ANALYSIS OF QUALITY CONTROL IN THE AMPLANG PRODUCTION PROCESS TO MINIMIZE DEFECTS USING THE SEVEN TOOLS METHOD:
A CASE STUDY AT MSME (AMPLANG LILY)

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ABSTRACT

Amplang is a traditional Indonesian snack made from milkfish and is widely recognized for its distinctive taste and crunchy texture. In an increasingly competitive food industry, maintaining consistent product quality is essential to meeting consumer expectations and sustaining market competitiveness. This study aims to analyze quality control practices in the amplang production process at Amplang Lily, with a particular focus on reducing product defects. The research employs the Seven Quality Control Tools, including flowcharts, check sheets, histograms, scatter diagrams, fishbone diagrams, Pareto charts, and control charts, which are applied across various stages of the production process. The findings reveal that product defects are primarily attributable to substandard raw materials, inaccurate ingredient measurements, improper processing techniques, and human error during production. This study is limited to a single case study at Amplang Lily, which may restrict the generalizability of the findings to other similar enterprises. Therefore, future research is recommended to examine the application of quality control tools across a broader range of small and medium-sized enterprises (SMEs) or in the production of similar products using different raw materials.

Keywords: Amplang; Quality Control; Seven Tools

INTRODUCTION

Amplang is a type of snack made from fish mixed with flour and other ingredients (Yunus, 2019). With its savory taste and crunchy texture, amplang is favored by a wide range of consumers, from children to adults, thus holding significant market potential. In addition, amplang is known for its nutritional content from fish, which is beneficial for health, making it a popular snack choice. With continuous improvements in quality, amplang has the potential to become a competitive product in the snack food market. However, to meet market demand for amplang and target available market opportunities, it is essential for producers to focus on improving consumer satisfaction through better product quality. Consumer demand for quality is increasingly high, not only concerning the physical aspects of the product but also its ability to function optimally (Sari, 2017). This indicates that consumers desire products that not only look good but also provide the benefits they expect. Therefore, business owners need to produce high-quality amplang to compete in the increasingly competitive market and maintain customer loyalty (Darmanto, 2022).

According to Ernawati et al. (2022), the better the product quality, the greater the consumer interest in purchasing, as products that meet or exceed consumer expectations encourage repeat purchasing decisions and attract more customers. One critical factor in achieving this is proper quality control. Quality control is essential in fulfilling consumer satisfaction, particularly for MSMEs aiming to enhance their competitiveness in the market (Widaningrum et al., 2025). Effective quality control ensures that the products meet the desired standards and helps prevent product defects. Quality control is crucial for a company as it is a vital step in producing high-quality products that not only increase customer satisfaction but also strengthen the company's brand image (Budiman et al., 2021). Therefore, a product's quality heavily depends on the company's ability to manage the production process effectively, including selecting the right raw materials, efficient production procedures, and strict supervision at every production stage (Noor, 2016). Thus, maintaining and improving the quality of amplang will be key to winning the market competition and building long-term customer relationships.

UMKM Amplang Lily is an MSME producing amplang in Tarakan City, North Kalimantan. The products produced by this MSME include bandeng amplang, shrimp amplang, and crab amplang, known for their distinctive flavors that are popular among many consumers. However, Amplang Lily faces issues with product defects, particularly with the texture of the amplang, which tends to be somewhat hard, potentially reducing consumer satisfaction. This defect can affect the product's reputation in an increasingly competitive market. Therefore, this study will apply the Seven Tools of Quality Control to identify the root causes of these defects and provide appropriate quality control solutions. (Helia & Suyoto, 2017). It is hoped that the results of this study will provide valuable insights for Amplang Lily in improving the quality of their amplang products, which in turn will enhance the product's competitiveness in the market and ensure consumer satisfaction. With quality improvements, this MSME is expected to expand its market share and increase long-term profitability.

