Indonesian Journal of Engineering and Technological Innovation
DOI: https://doi.org/10.63142/ijeti.v1i2.377
Volume 1 Issue 2, 2025
e-ISSN: 3090-9244 | p-ISSN - | Hal. 40-52
Available online since: June 30, 2025

Efforts to Improve the Quality of Shrimp Pasted Products through the Implementation of the Plan-Do-Check-Act Cycle and *the Root Cause Analysis* Method at UD Nurhayati

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Abstract

Micro, Small, and Medium Enterprises (MSMEs) play a vital role in the economy. However, MSMEs often face challenges in maintaining product quality due to limited machinery and suboptimal production process control, leading to losses. One example is the production of shrimp paste at UD Nurhayati, with a capacity of approximately 3 dozen cups per month. Defective products were found due to poorly controlled processing. These defects included uneven shrimp paste texture and high humidity levels that could potentially lead to mold growth. This study aimed to identify the root cause of problems in the production line using the Root Cause Analysis (RCA) method, followed by improvements through the implementation of the Plan, Do, Check, and Action (PDCA) cycle to assist UD Nurhayati in addressing defective products. Based on the results of the application of these methods, this study produced several outcomes, namely a significant reduction in the number of defective products and an increase in production capacity of 33.3% and 14.95%, respectively, compared to the condition before the improvements were made. This study indicates that the application of the PDCA and RCA methods can improve the quality and effectiveness of the production process. These results imply that UD Nurhayati needs to standardize work procedures and provide ongoing training for employees to maintain consistent product quality.
Keywords: *PDCA; Root Cause Analysis; Defective Products; Production; Quality.*

Abstrak

Usaha, Mikro, Kecil, dan Menengah (UMKM) memiliki peranan penting dalam perekonomian. Namun, UMKM sering kali menghadapi permasalahan dalam menjaga kualitas produk akibat keterbatasan mesin serta pengendalian proses produksi yang belum optimal sehingga menimbulkan kerugian. Salah satunya terjadi pada produksi terasi di UD Nurhayati dengan kapasitas sekitar 3 lusin cup per bulan, di mana terdapat produk cacat akibat proses pengolahan yang belum terkendali dengan baik. Cacat tersebut meliputi tekstur terasi yang tidak seragam dan tingkat kelembapan tinggi yang berpotensi menimbulkan jamur. Penelitian ini bertujuann untuk mengidentifikasi akar penyebab masalah pada lini produksi menggunakan metode *Root Cause Analysis* (RCA), kemudian dilanjutkan dengan melakukan perbaikan melalui penerapan siklus *Plan, Do, Check,* dan *Action* (PDCA) untuk membantu UD Nurhayati dalam mengatasi produk cacat. Berdasarkan hasil penerapan metode tersebut, penelitan ini menghasilkan beberapa luaran, yakni penurunan jumlah produk cacat dan peningkatan kapasitas produksi yang signifikan secara berturut-turut sebesar 33,3% dan 14,95% dibandingkan dengan kondisi sebelum perbaikan dilakukan. Penelitian ini menunjukkan bahwa penerapan metode PDCA dan RCA dapat meningkatkan kualitas serta efektivitas proses prodksi. Hasil tersebut mengimplikasikan bahwa UD Nurhayati perlu melakukan standarisasi prosedur kerja dan pelatihan berkelanjutan bagi karyawan untuk mempertahankan mutu produk secara konsisten.
Kata Kunci: PDCA; *Root Cause Analysis;* Produk Cacat; Produksi; Kualitas.

INTRODUCTION

Processed seafood products are one of the important commodities in the Indonesian food industry. One of them is shrimp paste, a traditional shrimp-based spice that is widely produced in various regions. The production of processed fishery products can become a leading commodity if the standards for handling raw materials, processing, and packaging are carried out in accordance with the quality standards that have been set (Pratama et al., 2023). UD Nurhayati as one of the shrimp paste producers faces challenges in maintaining product quality consistency. The production process plays an important role in determining product quality so that every company can estimate the extent to which production is running effectively (Erdi & Haryanti, 2022). This is especially relevant in shrimp paste production, where the quality is greatly influenced by the selection of the right raw materials, controlled fermentation processes, and optimal storage conditions.

