

## Quality control analysis of chiffon cake pandan in Holland Bakery

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### ABSTRACT

The advancement of business development affects economic competition. Companies with strong competitive advantages must compete with other companies in the same field. One way to compete with the same competitors is to favor the quality of the products produced. Holland Bakery is one of the cake and bread manufacturers. Holland Bakery continues to strive to produce quality products, but there is still damage that exceeds the standard limit by 2.13% in 2022 with the standard limit set, which is 2%. One way to do quality control is to use the Statistical Quality Control (SQC) method. This study aims to analyze the quality of one of Holland Bakery's products, namely Chiffon Cake Pandan Sponge Cake, which is still within the tolerance limit or not, and what types of damage occur most often. This research was conducted from September 21 - October 20, 2023, with the results obtained that the level of damage is still within the tolerance limit. However, there is still damage exceeding the UCL line on the 10th day of production by 10% due to burning, the 19th day by 6.67% due to non-standard shape, the 23rd day by 11.11% due to burning, and the 29th day by 10% due to burning. The most dominant damage is due to burning as many as 16 pieces. Then, the cause-and-effect diagram shows that damage factors occur due to humans (man), environment (environment), and methods (method). Improvements from various aspects such as humans, environment, and methods can be made to minimize damage so that quality is always maintained. It is expected that Holland Bakery can review the production method of Chiffon Cake Pandan, monitor the condition of workers, and add air ventilation in the production room.

### KEYWORDS

Quality Control; Statistical  
Quality Control

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## Introduction

Many entrepreneurs have acknowledged the significance of comprehending management science before embarking on a commercial venture. Management is the systematic and strategic process of devising plans, arranging and coordinating resources, and exercising control to accomplish objectives efficiently and effectively (Daft, 2012). Every institution, including enterprises, strives to generate profits due to the risks undertaken by entrepreneurs (Ebert & Griffin, 2015). Hence, comprehending operations administration is vital for guaranteeing the longevity and prosperity of a corporation. In the contemporary corporate landscape, there is a growing intensity of competition, which significantly impacts the strategies organizations use to compete in the market. Emphasizing product quality is becoming a progressively crucial approach, mainly due to shifts in customer preferences, as they now prioritize quality over quantity or cheap costs. Consumers seek the utmost value and establish expectations on the quality of a product (value expectation).

The quality of a product has a substantial influence on consumer trust and loyalty, particularly in a highly competitive corporate setting. Quality is assessed based on a product or service's capacity to fulfill consumer requirements (Heizer & Render, 2015). Hence, organizations need to comprehend shifts in customer preferences and prioritize enhancing product quality to emerge victorious in the market. Rustendi (2012) highlights the significance of high-quality goods in yielding economic advantages, ensuring consumer contentment, and preventing customer grievances. High quality ensures customer happiness, enhances reputation, provides a competitive edge, and improves operational efficiency. Hence, organizations must guarantee that the manufacturing quality aligns with internal, local, and worldwide regulatory requirements.

Quality control is essential for assuring a high standard of product quality. Mungnay (2016) defines quality control as the systematic process of maintaining the quality of items according to the company's established requirements. Quality control and production control are inseparable since they are interconnected and aim to ensure that products meet established standards. Holland Bakery has emerged as a trailblazer in producing superior bread goods within the bread industry in Bandar Lampung. The items, including Chiffon Cake Chocolate Chips, have gained popularity among consumers, producing thousands of units annually. Nevertheless, the primary difficulties that emerged mainly concerned the quality aspect. This was evident in the case of the Pandan Chiffon Cake, which encountered substantial levels of defective goods despite being produced in large quantities.

Holland Bakery adheres to rigorous specifications, including charring, insufficient rise, improper form, dough mass, cooked mass, and distance from the pan's edge. Despite the standardization of the manufacturing process, a proportion of defective items are still within acceptable limits. Hence, organizations need to use more efficient quality control measures. Statistical Quality regulation (SQC) is a statistical technique that may be used to monitor, regulate, analyze, and enhance the quality of a product (Rully & Nurrohmah, 2013). Within the scope of this study, it is crucial to examine the quality control measures of Chiffon Cake Pandan sponge cake at Holland Bakery Bandar Lampung. This analysis aims to reduce the occurrence of defective goods and guarantee the long-term viability of the company.