LITERATURE REVIEW

Quality Control In Production

Quality control refers to a series of steps implemented during production to ensure that the resulting products meet established quality standards (Susanti, 2024). Its primary objective is to maintain high product quality and minimize defects. (Susanti, 2024). Quality control not only focuses on finished products but also ensures that every step in the production process meets the defined quality criteria. (Mutrofin et al., 2024). By

implementing proper quality control, companies can reduce product defects, enhance customer satisfaction, and minimize unnecessary production costs (Islamic, 2024). Furthermore, effective quality control can also improve the product's competitiveness in an increasingly competitive market (Suriyanti et al., 2024).

The Seven Tools of Quality Control

The Seven Tools of Quality Control are statistical tools used to assist companies in identifying and addressing product quality issues (Palupi, 2022). These tools make it easier for companies to identify production problems, analyze their causes, and seek solutions for improvement. The following is a description of the seven tools frequently utilized in quality control, as outlined by Heizer and Render (2017).

1. Flow Chart: A diagram that visually illustrates the steps in the production process. By using this diagram, companies can more easily trace the production flow and identify potential points where problems may arise.
2. Check Sheet: A form used to record data or information during the production process. This tool helps identify potential issues and provides data that can be analyzed further.
3. Histogram: A graph that shows how often a particular value or category appears in production data. This graph helps companies observe the distribution of data and identify variations that may occur in the production process.
4. Scatter Diagram: A tool used to examine the relationship between two variables. This tool is useful for determining whether there is a correlation between two factors that may affect product quality.
5. Fishbone Diagram: Also known as the Ishikawa diagram, it is used to illustrate various causes of a problem in the product. This diagram helps companies identify the root causes of product defects and find appropriate solutions.
6. Pareto Diagram: A tool used to identify the most frequent problems and prioritize the issues that have the greatest impact. This principle helps companies focus on solving the most significant problems first.
7. Control Chart: A graph that shows the stability of a production process over time. By using this chart, companies can monitor whether the production process is within acceptable limits or requires improvement.

METHOD

This study employs a quantitative approach using the Seven Tools method in quality control to analyze the quality of amplang products produced by Amplang Lily, a micro, small, and medium enterprise (MSME). The focus of this research is direct observation of amplang products manufactured at Amplang Lily, located in Perumnas, Kp 4, Rt 04, No 94, Jl. Gang Rambai 2, Tarakan City, North Kalimantan. The study aims to identify and analyze product defects and understand the production processes related to quality control. The population in this study consists of all amplang products produced during the observation period. The research sample comprises amplang products taken during that period, which are then classified into good products and defective products for analysis using the Seven Tools of Quality Control. Additionally, Mrs. Eka, the owner of Amplang Lily, serves as a key source of data, providing information on production data, types of product defects, causes of defects, and quality control efforts implemented.

Data collection involved direct observation of the amplang products and production processes, as well as interviews with Mrs. Eka. The data collected were then analyzed using the Seven Tools method in quality control. According to Anam and

Jufriyanto (2022), the check sheet was utilized to ensure data alignment with relevant categories, while the histogram was employed to visualize data distribution. The Pareto chart was used to identify the primary issues requiring attention, and the fishbone diagram was applied to uncover the root causes of product defects. The control chart monitored the stability of the production process, the scatter diagram analyzed the relationships between variables affecting product quality, and the flowchart mapped the production process to identify potential problem points.

By applying this approach, the study aims to provide a comprehensive understanding of the quality of amplang products and how quality control measures can be effectively implemented to enhance product quality.