Quality is the most important part of maintaining market competitiveness and long-term business development (Al-Faritsy & Falah, 2024). In the sustainability of the company, quality products and competitive prices are needed. Increased product competitiveness can be achieved by lowering the level of product defects during the production process. Products that do not meet quality specifications in the production process are referred to as defective products (Athariq et al., 2025). To increase consumer interest, companies need to understand the standards of product valuation. Thus, companies can focus on reducing defective products during the production process to improve quality and productivity.

The researcher identified several problems related to product defects at UD Nurhayati, namely moist shrimp paste and inconsistent texture. This problem is suspected to arise due to a lack of maintenance in the grinding machine so that the raw materials are not ground evenly and produce an inhomogeneous dough. This condition causes the texture of the shrimp paste to be inconsistent and the moisture content to remain high so that the shrimp paste gets easily damp. As a result, product quality decreases and has an impact on the waste of raw materials, production time, and company costs. Product defects at UD Nurhayati for the August 2025 period are 30% and the type of moist shrimp paste defects are the most common, at 17%. For this reason, it is necessary to take quality control measures so that the quality of the products produced remains consistent (Maulana, Muhammad Rizqi Fatmawati & Brav, 2022).

Efforts to overcome these problems by implementing the Plan, Do, Check, Action (PDCA) cycle can be a solution to reduce product defects and even potentially achieve zero defects (Caesarriani, 2025). The Plan, Do, Check, Action (PDCA) cycle is a repetitive process for continuous improvement in an organization. Plan is the stage of identifying problems based on the current situation and opportunities for improvement so that goals can be set. Do is the implementation of the plan by collecting data (Faturahman and Ferdian 2022). Check is the stage of evaluating the results of implementation. Action is the stage of taking action, such as corrective and standardization measures.

Root Cause Analysis is a useful method for identifying the origin of problems and finding the root cause using quality tools (Rouf & Muhammad, 2023), namely fishbone diagrams and 5 whys analysis. The Root Cause Analysis (RCA) method is based on the belief that problems can best be solved by correcting or eliminating the root cause, rather than just immediately addressing the obvious symptoms. The Root Cause Analysis (RCA) method is based on the belief that problems can best be solved by correcting or eliminating the root cause, rather than just immediately addressing the obvious symptoms

(Reza et al., 2020) in (Faturahman and Ferdian 2022). RCA aims to find the underlying cause of a problem so that it can be permanently resolved and does not recur in the future.

RESEARCH METHODOLOGY

This study uses a quantitative descriptive approach with the aim of analyzing and improving product quality through the application of *Plan, Do, Check, Action* (PDCA) cycles and *Root Cause Analysis* (RCA) methods. This study aims to analyze the defects of shrimp paste products, identify causative factors, and sustainable solutions at UD Nurhayati, which is located on Jl Palangkaraya II No. 6, Gresik, East Java. The research sample was taken using *purposive sampling*, namely shrimp paste products that experienced moisture defects and inconsistent texture during the period of August – September 2025, so that the analysis was more focused on the problems that occurred.

