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COMMUNITY SERVICES AND DEDICATION | RESEARCH ARTICLE

Maximizing The Production Quality of Presto Milkfish in Juata Through Six Sigma Method Implementation

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ABSTRACT
This study aims to analyze the implementation of the quality control system in the Presto milkfish production process and identify factors that affect the quality of the final product. The research was conducted using Six Sigma methodology. The research shows that there are several important points in the manufacturing process that affect the quality of the final product. Factors contributing to quality degradation include cooking time, process temperature variation, raw material quality, and operator skills. Implementing a quality control system on the production process that includes standardization of the production process, inspection of raw materials, operator training, regular monitoring, and reduction of defects in milkfish. This study recommends continuous improvement in the Presto milkfish production system to maintain product quality consistency.

Keywords: Quality Control, Presto Milkfish, Production Process, Standardization, Production Efficiency.

I. Introduction

Product quality is one of the key factors in increasing business competitiveness, especially in the midst of today's global competition. According to Crosby (1979), in the book by Mitra Amitava (2016), companies need to reduce product damage because errors in the production process can cause significant losses, both in terms of quality and quantity of products (Tenny & Mukuan, 2018). Therefore, quality control must be applied from the beginning of the production process until the product reaches the hands of consumers (Didiharyono et al., 2018). In order to meet these needs, many industries are now using a more systematic statistical approach as part of a measurable and sustainable quality management strategy. This approach helps monitor the production process and allows for more effective identification and reduction of the root causes of product defects. One statistical method that has been proven effective and widely adopted by various companies is Six Sigma. This method helps companies improve product quality by reducing the causes of defects through five stages known as DMAIC: Define, Measure, Analyze, Improve, and Control (Budiwati, 2017). The main strength of this method lies in the DMAIC approach, which focuses on continuous improvement. This process relies on data and facts to eliminate inefficient steps. Gaspersz (2001) explained that DMAIC is a closed process that leads to high-quality standards, with a maximum target of 3.4 defects per

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million opportunities. Considering these things, this study aims to examine how applying the Six Sigma method, especially the DMAIC approach, can improve the effectiveness of quality control in the production process. The main question that is the focus of this study is: Is the Six Sigma method able to significantly reduce the level of product defects in a particular production process?

II. Literature Review and Hypothesis Development

Quality control is important in maintaining consistency and ensuring products meet desired standards. Without proper quality control, companies can face significant losses, both financially and in terms of reputation. As Evans and Lindsay (2017) explained, quality control ensures that products comply with established production and distribution standards. Statistical Process Control (SPC) is the first widely used approach in quality control. This method relies on statistical tools, such as control charts, to monitor variations in the production process and ensure consistent quality (Montgomery, 2009). SPC is a more reactive approach, focusing on monitoring quality during ongoing processes, but it is insufficient to address quality issues in depth. Total Quality Management (TQM), as explained by Goetsch and Davis (2014), is a management philosophy involving all organization members in continuous quality improvement. TQM emphasizes the importance of customer satisfaction and never-ending improvement. However, although TQM focuses on long-term quality enhancement, it often lacks in-depth analytical tools to address more complex quality issues.

Six Sigma is a more structured and data-driven method aimed at reducing product defects to an extremely low level, no more than 3.4 defects per million opportunities. It relies on the systematic DMAIC (Define, Measure, Analyze, Improve, Control) approach to identify and resolve process issues (Harry & Schroeder, 2000). According to Thomas Pyzdek in The Six Sigma Handbook, Six Sigma is "a methodology for improving quality and minimizing process variation by using appropriate statistical and managerial tools" (Pyzdek & Keller, 2014). With this approach, Six Sigma delivers highly measurable and focused results in quality improvement. Lean Manufacturing focuses on eliminating waste throughout the entire production process. Toyota introduced this concept through its renowned Toyota Production System (TPS), which aims to enhance efficiency while reducing all forms of waste (Womack & Jones, 2003). According to Womack and Jones (2003), Lean prioritizes cost reduction and improves quality through continuous improvement. The method eliminates waste such as waiting time, excess inventory, and inefficient processes while increasing productivity.

ISO 9001 is an international standard that establishes requirements for quality management systems within organizations. Designed to ensure compliance with customer needs and regulatory requirements, it enhances customer satisfaction by implementing an effective quality management system (ISO, 2015). ISO 9001 helps companies establish policies, procedures, and best practices to maintain product and service quality. Its implementation is often integrated with other methodologies, such as Six Sigma and Lean, to strengthen quality control processes.