RESULTS AND DISCUSSION
Flow Chart
Flow chart is a visual representation that presents the sequence of stages in a process in a systematic and logical manner, thereby facilitating the understanding of the flow of activities from the initial stage to the final stage (Damayanti & Santoso, 2020). The presentation of the flow chart in this study aims to provide a comprehensive overview of the stages of the production process that constitute the object of analysis, enabling readers to understand the process context prior to further analysis. Through the use of a flow chart, the production process flow can be understood concisely without requiring detailed and technical explanations in this section, while also supporting the clarity of the research methodology employed.
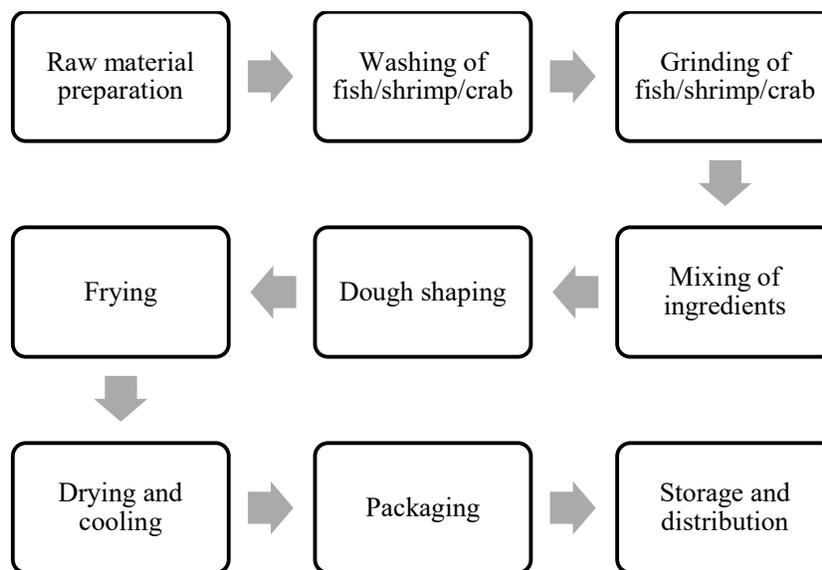
Source: Processed Data by the Researcher, 2024

Figure 1
Flowchart

The production process flow presented illustrates the stages of processing products made from fish, shrimp, or crab, which are carried out systematically from the initial stage to the final stage. The process begins with raw material preparation, which involves the preparation of the main raw materials before entering the processing stage.

The next stage is washing of fish/shrimp/crab, which aims to remove dirt and contaminants from the raw materials to ensure product quality and safety. The cleaned raw materials then undergo the grinding of fish/shrimp/crab process to reduce particle size and facilitate the mixing process in the subsequent stage.

The grinding results are further processed in the mixing of ingredients stage, where the main ingredients are mixed with additional materials until a homogeneous dough is obtained. The dough is then formed according to product specifications during the dough shaping stage.

The frying stage is conducted to cook the product and to develop the desired texture and sensory characteristics. The fried products subsequently undergo drying and cooling to reduce moisture content and product temperature, thereby enhancing product stability and shelf life.

The final stages include packaging, which serves to protect product quality and safety during storage, and storage and distribution, which involve storing and distributing the finished products to consumers or related parties.

Check Sheet

A check sheet is one of the quality control tools that functions to systematically and structurally record events, frequencies, or types of problems during the observation process (Anam & Jufriyanto, 2022).

The use of a check sheet in this study aims to facilitate consistent and objective data collection, as well as to reduce the likelihood of recording errors. The data obtained through the check sheet then serve as the basis for further analysis to identify patterns, trends, or dominant problems occurring in the observed process. Therefore, the check sheet plays an important role in supporting the accuracy and reliability of the research data.

Table 1
Check sheet

Production Day	Production Quantity (pcs)	Number of Defective Products (slightly hard texture)
1	70	9
2	70	13
3	70	14
4	70	8
5	155	27
6	10	2
7	70	10
8	70	17
9	70	12
10	70	6
11	70	19
12	155	21
13	10	3
14	40	6
15	40	8
16	40	4
17	40	3
18	40	2
19	40	10
20	10	3
21	40	10
22	40	2

23	40	8
24	40	3
25	40	5
26	40	7
27	40	5
28	40	9
29	40	10
30	40	5
Total	1610	261

Source: Processed Data by the Researcher, 2024

Table 1 presents the check sheet used to record daily production data and the number of defective products identified during the observation period. The check sheet organizes data according to production day, production quantity (pcs), and number of defective products with slightly hard texture, ensuring that all observations are consistently classified into relevant categories.