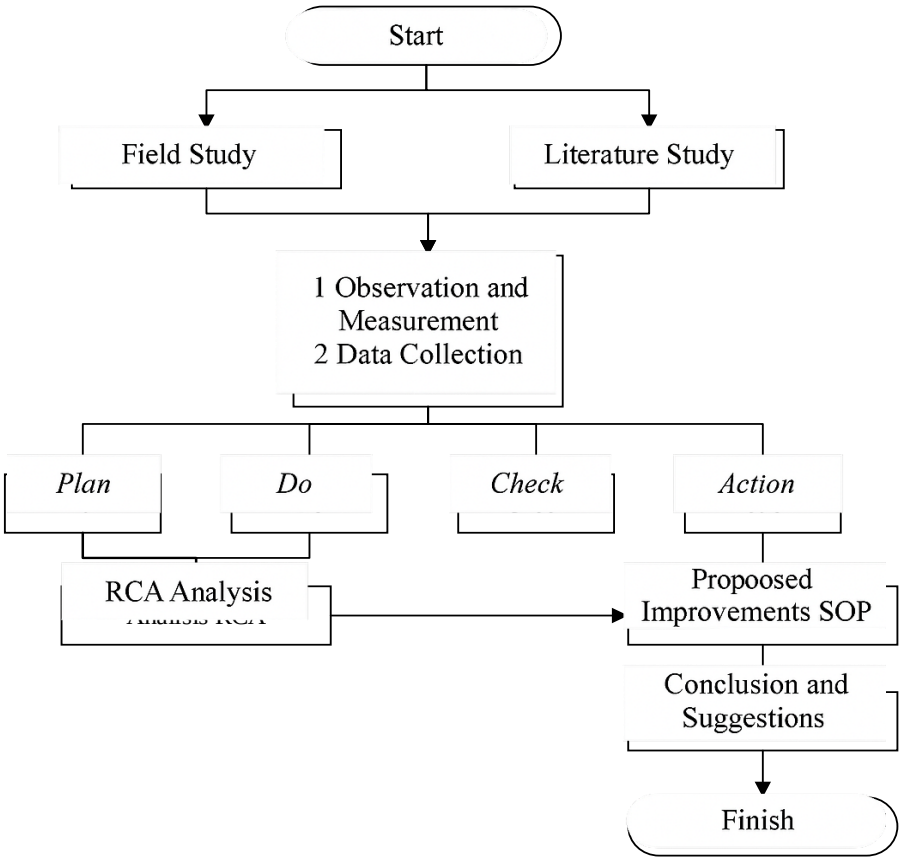

Figure 1. Research Flowchart
Source: Processed Researcher

The research was conducted through a series of detailed stages as shown in Figure 1. The steps taken in the data analysis process were as follows:

1. *Plan*
   a. Identifying problems
   b. Determining the type of defect
   c. Opportunities for improvement
2. *Do*
   Data was collected using research instruments such as check sheets, interviews, and observations. The improvement plan was implemented using the RCA method with the help of quality tools, namely fishbone diagrams and 5 whys.

3. *Check*
   After making repairs at the *Do* stage, an inspection of the improvement action is carried out by involving discussions with employees according to the SOP by making a special sheet to assess the results of the implementation of the production process.
4. *Action*
   a. Prevent similar problems from occurring
   b. Establishing new work procedures

In the use of the Root Cause Analysis (RCA) method, researchers use several quality tools to help track the variables that cause problems, namely

1. Diagram *Fishbone*
   A cause-and-effect diagram is an analytical tool used to identify the main and secondary factors that cause a problem (Surya et al., 2025). A fishbone diagram is also a visual tool for identifying, exploring, and graphically depicting all the causes that contribute to a problem (Arif & Gunawan, 2023).
2. Diagram Pareto
   A pareto chart is a bar graph that shows the frequency distribution of data that has been arranged by category or often shows problems based on the sequence of events and is used at stages in a program to improve quality and determine which steps to take (Sitompul, 2024).
3. 5 *Why's*
   The Root Cause Analysis method used, namely the 5 Why's analysis, is a systematic approach that aims to explore the main causes of a problem in depth (Rouf & Muhammad, 2023). By constantly asking "why" over and over again, this study explores the layers of causation that underlie every failure in shrimp paste products.

RESULTS AND DISCUSSION

The researcher collected data at UD Nurhayati on the number of defects that occurred in each criterion based on existing provisions. The types of defects that occur can be seen in the table below

Table 1. Product Defect Identification

No.	Types of Defects	Identify the Type of Disability
1.	Texture is not uniform	The type of defect has a difference in consistency, there are overlarge/coarse granules and separate lumps.
2.	Moist shrimp paste	The type of defect that occurs when the moisture content condition is too high so that it feels wet, sticky, and is at risk of expiring easily.

To review the problem of defects that occur in shrimp paste products, the researcher applied the Plan, Do, Check, Action (PDCA) cycle and the Root Cause Analysis (RCA) method. Data collection was carried out through a field study with a focus on defective products for 15 working days in August 2025 which will be used as a reference for data processing.