Companies like Holland Bakery may maintain competitiveness in a challenging business climate by recognizing the significance of management, product quality, and quality control. Hence, this study aims to assess the quality control measures used for the Chiffon Cake Pandan sponge cake at Holland Bakery Bandar Lampung. It also seeks to evaluate the efficacy of the current quality control procedures and provide suggestions to enhance the firm's product quality and operational efficiency. The primary objective of this study is to evaluate if the extent of damage to the Pandan Chiffon Cake at Holland Bakery falls within the acceptable tolerance thresholds set by the company's quality standards. Furthermore, the objective is to determine the prevailing kind of harm inflicted on the product. This study offers many advantages, particularly in theory, since it aims to enhance quality control science. Specifically, it aims to improve Holland Bakery's quality control methods. This study aims to enhance the author's understanding and expertise in production quality control by using the Statistical Quality Control (SQC) approach to ensure the manufacture of high-quality goods. Finally, this study is expected to inspire Holland Bakery to prioritize product quality by using efficient quality control measures.

## Literature review

### *Operations management*

Production refers to the process of manufacturing or providing products and services. Operations management encompasses a set of actions aimed at generating value in products and services by transforming inputs into outputs (Heizer & Render, 2015). The process of producing products and services is present in all organizations. Production operations in manufacturing organizations often follow a direct and uncomplicated process to create items. However, a production function may be less evident in organizations that do not manufacture physical things or intangible assets, requiring more clarification. Operations refer to the production activities inside a company, regardless of whether the end result is a product or service.

### *Quality assurance*

Effective implementation of quality control measures significantly influences the overall quality of the company's goods. Quality control is a process that verifies whether quality policies are effectively implemented and manifested in the end outcomes. Quality control refers to the systematic measures used to ensure that the items produced meet the specified product standards, which are defined based on the policies set by firm leadership (Mungray, 2016).

### *Statistical Quality Control (SQC)*

Statistical Quality Control (SQC) is a methodology used to monitor and control the quality of a process or product using statistical techniques. Statistical Quality Control (SQC) employs seven primary statistical tools for quality control, as noted by Heizer and Render (2015). These tools include flow charts, check sheets, histograms, scatter diagrams, Control charts, Pareto charts, and cause-and-effect diagrams. They are utilized as quality analysis tools in management. Flow charts visually depict processes, check sheets document data, histograms illustrate the frequency of values, scatter diagrams demonstrate the correlation between two measurements, control charts oversee quality control, Pareto charts pinpoint critical issues, and cause-effect diagrams visualize cause-and-effect relationships. Utilizing these technologies enables a comprehensive comprehension of product quality, assists decision-making, and supports process enhancements.

### *Cognitive framework*

The Pandan Chiffon Cake is a sponge cake offered by Holland Bakery that is popular among the general population. The Pandan Chiffon Cake is crafted with premium ingredients and manufactured using state-of-the-art machinery and technology. Quality refers to the capacity of a product or service to fulfill customers' requirements (Heizer & Render, 2015). Hence, organizations must be able to manufacture high-quality items that align with client preferences. In addition, quality should also be determined by certain norms or standards. A product is considered quality if it adheres to pre-established quality criteria. When striving to produce a high-quality product that meets customer expectations, it is common for unwanted deviations to arise. These deviations might produce damaged goods, which can negatively affect the organization. One measure that may be used to address this issue is the implementation of a quality control system aimed at minimizing product damage. Quality control is the systematic process of ensuring that the items produced meet the predetermined product requirements set by corporate leadership rules (Mungray, 2016). This activity arises due to the frequent disparities between the expected standards and the actual production outcomes. Hence, in quality control, it is essential to diligently monitor the manufactured goods to ensure adherence to defined benchmarks and fulfill customer demands.