Based on Table 1, data were collected over 30 production days, with a total production output of 1,610 units. During this period, 261 defective products exhibiting a slightly hard texture were recorded. The table shows variations in both production quantity and defect occurrence across different production days, indicating fluctuations in process performance.

The use of the check sheet in Table 1 facilitates systematic data collection and enables the identification of defect patterns over time. This structured dataset serves as a reliable basis for subsequent quality analysis and supports further evaluation of process stability and defect trends in the production system.
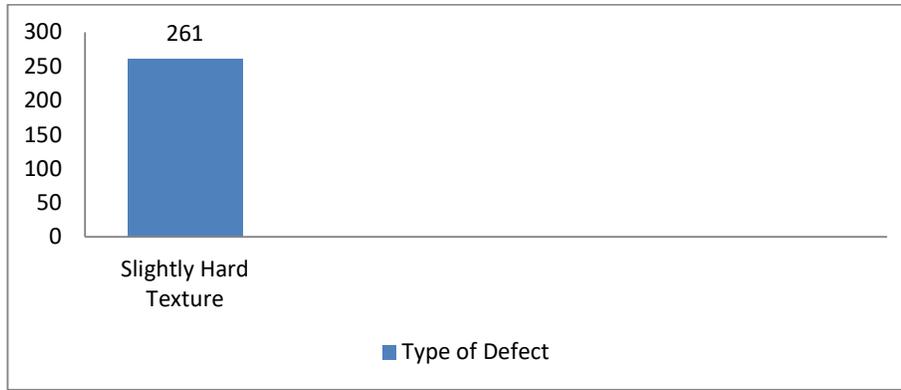
Histogram

A histogram is a statistical tool used to present the frequency distribution of data in the form of a bar chart, where the height of each bar represents the number or frequency of occurrences within a specific category or interval. Histograms function to assist in visualizing data distribution patterns, identifying dominant categories, and facilitating an overall understanding of data characteristics (Anam & Jufriyanto, 2022).

In this study, histograms are used to illustrate the distribution of the number of defective products based on the types of defects that occurred during the observation period. As shown in Table 2, data on the number and percentage of defects classified by defect type serve as the basis for constructing the histogram. Furthermore, Figure 2 presents the histogram as a visual representation of the data shown in Table 2.

Table 2
Histogram

Type of Defect	Number of Defects	Percentage
Slightly Hard Texture	261	100%

Source: Processed Data by the Researcher, 2024

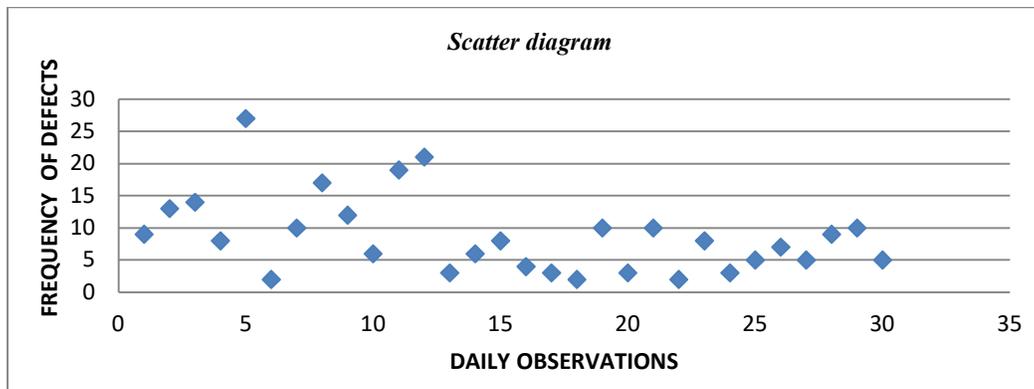Source: Processed Data by the Researcher, 2024

Figure 2
Histogram

Based on the histogram presented in Figure 2, it can be observed that all defective products identified during the observation period fall into the category of slightly hard texture. The number of defects in this category amounts to 261 units, which is equivalent to 100% of the total defective products, as shown in Table 2.