Table 2. Terasi Product Defect Data for the August 2025 period
Source: Processed Researcher

No	Date	Production Quantity (cup)	Types of Defects		Number of Defects (cup)
			Inconsistent Textures	Damp Products	
1	01/08/2025	24	2	0	2
2	04/08/2025	35	1	2	3
3	05/08/2025	30	1	0	1
4	08/08/2025	25	0	0	0
5	10/08/2025	40	1	3	4
6	11/08/2025	35	0	0	0
7	12/08/2025	35	1	2	3
8	14/08/2025	60	2	3	5
9	19/08/2025	28	0	0	0
10	21/08/2025	30	1	1	2
11	22/08/2025	35	0	1	1
12	25/08/2025	55	3	2	5
13	26/08/2025	45	1	3	4
14	28/08/2025	40	0	0	0
15	29/08/2025	38	0	0	0
Total		**555**	**13%**	**17%**	**30**

Planning Stage (*Plan*)

The *plan* stage aims to analyze the causes of problems in the shrimp paste production process from start to finish so that the process as a whole is known. In table 2, it can be seen that shrimp paste products in August 2025 have a fairly high percentage of defects. Thus, it is necessary to carry out a more thorough analysis related to these problems.

1. Diagram Pareto

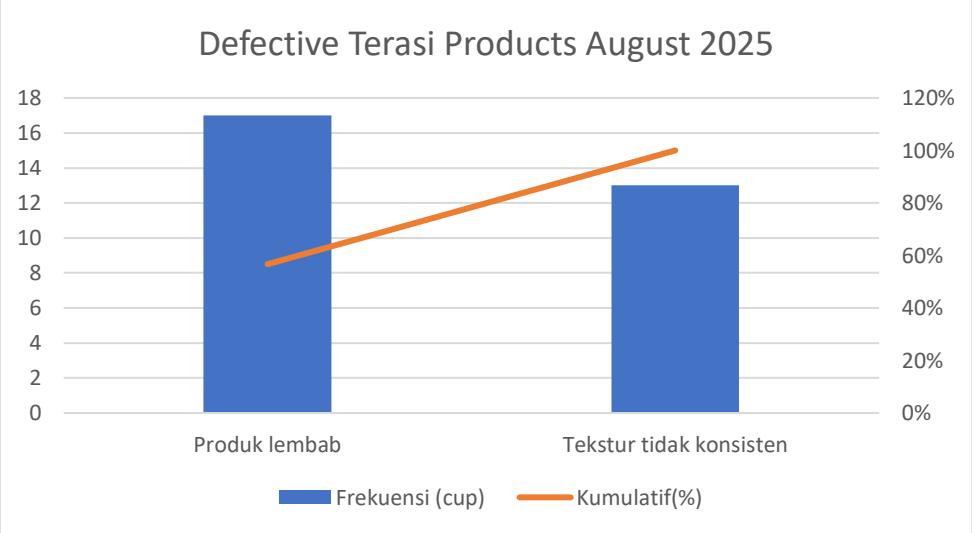

Figure 2. Pareto Chart of Shrimp Crop Defects August 2025

Based on figure 2, it can be seen that the problem that often occurs is damp products with a frequency of about 17 incidents. The cumulative line shows that these two types of defects contribute up to 100% of the total observed problems, of which the defects of moist products alone account for about 60%. This condition shows that improvement efforts are needed focused on handling the problem of moist products with the analysis of fishbone diagrams.