SQC (Statistical Quality Control) provides the necessary tools for conducting statistical quality control in order to ensure and assess the quality of a product or process. Statistical quality control guarantees that procedures adhere to pre-established norms. Statistical quality control is used to determine whether items should be accepted or rejected

based on their production, as well as to oversee the process and assess the quality of the product being worked on. The statistical methodologies used in this study include flow charts, check sheets, histograms, control charts, and fishbone diagrams (also known as cause-and-effect diagrams). This research utilizes a framework to demonstrate how statistical quality control can be employed to analyze the extent of damage in pandan chiffon cake products manufactured by Holland Bakery Bandar Lampung. Additionally, it aims to identify the underlying causes of this issue and explore potential solutions to generate proposals.

## Methods

This study used a qualitative methodology, using interviews and documentation at PT Mahkota Pangan Citra Rasa (Holland Bakery) in Bandar Lampung. The study spanned a duration of 30 days, commencing on 21 September and concluding on 20 October 2023. The data sources consisted of primary data obtained via direct interviews with employees, as well as secondary data extracted from corporate records. Data gathering methods include the use of interview and documentation procedures. The process of data analysis involves the use of seven specific tools: flow charts, check sheets, histograms, control charts (specifically P charts), and cause-and-effect diagrams. Employees involved in manufacturing were interviewed, and corporate documents pertaining to output amounts and damaged items were examined. The study starts by constructing a flow chart to provide a comprehensive outline of the many processes involved in manufacturing. Data on production and damage were gathered using check sheets, organized in tables, and examined using histograms to comprehend the patterns of damage over a period of 30 days. The P control chart examines the ratio of non-conforming faulty items. The process entails determining the ratio of nonconformity (P), the central value (CL), and the upper and lower boundaries for control (UCL, LCL). Subsequently, a fishbone diagram is used to ascertain the elements responsible for product deterioration. This study endeavors to provide firms a more lucid depiction of the manufacturing process and assess the quality of the Pandan Chiffon Cake, with the intention of enhancing their understanding.

## Results

### *Characteristics of the research object*

Holland Bakery, founded in 1978 in Jakarta, is the first modern bakery in Indonesia under the management of PT Mustika Citra Rasa. Providing a variety of products such as classic bread, sponge cakes, donuts, and birthday cakes, Holland Bakery has more than 200 outlets throughout Indonesia. Armed with Dutch recipes and a windmill on the roof, Holland Bakery is known as a one-stop shopping bakery. Winning numerous awards, including Top Brand and "The Most Favorite and Popular Bakery," Holland Bakery continues to innovate with the motto "TOP FOR QUALITY." The company's vision is to make Holland Bakery products an alternative main dish for Indonesian people. The company's mission involves improving product quality, developing healthy products, responding to community needs, and improving the quality of human resources. Holland Bakery's values include quality, trust, HR empowerment, enthusiastic service, effectiveness, commitment, profitability, social responsibility, and teamwork. The organizational structure is led by the Operations Director using a line and staff organizational structure.

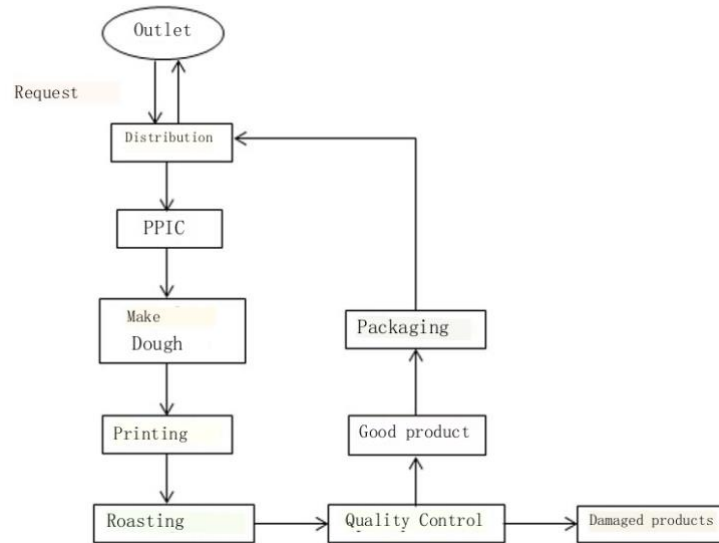
### *Data analysis using statistical quality control*

The Statistical Quality Control method provides an overview of the types of defects and causes of defects in Chiffon Cake Pandan products using five statistical tools: flow charts, check sheets, histograms, control charts, and fishbone diagrams (cause-and-effect diagrams).