The histogram indicates that no variation in other types of defects occurred during the observation period, meaning that the quality issue is entirely focused on the texture aspect. This finding suggests that factors affecting product texture should be prioritized in efforts to control and improve the quality of the production process.

Scatter Diagram

A scatter diagram is a quality control tool used to illustrate the relationship between two quantitative variables through the distribution of data points along the horizontal and vertical axes. The scatter diagram aims to identify the direction and pattern of relationships between variables, as well as to detect data trends and the potential presence of extreme values (outliers) as a basis for further analysis (Anam & Jufriyanto, 2022).

The relationship between daily observations and defect frequency in this study is presented using a scatter diagram in Figure 3, which is employed to examine the distribution pattern and the tendency of the relationship between the variables.

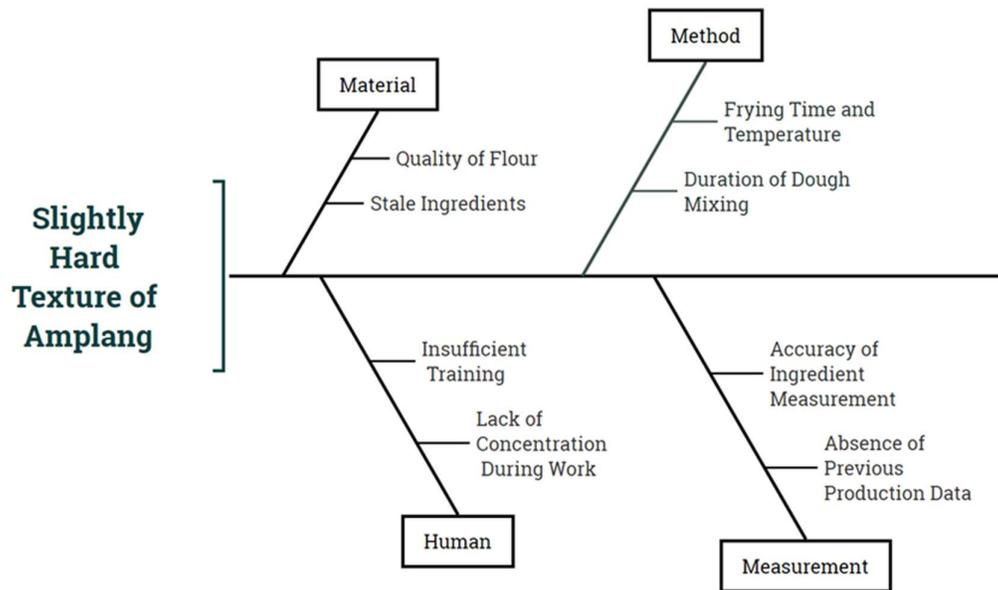Source: Processed Data by the Researcher, 2024

Figure 3
Diagram Scatter

Based on Figure 3, the scatter diagram illustrates the distribution of the relationship between daily observations and the frequency of defects. The data points are widely dispersed and do not form a clear linear pattern, indicating that the relationship between the number of daily observations and defect frequency tends to be weak. Although relatively higher defect frequencies are observed in some of the initial observations, overall increases in the number of daily observations are not consistently followed by increases in defect frequency. This suggests that defect frequency is not solely influenced by the number of daily observations but may also be affected by other factors within the observed process.

Fish Bone

A fishbone diagram, also known as a cause-and-effect diagram, is a quality control tool used to identify and categorize various potential causes of a particular problem. This diagram organizes causal factors into several main categories, enabling a systematic analysis of cause-and-effect relationships. The purpose of using a fishbone diagram is to assist in identifying the root cause of a problem, thereby facilitating the formulation of more appropriate and effective corrective actions (Palupi, 2022).

The analysis of the causes of defects in this study is presented through the fishbone diagram in Figure 4, which illustrates the main factors contributing to the observed problem.