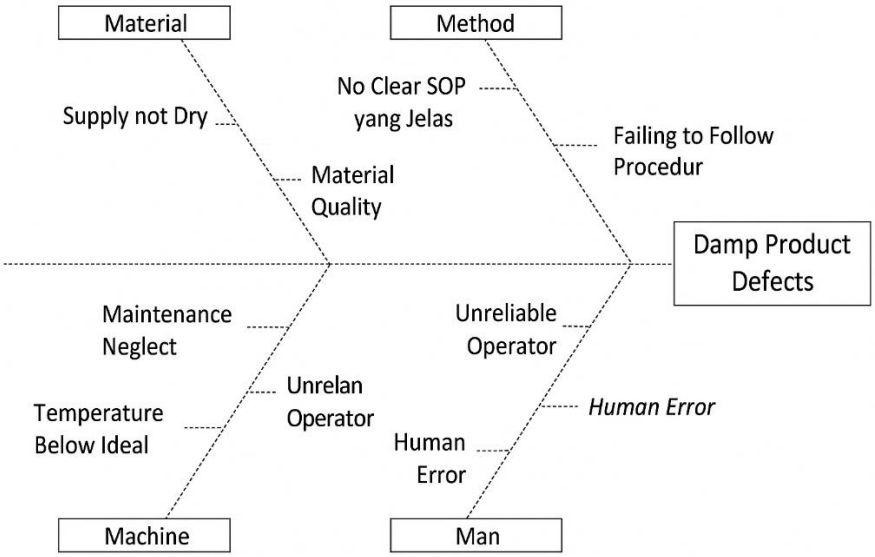

Figure 3. *Fishbone* Diagram of Damp Product Defects

Based on the fishbone diagram above, it is known that moist product defects can be caused by four main factors, namely:

a. Material
   Material factors are related to the condition of the raw materials used. The shrimp paste becomes moist because the raw materials have not dried completely before the grinding process. In addition, the poor quality of the materials used, such as materials with high moisture content or not stored properly, also increases the risk of the product becoming damp after the production process.
b. Machine
   The engine factor arises due to the lack of maintenance of the dryer and grinder, so that the machine cannot reach the ideal temperature during the drying process. This condition causes the moisture content in the product not to be reduced optimally. In addition, the possibility of the machine jamming or not functioning optimally also hinders the smooth drying process.
c. Method
   The method factor shows that the absence of clear SOPs regarding drying time and temperature is the main cause of the inconsistency of the results. Operators sometimes do not follow the established procedures, so the drying results are uneven and some products still contain high moisture content.
d. Human
   Human factors are related to the operator's lack of accuracy in monitoring the level of dryness of the product. In addition, the lack of training means that operators do not yet understand the importance of proper temperature and drying time settings.

This condition can cause human error, which has an impact on the final quality of the product.

Based on interviews with the production and analysis using *fishbone* diagrams, the results will be an advanced stage in the interview process to identify obstacles in the production process.

a. Problem: The production of moist shrimp paste and texture is inconsistent.
b. Why-1: The shrimp paste is moist and the texture is inconsistent because the raw materials are not ground evenly.
c. Why-2: The raw materials are not evenly ground because the grinding machine is poorly maintained and the performance is unstable.
d. Why-3: The grinding machine is unstable because the grinding process does not have clear operational standards.
e. Why-4: The absence of clear operational standards causes operators to use their own assumptions when working.
f. Why-5: The operator does not have a guide or SOP for the maintenance of the grinding machine.
g. The root of the problem: There is no clear SOP for grinding machine maintenance, so the grinding process is not optimal and results in moist shrimp paste products and inconsistent texture.

After the analysis is carried out using the 5 *why's* method, the next step is to prepare a repair plan based on the root of the problem found in each causal factor. The following is a repair plan prepared to reduce moisture product *defects* in the shrimp paste production process.

Table 3. Proposed Improvements

Factor	Proposed Improvements
Material Side	The problem of raw materials that have not dried and poor material quality can be overcome by checking the moisture content before the production process. If the moisture content is still high, the material needs to be dried longer. In addition, companies can evaluate suppliers to ensure that the materials received are up to standard.
Machine Side	Problems with the engine such as unstable temperatures and frequent jams can be fixed by performing regular maintenance and temperature calibration. Periodic maintenance schedules also need to be made so that the condition of the machine is always optimal and does not interfere with the production process.
Side Method	The absence of clear SOPs and non-compliance with procedures are one of the main causes of defects. Therefore, companies need to create and implement detailed SOPs from the beginning to the end of the production process.
The Human Side	Changing operators and training new ones takes a long time. Therefore, the authors suggest a rotation system based on work routines. Operators are classified into two categories, namely competent and incompetent. Furthermore, work placement is carried out in the A-B-A-B pattern, where competent operators (A) side by side with incompetent operators (B), so that less

	skilled operators can learn directly from more experienced colleagues.