III. Research Method

3.1. Types of research

This study employs a descriptive approach using a mixed-methods design (qualitative and quantitative) to provide a more comprehensive understanding of the research problem.

3.2. Location and Subject of Research

The research was conducted at Bandeng Presto Juata, located in Juata Permai. The study's subject includes the owner himself, Mr. Yohanes Sumbung.

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3.3. Data collection technique

This study employed multiple data collection techniques to ensure comprehensive findings. First, interviews were conducted with the business owner to understand production processes and challenges. Second, direct observations were carried out to identify defects and inconsistencies in the manufacturing process. Finally, documentation analysis was performed by reviewing production records and quality reports relevant to the research.

3.4. Six Sigma

Six Sigma is a method for significantly improving product or service quality by reducing defects to near-zero levels. The "Six" in Six Sigma represents an extremely high quality standard, corresponding to six standard deviations from the mean in a normal distribution.

Six Sigma research typically follows the DMAIC cycle, beginning with:

First, clearly define the problem by establishing specific objectives, identifying affected stakeholders, and determining success metrics. Next, relevant data will be collected to measure current process performance, forming the foundation for analysis. Third, thoroughly analyze this data using statistical tools and visualizations to pinpoint root causes. Once identified, develop and implement innovative solutions to enhance the process. Finally, control the improved process by establishing new standards, continuously monitoring performance, and taking corrective actions to ensure sustained improvements.

IV. Results and Discussion

4.1. Logbook

Table 1. Logbook

September	Production Quantity	Number of Defects	Type of Defect		
			Fishy smell	Destroyed During Packaging	Destroyed When Pressure Cooked
Week 1	50Kg	5 Tail	2 Tail	-	3 Tail
Week 2	50Kg	-	-	-	-
Week 3	50Kg	3 Tail	1 Tail	1 Tail	1 Tail
Week 4	50Kg	4 Tail	-	2 Tail	2 Tail

October	Production Quantity	Number of Defects	Type of Defect		
			Fishy smell	Destroyed During Packaging	Destroyed When Pressure Cooked
Week 1	50Kg	1 Tail	-	-	1 Tail
Week 2	50Kg	10 Tail	-	3 Tail	7 Tail
Week 3	50Kg	2 Tail	1 Tail	-	1 Tail
Week 4	50Kg	-	-	-	-

Table 1 is a daily record containing activities of MSMEs during the production process, starting from production time, production quantity, number of defects, and type of defects.

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4.2. Six Sigma DMAIC

In this study, the researcher used the Six Sigma DMAIC method. Six Sigma DMAIC is a roadmap used for continuous improvement. DMAIC consists of defining, measuring, analyzing, improving, and controlling. The following is a summary of the research results.

4.2.1. Define

The Define phase aims to establish the problem's scope and identify quality issues within the product. In this stage, researchers utilize the SIPOC diagram - a visual tool that documents business processes from start to finish, helping identify relevant elements of the improvement project. Below is the SIPOC diagram illustrating the product process flow, which aids in pinpointing the problem's scope.

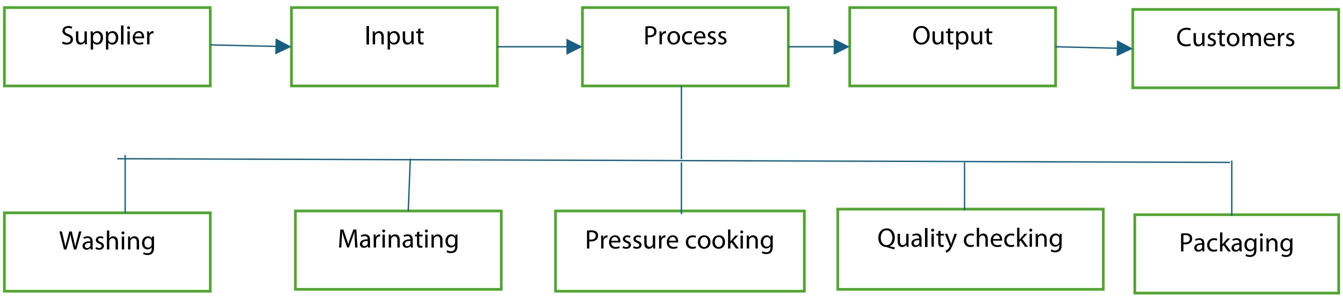

Figure 1. Line Process

4.2.2. Measurement

In this phase, we can measure the defect rate and identify which type of defect has the highest occurrence percentage. Below is the obtained data:

Table 2. Measurement

Month	Production Quantity	Number of Defects	% Defects
August	200 kg	20 Tail	10%
September	200 kg	33 Tail	16.5%

Type of Defect	Number of Defects	Percentage of Total Defects
Fishy odor	5 tail	15%
Destroyed during packaging	10 tail	30%
Destroyed during pressure cooking	15 tail	45%

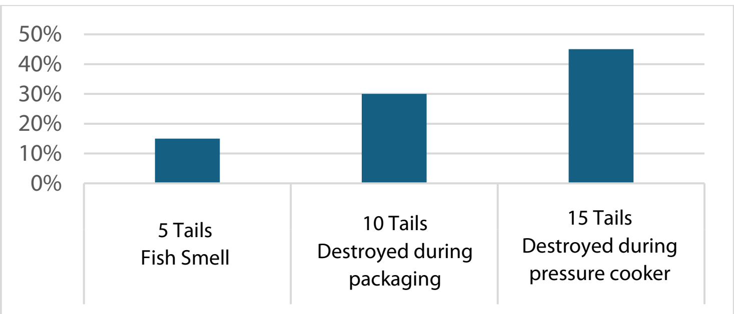

Figure 2. Process Measurement

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Based on the above data, it can be concluded that there was an overall increase in defect percentage from September to October. The "crushed during presto cooking" defect type showed the highest percentage, indicating a critical issue in the boiling process.

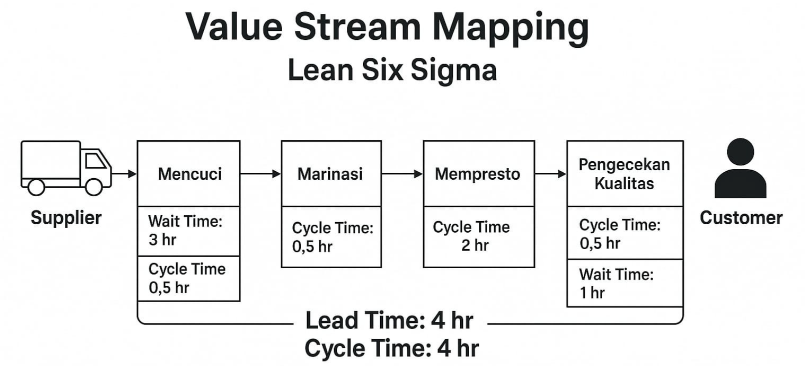

Figure 3. Value Stream Mapping

1. Definition of Time
   Cycle Time (Effective working time)
   Is the time required to complete one unit of work, without waiting time? Total cycle time is calculated from:
   - Washing: 0.5 hours
   - Marinating: 0.5 hours
   - Presto Cooking: 2 hours
   - Quality Inspection: 0.5 hours

   Total Cycle Time = 0.5 + 0.5 + 2 + 0.5 = 4 hours

   Lead Time (Total Process Duration)
   Refers to the total time required from the start to the end of the process, including idle/waiting time. Wait Time Mencuci: 3 jam
   - Washing Cycle Time: 0.5 hours
   - Marinating Cycle Time: 0.5 hours
   - Presto Cooking Cycle Time: 2 hours
   - Inspection Cycle Time: 0.5 hours
   - Inspection Wait Time: 1 hour

   Total Lead Time = 3 (pre-processing) + 0.5 + 0.5 + 2 + 0.5 + 1 = 8.5 hours

2. Process Efficiency Calculation
   Process Efficiency (%) = $\left(\frac{Total\ Cycle\ Time}{Total\ Lead\ Time}\right)$

   $= \left(\frac{4}{8,5}\right) \times 100 = 47{,}06\%$
   - Cycle Time (4 hours): The total active working time that truly adds value is 4 hours.
   - Lead Time (8.5 hours): Represents the complete duration from start to finish, including waiting time.
   - Process Efficiency (47.06%): It reveals that only about half of the total time is used for productive activities, with the remainder being wasted.