Source: Processed Data by the Researcher, 2024

Figure 4
Fish Bone

Based on Figure 4, the fishbone diagram indicates that the issue of slightly hard amplang texture is influenced by several main factors, namely material, method, human, and measurement.

Under the material factor, the identified causes include suboptimal flour quality and the use of ingredients that are no longer fresh. Both factors may affect the dough structure and the final product quality.

Within the method factor, the causes identified are inappropriate frying time and temperature, as well as mixing duration that does not comply with established standards. These process inaccuracies may lead to changes in texture, resulting in a harder product.

Furthermore, under the human factor, the problem is influenced by insufficient training and lack of concentration during work, which may contribute to inconsistencies in the production process.

Lastly, in the measurement factor, inaccuracies in ingredient measurement and the absence of previous production data as a reference for evaluation were identified. These conditions may result in product variability.

Thus, Figure 4 demonstrates that the slightly hard texture of amplang is not caused by a single factor but rather results from the combination of multiple factors within the production process.
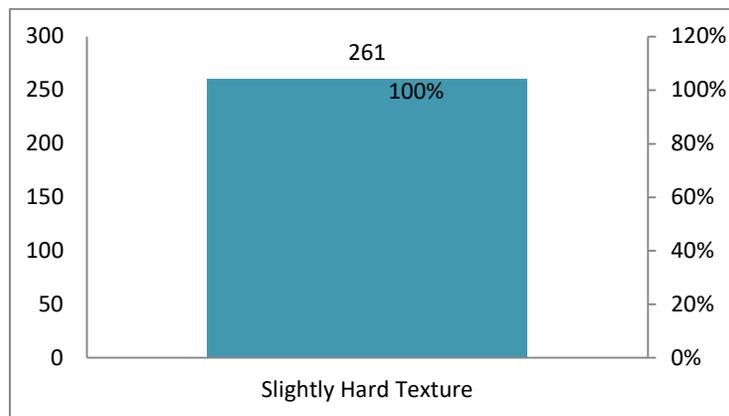
Pareto Diagram

A Pareto diagram is one of the quality control tools used to identify and prioritize problems based on their frequency or impact. The purpose of using a Pareto diagram is to determine the most dominant problem so that improvement efforts can be focused on the factor that has the greatest impact (Palupi, 2022).

Based on Table 3, the type of defect identified is slightly hard texture, with a total of 261 products, accounting for 100% of the total defects. This information is subsequently visualized in the form of a Pareto diagram in Figure 5.

Table 3
Pareto Diagram

Type of Defect	Number of Defective Products	Percentage %
Slightly Hard Texture	261	100%

Source: Processed Data by the Researcher, 2024

Source: Processed Data by the Researcher, 2024

Figure 5
Diagram Pareto

Based on Figure 5, the Pareto diagram shows that the type of defect identified in the amplang product is slightly hard texture, with a total of 261 products, accounting for 100% of the total defects. This indicates that all quality issues identified during the observation period originated from a single type of defect.