### *Check sheet*

Creating Check Sheets helps simplify the process of collecting and presenting data. In this research, the Check Sheet is used to see quickly the types of damaged products and the frequency of damage that occurs in the production process. A check sheet of production data and damaged products for Chiffon Cake Pandan shows 1.53% damage during the research. This damage does not exceed the standard tolerance limit set by the company, namely 2%. 1,485 Pandan Chiffon Cakes were produced with 25 damaged products. The only damage during the research was burnt, and the shape did not meet standards.

**Flow chart**

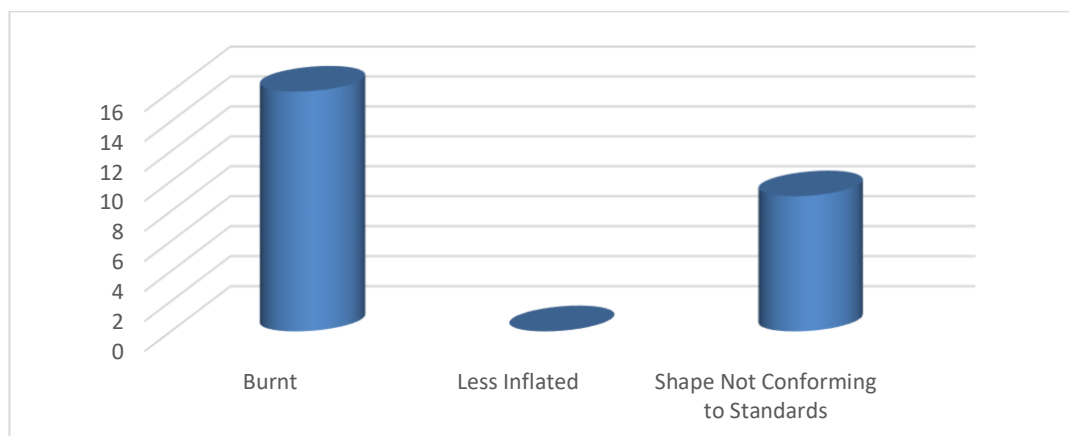


**Figure 1.** Pandan Chiffon Cake Flow Chart

Flow Charts/Flow Diagrams present a process or system using interconnected boxes and lines. Making a flow chart (flow diagram) in this research is to provide an overview of the flow of Pandan Chiffon Cake from outlet request to finished product. Below is a flow chart of the Pandan Chiffon Cake production process stages. The flow chart above explains that Holland Bakery produces Pandan Chiffon Cake according to the outlet's request, which the distribution department accepts. PPIC (production, planning, inventory, control) receives orders from distribution, which also has the task of weighing raw materials according to recipes, preparing packaging, and making material planning. After receiving the recipe from PPIC, the production department starts producing orders according to the recipe. Making Pandan Chiffon Cake starts by making the dough by mixing all the ingredients, stirring using a large mixer until fluffy, then transferring it to a baking sheet and measuring according to the recipe; the baking process is carried out. After the product is cooked, quality control is carried out. Quality control has several standard specifications, such as burning, not expanding enough, and shape not meeting standards. The product is said to be burnt if it has a darker color. Even though it is still fit to eat, the product does not pass quality control. The product does not expand enough; it does not expand upwards as it should. So, the product looks like it has yet to expand ideally. Products with a shape that does not comply with standards, namely the outer product, are peeling. Apart from that, the product is also weighed with a weight specification of 525 - 560 grams. Good products will be packaged and then handed over to the distribution department. After that, the product is sent to the outlet.

**Histogram**

The histogram helps illustrate the number of defects during 30 days and provides information on what types of damage most often occur in Pandan Chiffon Cake. The following is a histogram created based on data on production quantities and number of damaged products. The histogram above shows that the highest type of damage was burnt with 16 pieces. Shapes that do not comply with standards are in second place, namely nine pieces. Meanwhile, during the research period, there was no damage to underselling.