Implementation Stage (*Do*)

This stage is the implementation of every action plan that has been prepared beforehand. The implementation steps are explained as follows:

a. Inspecting and Drying Raw Materials

Gambar 4. Stages of Raw Material Inspection and Drying Activities

b. Performing Grinding Machine Maintenance and Calibration

Figure 5. Stages of Grinding Machine Maintenance and Calibration Activities

c. Preparation of Production SOPs

Figure 6. Stages of Production SOP Preparation Activities

d. Conducting Operator Training and Supervision

Figure 7. Operator Training and Supervision Activity Stage

Stages of Checking

The *check* stage is the process of evaluating the results of repairs that have been carried out by comparing the conditions before and after the repair. This evaluation is carried out to ensure that each *action plan* that is implemented is able to reduce the amount of shrimp paste products.

a. Inspecting and Drying Raw Materials

Table 4. *Checklist* of Raw Material Inspection and Drying Repair Activities

No	Improvement Plan	10 Sep 2025	15 Sep 2025	25 Sep 2025
1	Checking the moisture content of raw materials before and after drying	✓		

2	Evaluating the quality uniformity of raw materials		✓	
3	Assess the effectiveness of the drying process on the final product		✓	
4	Recording of evaluation and follow-up results at suppliers			✓

b. Performing Grinding Machine Maintenance and Calibration

Table 5. *Checklist* of Grinding Machine Maintenance and Calibration Repair Activities

No	Improvement Plan	11 Sep 2025	17 Sep 2025	27 Sep 2025
1	Inspection of the condition of the machine after maintenance	✓		
2	Perform mesun performance tests to ensure smooth grinding		✓	
3	Evaluate the level of fineness of raw material milling results		✓	
4	Record calibration results and schedule the next routine maintenance			✓

c. Preparation of Production SOPs

Table 6. Checklist of Improvement Activities for the Preparation of Production SOPs

No	Improvement Plan	12 Sep 2025	18 Sep 2025	28 Sep 2025
1	Check the suitability of the implementation of new SOPs at each stage of production	✓		
2	Compare production results before and after the implementation of SOPs		✓	
3	Evaluate the clarity and ease of SOPs for operators		✓	
4	Prepare revisions or improvements to SOPs if obstacles are found			✓

d. Conducting Operator Training and Supervision

Table 7. *Checklist* of Operator Training and Supervision Improvement Activities

No	Improvement Plan	13 Sep 2025	19 Sep 2025	29 Sep 2025
1	Observe operator performance after training	✓		
2	Evaluating the effectiveness of the A–B–A–B work rotation pattern		✓	

3	Evaluate the clarity and ease of SOPs for operators		✓	
4	Assess the operator's ability to implement new SOPs			✓

After evaluating and checking the results, it turned out that the level of defects in shrimp paste products had decreased significantly compared to before the repairs were made. This shows that the implementation *of the action plan* that has been designed is able to improve the production process. Of the total 638 cups of shrimp paste produced, 20 cups were found to be defective or about 3.1%, with details of inconsistent texture defects of 9% and moist/moldy shrimp paste accounting for 11% of the total defects.

Table 8. Shrimp Pasted Product Defect Data for the September 2025 period
Source: Processed Researcher

No	Date	Production Quantity (cup)	Types of Defects		Number of Defects (cup)
			Inconsistent Textures	Damp Products	
1	01/09/2025	36	0	0	0
2	02/09/2025	40	0	0	0
3	03/09/2025	60	2	3	5
4	09/09/2025	48	1	1	2
5	10/09/2025	48	1	0	1
6	11/09/2025	40	1	0	1
7	12/09/2025	45	0	2	2
8	13/09/2025	48	1	0	1
9	18/09/2025	36	0	0	0
10	19/09/2025	24	2	0	2
11	24/09/2025	60	1	1	2
12	25/09/2025	45	0	1	1
13	26/09/2025	40	1	0	1
14	29/09/2025	36	0	0	0
15	30/09/2025	30	0	0	0
Total		**638**	**9%**	**11%**	**20**

Action Stage

The solution implemented through the application of PDCA and RCA can be said to be successful because it was able to reduce 33.3% of moisture paste defects compared to before the repair as shown in table 9. However, there are still defective products that appear in every production cycle so follow-up actions are needed to keep the repair results consistent and can even lower the level of product defects in the future.