Since only one defect category was observed, the issue of slightly hard texture becomes the primary priority for quality improvement efforts. Therefore, subsequent analysis should focus on identifying the root causes of this defect, as previously examined using the fishbone diagram.
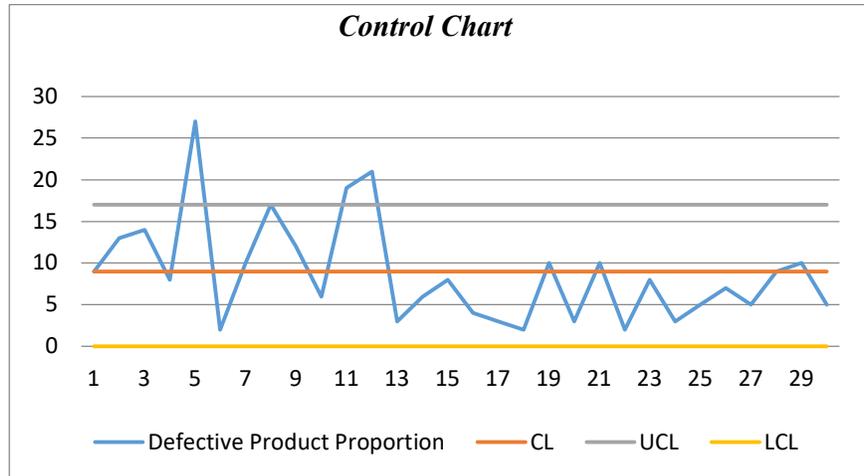
Control Chart
A control chart is a quality control tool used to monitor the stability of a production process over time. The chart presents data in graphical form and includes an Upper Control Limit (UCL), a Center Line (CL), and a Lower Control Limit (LCL). These control limits are used to determine whether a process remains in a statistically controlled condition. The purpose of using a control chart is to identify the presence of variation within the process (Palupi, 2022).

The results of monitoring the stability of the production process are presented in Figure 6, which illustrates the position of the observed data relative to the upper and lower control limits to assess whether the process is statistically under control.

Table 4
Control Limit Calculation

Day	Production Quantity	Number of Defective Products	Defective Product Proportion	CL	UCL	LCL
1	70	9	7.8	9	17	0
2	70	13	5.4	9	17	0
3	70	14	5	9	17	0
4	70	8	8.7	9	17	0
5	155	27	5.7	9	17	0
6	10	2	5	9	17	0
7	70	10	7	9	17	0
8	70	17	4.1	9	17	0
9	70	12	5.8	9	17	0
10	70	6	11.6	9	17	0
11	70	19	3.6	9	17	0
12	155	21	7.3	9	17	0
13	10	3	3.3	9	17	0
14	40	6	6.6	9	17	0
15	40	8	5	9	17	0
16	40	4	10	9	17	0
17	40	3	13.3	9	17	0
18	40	2	20	9	17	0
19	40	10	4	9	17	0
20	10	3	3.3	9	17	0
21	40	10	4	9	17	0
22	40	2	20	9	17	0
23	40	8	5	9	17	0
24	40	3	13,3	9	17	0
25	40	5	8	9	17	0
26	40	7	5,7	9	17	0
27	40	5	8	9	17	0
28	40	9	4,4	9	17	0
29	40	10	4	9	17	0
30	40	5	8	9	17	0

Source: Processed Data by the Researcher, 2024

Source: Processed Data by the Researcher, 2024

Figure 6
Control Chart

Based on Table 4, the Center Line (CL) is established at 9, with an Upper Control Limit (UCL) of 17 and a Lower Control Limit (LCL) of 0. These values were obtained from the calculation of the proportion of defective products during the 30-day observation period.

Furthermore, Figure 6 shows that most of the observation points lie between the upper and lower control limits. However, one observation point exceeds the UCL, specifically on Day 5, with 27 defective units recorded. This condition indicates the presence of special cause variation, causing the process to fall outside the statistical control limits during that period.

Overall, although the majority of the process remains within the control limits, the presence of a single point exceeding the UCL suggests that the production process is not yet fully stable and requires further evaluation of the factors contributing to the defect spike on that particular day.

Discussion

The results of this study indicate that the implementation of the Seven Tools in quality control of amplang production at UMKM Amplang Lily has the potential to minimize product defects. The analysis was conducted systematically using all tools within the Seven Tools framework. A check sheet was employed to collect defect data in a structured and consistent manner. The data were subsequently presented in a histogram to examine the frequency distribution of defects. Stratification was performed to classify the data into specific categories, enabling clearer identification of sources of variation. A scatter diagram was used to analyze the relationship between production volume and defect frequency. The Pareto diagram helped determine the most dominant type of defect, namely slightly hard texture. Furthermore, a fishbone diagram was utilized to identify the root causes of defects from the perspectives of material, method, human, and measurement factors. Finally, a control chart was applied to evaluate process stability and detect variations beyond the statistical control limits.