**Figure 2.** Number of defects

The histogram above shows that the highest type of damage was burnt with 16 pieces. Shapes that do not comply with standards are in second place, namely 9 pieces. Meanwhile, during the research period there was no damage to underswelling.

### Control chart

The report from the Check Sheet above shows that the number of damaged products differs. Therefore, it is necessary to create a control chart to see whether the level of product damage is within control limits.

The following is a picture of the Chiffon Cake Pandan damage control map:

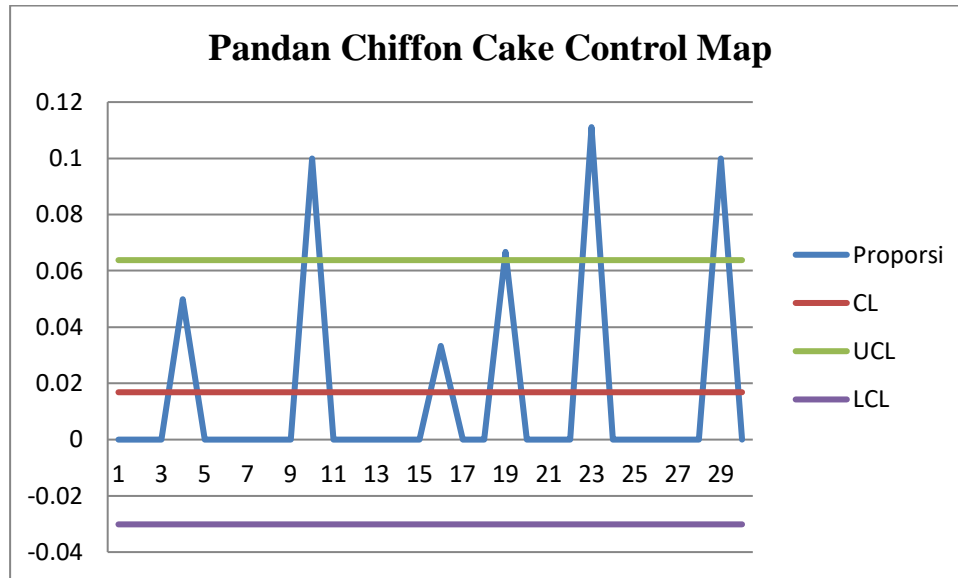


Figure 3. Pandan Holland Bakery Chiffon Cake Damage Control Map

The control chart graph above shows that Pandan Holland Bakery's Chiffon Cake production contained damage exceeding the upper control limit, namely 6.38%. Four points are out of the upper control limit, namely on the 10th day, producing 60 pieces of Pandan Chiffon Cake with a total of 6 products damaged by burning with a damage percentage of 10%; on the 19th day, producing 45 Pandan Chiffon Cakes with a total of 3 products damaged due to non-standard shape and damage percentage of 6.67%, 23rd day of producing 45 Pandan Chiffon Cakes with five products damaged due to burning with a damage percentage of 11.11%, and 29th produced 60 pieces of Pandan Chiffon Cake with the number of products damaged by burning as many as six pieces with a damage percentage of 10%. Day 23 was the day with the highest number of damaged products. Several factors cause Pandan Chiffon Cake to burn, such as workers needing to be more focused, setting the oven temperature incorrectly, and baking too long. Meanwhile, factors that caused the Pandan Chiffon Cake's shape not to meet standards include inappropriate methods, such as lumpy dough and the pan not being turned over immediately after it was cooked.

### Fishbone diagram

The Fishbone Diagram is a useful tool for analyzing factors that cause damage in the Pandan Chiffon Cake production process. This diagram is grouped into five elements: Man, Material, Machine, Method, and Environment, each playing a crucial role in the production process. The element of Man involves the workers who carry out various tasks and responsibilities in production. The skills, expertise, and motivation of these workers have a direct impact on the final product. Their ability to execute tasks effectively and their dedication to maintaining quality standards are essential for producing a high-quality Pandan Chiffon Cake.

