect identification stage, what is done is by making a SIPOC and CTQ diagram which is then identified as a factor that can hinder the production process at PT SMI such as Welding leaks during the welding process with a percentage of 93%. Meanwhile, the finishing is not neat during the welding process with a percentage of 7%. This needs to be considered so that researchers focus on leaky welding defects which have the highest percentage. Based on the results of the calculation of DPMO (Defect Per Million Opportunities) and the sigma value in the measure stage before improvement in January 2023 through June 2023, the DPMO value is 106456 and the sigma value is 2.70 while the DPMO value and the sigma value after improvement in July 2023 through December 2023 is a DPMO value of 51579 and a sigma value of 3.15. The proposal in this research is to use the 5S method (Seiri, Seiton, Seiro, Seikersu, Shitshuke). It is hoped that future research will be able to carry out a more detailed analysis of several factors that cause defective products and provide in-depth solutions and suggestions for companies. Make a list of operators who have taken part in training so that they understand the job description according to the SOP. Provide recommendations to the company so that it can implement proposed improvements.

6. REFERENCES

Ahmad, F. (2019). Six Sigma DMAIC Sebagai Metode Pengendalian Kualitas Produk Kursi pada UKM. *JISI: Jurnal Integrasi Sistem Industri, 6*(1), 11-17. https://doi.org/10.24853/jisi.6.1.11-17

Anthony, K. C. (2022). *Pengendalian Kualitas Produk Percetakan Kemasan Obat Dengan Metode Six Sigma Di Cv. Cemerlang Abadi Sejahtera Offset* (Doctoral dissertation, Universitas Komputer Indonesia). https://elibrary.unikom.ac.id/id/eprint/7428/

Ayu Lestari, F., & Purwatmini, N. (2021). *Pengendalian Kualitas Produk Tekstil Menggunakan Metoda DMAIC*. *5*(1). http://ejournal.bsi.ac.id/ejurnal/index.php/ecodemica

Farid, M., Yulius, H., Irsan, I., Susriyati, S., & Maulana, B. (2022). Pengendalian Kualitas Pengolahan Kulit Uptd Kota Padang Panjang Menggunakan Metode Six-Sigma. *Jurnal Teknologi Dan Sistem Informasi Bisnis*, *4*(1), 186-192. http://jurnal.unidha.ac.id/index.php/jteksis/article/view/399

Harahap, B., Parinduri, L., Ama, A., & Fitria, L. (2018). Analisis Pengendalian Kualitas Dengan Menggunakan Metode Six Sigma (Studi Kasus: PT. Growth Sumatra Industry). *Buletin Utama Teknik, 13*(3), 211-218. https://jurnaltest.uisu.ac.id/index.html/but/article/view/541

Mauluddin, Y., & Nurwahidah, M. (2022). Rancangan Pengendalian Kualitas Pada Produk Roti Dalam Upaya Peningkatan Kualitas Produk Di CV. Sari Madani. *Jurnal Kalibrasi*, *20*(1), 32-43. https://jurnal.itg.ac.id/index.php/kalibrasi/article/view/1116

Merjani, A., & Siahaan, N. I. (2022b). Pengendalian Kualitas Dengan Metode Six Sigma DMAIC Pada Produk Top Body Cover Fast 5280 Untuk Mengurangi Customer Complain (Studi Kasus: PT. Batam Xingrui Teknologi). *Profisiensi, 10*(1), 49–54. https://doi.org/10.33373/profis.v10i1.3865

Nurhayani, N., Putri, S. R., & Darmawan, A. (2023). Analisis Pengendalian Kualitas Produk Outsole Sepatu Casual menggunakan Metode Six Sigma DMAIC dan Kaizen 6S. *Jurnal Teknik Industri: Jurnal Hasil Penelitian dan Karya Ilmiah dalam Bidang Teknik Industri*, *9*(1), 248-258. https://ejournal.uin-suska.ac.id/index.php/jti/article/view/22449

R, P. D. A. (2020). *Analisis Proses Pengendalian Kualitas Minyak Kelapa Sawit (CPO) dengan Metode Six Sigma Pada PT. Perkebunan Nusantara V Sei Garo.* Pekan Baru. Skripsi: Universitas Islam Riau. https://repository.uir.ac.id/8971/1/155210721

Rivaldy, Z. A. (2022). *Pengendalian Kualitas Produk Kantong Plastik Menggunakan Metode Six Sigma (Studi Kasus: Cv Makmur Raya Sejahtera).* Tugas Akhir: Universitas Islam Indonesia. https://dspace.uii.ac.id/handle/123456789/39001

Singgih, M. L., & Renanda, D. (2008). *Peningkatan Kualitas Produk Kertas Dengan Menggunakan Pendekatan Six Sigma di Pabrik Kertas Y.* Personal paper: Institut Teknologi Sepuluh Nopember. https://www.researchgate.net/profile/Moses-Singgih/publication/267296642

Subahagia Ningsih, M., & Mada, E. (2018). Metode Six Sigma untuk Mengendalikan Kualitas Produk Surat Kabar di PT X. *JURITI PRIMA (Jurnal Ilmiah Teknik Industri Prima), 2*(1), 15-21. https://doi.org/10.5281/zenodo.1211889

Syahputra, R. D. (2023). Analisis Six Sigma Dalam Peningkatan Kualitas Produk Crude Palm Oil (Cpo) Guna Meminimalisir Defect (Studi Kasus: PT. Peputra Masterindo). Tugas Akhir: Universitas Islam Indonesia https://dspace.uii.ac.id/handle/123456789/44508

Zikrah, Z. (2022). *Analisis Pengendalian Kualitas Pada Produk Jersey Dengan Metode Six Sigma Di Cv. Vinus Company* (Doctoral dissertation, Universitas Komputer Indonesia). https://elibrary.unikom.ac.id/id/eprint/7440/

Samsudin, A. E. P., Wijaya, D. K., & Islahudin, N. (2023). Perbaikan proses printing menggunakan metode DMAIC dan 5S untuk mengurangi waste proses di UKM limit screen printing Semarang. *JENIUS: Jurnal Terapan Teknik Industri*, *4*(1), 98-107. https://www.jurnal.sttmcileungsi.ac.id/index.php/jenius/article/view/468