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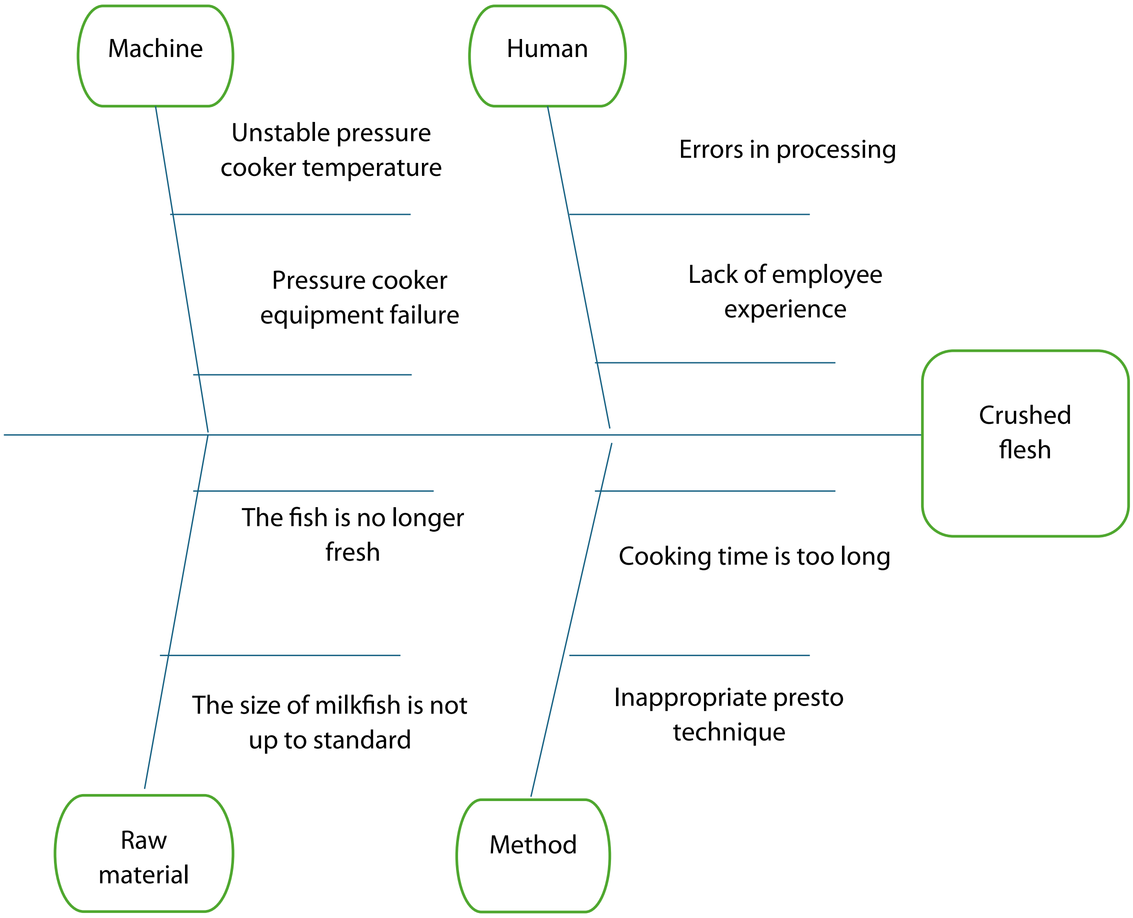
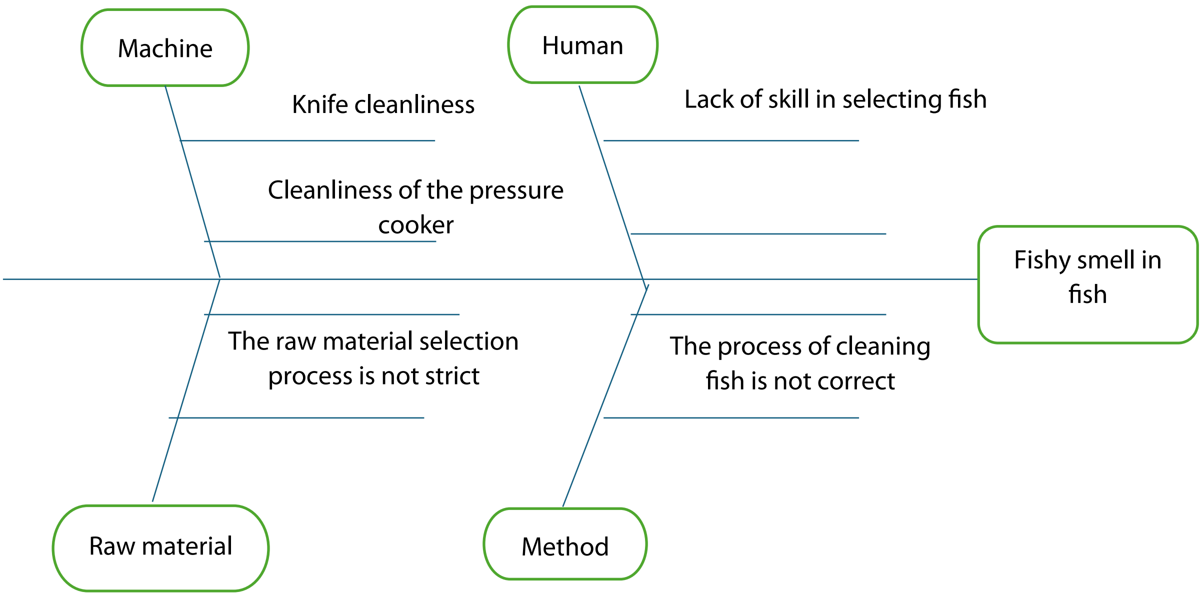
4.2.3. Analyze