Material is another critical element. This includes all the raw materials used in making the product, encompassing both primary and auxiliary ingredients. The quality and availability of these raw materials are pivotal in determining the quality of the final product. Consistency in ingredient quality ensures that the Pandan Chiffon Cake meets the desired standards. The Machine element refers to the machines and equipment used in the production process. The efficiency and condition of these machines significantly affect productivity and the quality of the cake. Well-maintained and properly calibrated machines are crucial for consistent quality and reducing the likelihood of production errors. Method encompasses the work instructions or orders that workers must follow during production. Adhering to appropriate and well-defined methods can increase efficiency and minimize the risk of errors. This includes the specific techniques and steps followed in mixing, baking, and handling the Pandan Chiffon Cake.

Lastly, Environment concerns the conditions of the production process, which can influence it both directly and indirectly. Environmental factors such as temperature, humidity, and cleanliness can greatly affect the quality of the product and the welfare of the workers. Maintaining a controlled and clean environment is essential for achieving a consistent quality in the Pandan Chiffon Cake. The harmonious integration of these five elements - Man, Material, Machine, Method, and Environment - is key to achieving efficiency, quality, and sustainability in a company's production process. Understanding and analyzing these elements through the Fishbone Diagram can help in

identifying and addressing the root causes of any damage or issues in the Pandan Chiffon Cake production, leading to an overall improvement in the process.

### *Burnt*

The number of damages due to the burning of the product was 16 out of total production of 1,485, with a percentage of 1.07%. Based on research through interviews, burnt product factors can occur due to human factors, methods, and the Environment. The factor causing burnt damage to Pandan Chiffon Cake is that in the production process of Pandan Chiffon Cake at Holland Bakery Bandar Lampung, the Man (worker), Method (Method), and Environment (environment) aspects play a crucial role in avoiding product damage. Workers who lack focus or are in a bad mood can hurt the final product. Therefore, companies are advised to train workers to increase work focus and psychological well-being. Furthermore, the Method in the Pandan Chiffon Cake baking process, such as duration and temperature, needs to be clarified to avoid uncertainties that could cause damage, such as a product that is burnt on the outside but still raw on the inside. Proper time and temperature settings can be tried and tested, and an oven thermometer is recommended to ensure optimal results according to the recipe. The production room environment, which tends to be hot, must also be considered. Adding air ventilation can help maintain optimal room temperature, avoiding excessive heat conditions affecting product quality. Thus, aligning aspects of workers, production methods, and the Environment can positively influence the quality and consistency of Pandan Chiffon Cake produced by Holland Bakery Bandar Lampung.

### *Shape not conforming to standards*

The number of damages due to forms not conforming to standards during the research period was 9. There are several reasons why the shape of Pandan Chiffon Cake does not meet standards. If the shape does not meet standards and is not pleasing to the eye, the product cannot pass quality control, so it cannot be sold. The factors causing burnt damage to Pandan Chiffon Cake are the Man (worker), Method (Method), and Environment (Environment) aspects in the production of Pandan Chiffon Cake at Holland Bakery Bandar Lampung, which play a crucial role in preventing product damage. Workers who are not focused or in a bad mood can potentially damage products, so companies are advised to organize training to improve workers' focus and mental well-being. In terms of production methods, clumping the dough can change the shape of the Pandan Chiffon Cake, and the solution is to ensure the dough is smooth without lumps by filtering it using a fine sieve. Apart from that, cooked Pandan Chiffon Cake needs to be turned over immediately to avoid sticking to the walls of the pan, and using a non-stick pan can be an effective solution. The production room environment, which tends to be hot, needs attention, with the addition of air ventilation to maintain optimal room temperature. This effort will help ensure that environmental conditions support the quality of Pandan Chiffon Cake produced by Holland Bakery Bandar Lampung. With worker, Method, and environmental improvements, companies can optimize their production results consistently.

## **Discussion**

To expand on the analysis of the 30-day research concerning the quality control of Pandan Chiffon Cakes at Holland Bakery, several key aspects can be elaborated upon. The research, which was meticulously planned and executed, aimed to identify the prevalence and causes of defects in the production process of these cakes, a popular item in the bakery's product line.