These findings align with quality control theory, which states that the use of statistical tools, such as the Seven Tools, can help identify the root causes of problems and provide appropriate solutions to improve product quality (Sitorus, 2017). Thus, the Seven Tools can be an effective approach for MSMEs to manage their product quality, even with

limited resources.

Previous studies, such as those conducted by Widodo (2018), also show that statistical data-based quality control techniques can reduce product defects in small industries. This study supports these findings and provides evidence that the Seven Tools can be applied to smaller industries, such as amplang MSMEs, which typically lack advanced quality control facilities or technologies. This emphasizes that, despite smaller production scales, the application of simple yet systematic tools can lead to significant improvements in product quality.

The contribution of this research lies in the integrated application of the Seven Tools in the amplang industry, which has received limited attention in the existing literature. This study not only identifies the dominant type of defect but also elaborates the analytical stages comprehensively, ranging from data collection and classification, distribution and relationship analysis, problem prioritization, root cause identification, to process stability evaluation. This structured approach demonstrates that quality improvement in MSMEs can be effectively implemented without requiring substantial technological investment.

Overall, the results of this study demonstrate that the Seven Tools have significant potential to identify and minimize defects in amplang production at Amplang Lily MSME. These findings contribute to the development of knowledge on quality control in the MSME sector and are expected to serve as a reference for other small business owners in improving their product quality.

CONCLUSION

This study analyzes the quality control of amplang production at Amplang Lily MSME using the Seven Tools of Quality Control. The findings indicate that defects in the amplang products are influenced by four main factors: material, method, human, and measurement. The material factor relates to the quality of raw materials used, the method factor pertains to the time, temperature, and duration in the production process, the human factor includes worker skills and consistency, while the measurement factor concerns the accuracy of ingredient measurements. By mapping the causes of defects through the fishbone diagram, the company can identify the root causes that affect product quality. These findings suggest that more effective quality control can be achieved by understanding and managing these defect-causing factors.

The primary contribution of this study is the demonstration that the application of the Seven Tools can be effectively used for quality control in MSMEs, even with small-scale operations. This finding enriches the quality control literature by emphasizing that simple yet systematic statistical techniques can be utilized to improve product quality, particularly for amplang products. Furthermore, this study contributes to the development of quality control theory, with a focus on the MSME sector, which has been underexplored in previous research.

Based on the findings, several improvement steps can be taken by Amplang Lily MSME to enhance their product quality. First, it is recommended to develop more detailed quality standards, referring to the control chart analysis results which indicate the proportion of product defects. These standards could include specific parameters, such as texture and product durability over a certain period, which will help maintain consistency in product quality.

Second, employee training and supervision should be prioritized. Given the importance of the human factor in the production process, providing training on proper production procedures and increasing on-site supervision can minimize errors caused by

worker ignorance or negligence.

Third, it is recommended that Amplang Lily MSME conduct customer satisfaction surveys. Through this survey, the company can gather feedback from consumers that focuses not only on production control but also on customer perceptions of product quality. This will provide broader insights into efforts for overall product quality improvement.

Overall, by implementing these recommendations, it is expected that Amplang Lily MSME can improve the quality of their amplang products, strengthen their competitiveness in the market, and create sustainable advantages in the snack food industry.

Based on the findings of this study, future research is recommended to expand the analysis by incorporating additional variables that may influence product quality and overall MSME performance. One important variable to examine is process capability, including the measurement of Cp and Cpk indices, to evaluate the production process's ability to meet product quality specifications. These indices provide a quantitative measure of how well a process can consistently produce products that meet established standards (Soeryono et al., 2025).

Furthermore, the relationship between quality control practices and broader business performance, such as production cost efficiency, sales growth, and market competitiveness, should also be investigated.

By extending the analysis to these variables, future research is expected not only to enhance understanding of the effectiveness of the Seven Tools in quality control but also to provide broader insights into strategies for improving both quality and overall MSME performance.

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