At this stage, we use the fishbone diagram to identify two defect factors significantly impacting the product during production. This chart categorizes defects based on people, machines, methods, and materials.





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4.2.4. Improve

In this phase, the researcher used the FMEA (Failure Modes and Effects Analysis) technique to provide improvement suggestions and recommendations based on the root causes identified in the analysis stage, aiming to enhance the company's performance and prevent the same errors in future production processes FMEA (Failure Modes and Effects Analysis) is a commonly used tool in improvement methodologies, helping to identify the causes and origins of quality issues. The improvement plan is executed by prioritizing corrective actions, where the RPN (Risk Priority Number) is calculated by multiplying the SOD (Severity, Occurrence, Detection) values. Subsequently, the RPN rankings from highest to lowest are used to identify failure modes requiring immediate corrective measures.

Table 3. Result

NO	Defect Category	Failure Mode	Potential Cause	S	O	D	RPN	Corrective Action
1	Meat Crushed	Failure in the Presto process	The pressure or temperature is too high during the pressure cooking process.	6	5	5	150	Ensure the pressure and temperature in the pressure cooker are within the standards.
			Presto duration is too long.					Monitor the pressure cooker time strictly.
			Inappropriate handling of meat before the pressure cooking process					Use appropriate raw material handling procedures.
2	Defect Category	Failure Mode	No fish quality standards before the production process.	2	4	3	24	Implement quality standards for raw material selection
			Inappropriate selection of raw materials					Select raw materials carefully before entering the pressure cooker process.
			Inappropriate selection of fish					Visual and olfactory inspections when receiving raw materials

Based on the calculation of the Risk Priority Number (RPN) above, it was found that crushed flesh is the most critical defect in production, with the highest Risk Priority Number (RPN) value of 150.

4.2.5. Control

At this stage, we implement control measures to enhance production quality and minimize defective products in the production process through the following proposed actions:

a. Conduct strict supervision during the production process and perform regular machine maintenance.
b. Ensuring cleanliness control of equipment and work areas with scheduled routine cleaning.
c. Training employees on SOPs (Standard Operating Procedures) to ensure smooth production processes.
d. Providing training for workers to standardize and improve their skills.

V. Conclusion

Product defects in Presto milkfish products were identified based on rework data from September 2024 to October 2024. Approximately 3 kg of products were defective out of a total production of 170 kg, with a defect percentage of 12.3%. Based on this data, an analysis was conducted using the Six Sigma DMAIC method, yielding a sigma value of 4, indicating that the Presto milkfish SME performs reasonably well. Crushed flesh, with an RPN of 150, is the dominant type of defect that needs improvement. Further analysis of the causes of these defects was carried out using a fishbone diagram. From the results, several control recommendations were proposed, including strict supervision of the production process, regular machine maintenance, maintaining workspace cleanliness, enforcing SOPs, and providing training for workers.

References

Fadhilah, S. R., & Zakaria, R. (2023, November). Analisis Pengendalian Kualitas Produk Pada PT. XYZ Menggunakan Metode Six Sigma DMAIC. In Prosiding Seminar Nasional Waluyo Jatmiko (pp. 1-10).

Falaq, I. N., & Nuryanto, I. (2023). Pengendalian Kualitas Produksi Bandeng Vacuum Spesial PT. Bandeng Juwana Pada Proses Packaging Menggunakan Metode Six Sigma. Journal of Student Research, 1(4), 236-248.

Nailah, N., Harsono, A., & LIANSARI, G. P. (2014). Usulan Perbaikan Untuk Mengurangi Jumlah Cacat pada Produk Sandal Eiger S-101 Lightspeed dengan Menggunakan Metode Six Sigma. Reka Integra, 2(2).