Table 9. Comparison of Product Defects August 2025 and September 2025
Source: Processed Researcher

No	Jenis Cacat	Agustus-25	Sep-25
1	Tekstur Tidak Konsisten	13	9
2	Produk Lembab	17	11
Total Cacat		30	20
Penurunan		33,3%	

The results can be said to be satisfactory because they show a decrease in defective products by 33.3%. However, when compared to production capacity, it can be seen that the decrease in the number of defects in September 2025 shows more optimal results. The following is a comparison of the number of production between August 2025 and September 2025.

Agustus-25		Sep-25	
Produksi	Cacat	Produksi	Cacat
555	30	638	20
Presentase			
Kapasitas Produksi		14,95%	*Increase*
Penurunan Cacat		33,30%	*Decrease*
Cacat/Kapasitas Agustus		5,41%	
Cacat/Kapasitas September		3,13%	

Figure 8. Comparison of Production Capacity in August – September 2025
Source: Processed Researcher

Figure 8 shows that in September 2025 there was an increase in production capacity by 14.95% compared to August 2025. This condition can increase production capacity and the number of defective products is actually lower when viewed from the comparison between production capacity and the number of defective products. This can be seen from the percentage of defects in August 2025 of 5.41%, while in September 2025 it was only 3.13%. In other words, if the production capacity in September 2025 is equalized by August 2025 then the percentage of defects will remain lower which indicates that the increase in production does not lead to an increase in the number of defects.

In addition, steps that can be taken periodically include regular supervision of the operator's performance to ensure that each production process is carried out in accordance with the SOPs for grinding and drying raw materials, especially in terms of timing, temperature, and cleanliness of the work area. In addition, it is necessary to schedule regular grinding machine maintenance, including cleaning, component lubrication, rotation stability checks, and temperature calibration to maintain optimal engine performance. This effort is expected to prevent a decline in engine performance that has the potential to cause uneven grinding results and reduce the possibility of the reappearance of moist and inconsistent textured shrimp paste products.

CONCLUSION

Based on the results of the application *of Plan, Do, Check, Action* (PDCA) and *Root Cause Analysis* (RCA) methods in the shrimp paste production process at UD Nurhayati, it can be concluded that the improvements made have succeeded in significantly reducing the level of product defects. After the implementation of the improvement, the level of shrimp shrimp defects decreased by 33.3% with inconsistent texture defects detailed by 9% and moist shrimp paste by 11% of the total defects. In addition, production capacity increased by 14.95% compared to the previous month, indicating that the increase in production volume did not lead to an increase in the number of defects.

Improvements made include checking the moisture content of raw materials before the production process, maintenance and calibration of grinding machines, preparation of clearer SOPs, and regular training and supervision of operators. To maintain the results of continuous improvements, UD Nurhayati needs to implement routine supervision of the implementation of SOPs, schedule regular machine maintenance, and provide

advanced training to operators to remain disciplined in carrying out the work procedures that have been set, so that the quality of shrimp paste products can be maintained and business competitiveness continues to improve in the future.

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ACKNOWLEDGMENTS

The authors would like to express their sincere gratitude to Universitas 17 Agustus 1945 Surabaya for the valuable support and facilities provided throughout the research process. Special thanks are also extended to the academic advisors for their constructive guidance and insightful feedback during the study and manuscript preparation. The authors acknowledge the contribution of all individuals and parties who have provided assistance, encouragement, and technical support. This research would not have been possible without the institutional support and collaborative environment fostered by Universitas 17 Agustus 1945 Surabaya.

FUNDING INFORMATION

None.

CONFLICTING INTEREST STATEMENT

The authors state that there is no conflict of interest in the publication of this article.

HISTORY OF ARTICLE

Submitted : March 29, 2025
Revised : May 30, 2025
Accepted : June 29, 2025
Published : June 30, 2025