### *Production and defect rate*

Over the course of the 30-day period, the bakery produced a total of 1,485 Pandan Chiffon Cakes. Out of these, 25 were identified as defective, resulting in a defect rate of 1.53%. This rate is notably below the company's acceptable standard of 2%, indicating a generally efficient and controlled production process. However, even though the defect rate is within acceptable limits, any instance of product failure can have implications for customer satisfaction and brand reputation, thereby necessitating a closer examination.

### *Types of defects*

The research categorized defects into three primary types: burning, insufficient rising, and non-standard shape. Interestingly, during this specific research period, the defects were limited to burning and non-standard shape. This observation could suggest either a temporal improvement in the control of the rising process or variations in environmental or operational conditions affecting specific types of defects more than others. Of the defects noted, burning was the most common, accounting for 16 of the 25 defective cakes. The next category was cakes not meeting the shape standards, with nine instances. This distribution of defects could point to specific areas in the baking process that require more stringent monitoring or control.

### *Control chart analysis*

The control chart presented a more granular view of the defect occurrences. Notably, there were spikes in the defect rate on the 10th, 19th, 23rd, and 29th days, exceeding the upper control limit. These spikes indicate irregularities in the production process on these specific days. The 23rd day marked the peak of defect rates, signaling a need for an in-depth analysis of the processes on this day.

## Cause-and-effect analysis

Using a cause-and-effect diagram, several factors contributing to the defects were identified. For burning, the causes ranged from human error (workers needing more focus) to technical issues (incorrect oven temperature settings, excessive baking duration). Environmental factors like insufficient space and room temperature also played a role. For the cakes not meeting shape standards, similar factors such as worker focus were identified, along with specific issues like lumpy dough and improper handling of the pan post-baking. The room's physical conditions again were noted as contributing factors.

## Detailed analysis of defect causes

Human Error, lack of focus among workers could stem from various factors such as fatigue, inadequate training, or lack of motivation. This aspect suggests a potential need for improved training programs, better shift scheduling, or enhanced motivation techniques. Technical and Process Issues, incorrect oven temperature settings and baking durations point to potential gaps in process standardization or equipment calibration. Regular maintenance of equipment and periodic training refreshers for staff on operational procedures could mitigate these issues. Environmental Factors, the impact of the physical environment, including space constraints and room temperature, on the baking process cannot be overlooked. This could indicate the need for a reevaluation of the workspace layout for efficiency and possibly an upgrade in the climate control systems within the bakery to ensure a consistent baking environment. Material Handling and Preparation, issues such as lumpy dough and improper handling of the baking pan post-oven indicate potential areas for improvement in the initial stages of the baking process. This might involve more rigorous quality checks of raw materials and stricter adherence to preparation protocols.

## Conclusion

The results of the 30-day research based on the check sheet were that the number of Pandan Chiffon Cakes produced was 1,485 pieces with 25 damaged products. The percentage of damage that occurred was 1.53%, which did not exceed the standard limit set by the company, namely 2%. Three types of damage usually occur in Pandan Chiffon Cake: burning, not rising enough, and the shape not meeting standards. However, during the research, the only damage occurred was burnt, and the shape did not meet standards. The histogram shows the dominant type of damage, namely 16 burnt ones. Meanwhile, only nine pieces were damaged to forms that did not comply with standards. Then the control chart shows that there is a level of product damage that exceeds the upper control limit, namely on the 10th day, it is 10%; on the 19th day, it is 6.67%; on the 23rd day, it is 11.11%, and on the 29th day it is 10%. Day 23 was the day with the highest level of damage. The factors that cause damage to occur are analyzed using a cause-and-effect diagram. This analysis shows that the factors that cause damage due to burning are workers needing more focus, setting the oven temperature incorrectly, baking too long, needing to be more spacious, and the room air being hot. Factors that cause damage due to forms not meeting standards are that workers lack focus, the dough is lumpy, the pan is not immediately turned over after it is cooked, the room needs to be more spacious, and the air is hot.

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