Rosyidasari, A., & Iftadi, I. (2020). Implementasi Six Sigma dalam Pengendalian Kualitas Produk Refined Bleached Deodorized Palm Oil. Jurnal INTECH Teknik Industri Universitas Serang Raya, 6(2), 113-122.

Hidajat, H. H., & Subagyo, A. M. (2022). Analisis Pengendalian Kualitas Produk X Dengan Metode Six Sigma (DMAIC) Pada PT. XYZ. Jurnal Ilmiah Wahana Pendidikan, 8(9), 234-242.

Hanifah, P. S. K., & Iftadi, I. (2022). Penerapan Metode Six Sigma dan Failure Mode Effect Analysis untuk Perbaikan Pengendalian Kualitas Produksi Gula. Jurnal INTECH Teknik Industri Universitas Serang Raya, 8(2), 90-98.

Rahayu, P., & Bernik, M. (2020). Peningkatan Pengendalian Kualitas Produk Roti dengan Metode Six Sigma Menggunakan New & Old 7 Tools. Jurnal Bisnis dan Kewirausahaan, 16(2), 128-136.

Rinjani, I., Wahyudin, W., & Nugraha, B. (2021). Analisis Pengendalian Kualitas Produk Cacat pada Lensa Tipe X Menggunakan Lean Six Sigma dengan Konsep DMAIC. UNISTEK: Jurnal Pendidikan dan Aplikasi Industri, 8(1), 18-29.

Juwito, A., & Al-Faritsy, A. Z. (2022). Analisis Pengendalian Kualitas untuk Mengurangi Cacat Produk dengan Metode Six Sigma di UMKM Makmur Santosa. Jurnal Cakrawala Ilmiah, 1(12), 3295-3314.

Al Faritsy, A. Z., & Wahyunoto, A. S. (2022). Analisis Pengendalian Kualitas Produk Meja Menggunakan Metode Six Sigma Pada PT XYZ. Jurnal Rekayasa Industri (JRI), 4(2), 52-62.

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.

Pratama, A. A., & Chirzun, A. (2023). Analisis Pengendalian Kualitas Dalam Meningkatkan Pelayanan Asuradur Kredit Usaha Rakyat Menggunakan Six Sigma. Jurnal Teknologi dan Manajemen Industri Terapan, 2(3), 191-199.

Basjir, M., & Hariyono, A. T. (2020). Pengendalian Kualitas dengan Pendekatan Six Sigma dan New Seventools sebagai Upaya Perbaikan Produk. Journal of Research and Technology, 6(2), 297-311.

Ibrahim, I., Arifin, D., & Khairunnisa, A. (2020). Analisis Pengendalian Kualitas Menggunakan Metode Six Sigma Dengan Tahapan DMAIC Untuk Mengurangi Jumlah Cacat Pada Produk Vibrating Roller Compactor Di PT. Sakai Indonesia. Jurnal KaLIBRASI: Karya Lintas Ilmu Bidang Rekayasa Arsitektur, Sipil, Industri, 3(1), 18-36.

Sinambela, Y., Sinaga, R., & Simbolon, T. (2023). Pengendalian Kualitas Hasil Produksi Cetak Buku Dengan Menggunakan Metode Six Sigma. JOURNAL OF INDUSTRIAL AND MANUFACTURING ENGINEERING, 7(1), 99-108.

Prasetyo, A., Lukmandono, L., & Dewi, R. M. (2021, October). Pengendalian Kualitas pada Spandek dengan Penerapan Six Sigma dan Kaizen untuk Meminimasi Produk Cacat (Studi Kasus: PT. ABC). In Prosiding Seminar Nasional Sains dan Teknologi Terapan (Vol. 9, No. 1, pp. 29-34).

ISSN [Online]: 2776-642X

Bahauddin, A., & Latif, M. R. (2022). Pengendalian kualitas base oil menggunakan metode six sigma. Journal Industrial Services, 7(2), 269-275.

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.

Septiawan, I., Ningsih, M. S., & Gunawan, I. (2022). Analisis pengendalian kualitas pada Crude Palm Kernel Oil dengan metode Six Sigma di PT. X. Jurnal VORTEKS, 3(1), 166-173.

Kusumawati, A., & Fitriyeni, L. (2017). Pengendalian Kualitas Proses Pengemasan Gula Dengan Pendekatan Six Sigma. Jurnal Sistem Dan Manajemen Industri, 1(1), 43-48.