Quality control of kremes noodle

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Quality control of kremes noodle products based on food safety aspects with six sigma and swot methods

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ABSTRACT
At this time food safety problems often occur in the management of the production process from internal and external factors, this occurs because the quality of the production is not good enough to affect the quality of the product. Aims to improve quality in the production process of Kremes Noodles to determine critical to quality, determine the quality level of noodle products, and develop strategies to improve the quality of Kremes Noodle products. So by using the six sigma method which has the steps of Defining, Measuring, Analyzing, Improving, and Controlling. To strengthen the strategy in the improve stage, this is done using a SWOT analysis. In this study, there are 5 types of errors that have an impact on product quality and one of the strategies used is to carry out inspections before the process starts and monitoring during the process.

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INTRODUCTION

Competition in today's increasingly fierce business world encourages companies to further develop ideas to obtain effective and efficient ways to achieve the goals and objectives that have been set. Many factors affect the successful achievement of company goals. One of the most important forces that support the success of achieving company goals and increasing the company's growth rate in the market is the quality factor or quality of food safety (Harce 2022). Food security problems often occur in the management of the production process from internal and external factors, one of the causes of even food security from internal factors is the cleanliness of production machines and the cleanliness of the production environment (Sartika, 2020). Quality satisfaction is a combination of the taste of food, the level of food doneness, the appearance of food, food hygiene, and how attractive eating is (Trisilawati, 2021)

Food safety is an indication of efforts that need to be considered to prevent food pollution, including biological, chemical and other objects that will endanger consumer health (mautongue 2021). In the aspect of food safety, it is not only a guarantee of safety when food is consumed by consumers, but at the time of the continuity of the production process also determines the safety of the food (Purwanto, 2021). It is said that most people are not fully aware of food safety which is one of the trigger factors for disease (Wahyuni 2018).

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However, there are still problems in quality to ensure food security. Similar conditions experienced by PT. CDE in the production process includes the warnya mie kremesnya, weight that is not up to standard, packaging images are not synchronized and others as it causes losses to the company both in terms of matrial and consumer satisfaction. A tool is needed that can be used appropriately, to analyze the problem as well as possible. In identifying disability at this time using the six sigma method.

Izza, (2019) Six sigma is a structured methodology to improve processes focused on reducing process variances while reducing defects (products / services that are outside specifications) by using statistics and problem solving tools intensively. Furthermore, Dewi (2019) Six Sigma is defined as a set of tools raised in quality management that builds a framework that is in accordance with standards for improvement processes. In the six sigma method there are steps namely define, measures, analize, improve, control. To further strengthen this six sigma method, analysis is carried out using the SWOT method at the improve stage, so that at this stage the strategy used will be more effective in improving quality, thereby suppressing product defects that cause quality decline.

The SWOT method is a way to conduct strategic planning used to evaluate strengths, weaknesses, opportunities, and threats on a company project. By using this SWOT analysis, it is able to design an effective strategy and can be used to what extent this strategy can be utilized by Mutiara (2021). According to Ratnawati (2020), SWOT analysis is a method to evaluate an industry or company with indicators of strengths, weaknesses, opportunities, and threats. This SWOT analysis has two dimensions, namely 4 (four) components, namely internal elements of Strengths and Weaknesses, and external aspects of Opportunities and Threats.

The purpose of this writing aims to improve the quality in the production process of kremes noodles. In determining critical to quality, determining the quality level of noodle products, and developing strategies to improve the quality of kremes noodle products using the six sigma method and SWOT analysis. In an effort to reduce defects and improve the quality of kremes noodle production to be more optimal.

How the focus of this problem often occurs during the production process that determines starting from weight, betuk, color, strength, and also the packaging of kremes noodles according to the standards or quality provided by the company so as to make the production process run smoothly.

METHODS

The writing of this article is a research at PT. CDE about the quality of kremes noodle production which is the main product at PT. CDE. By taking primary data through interview methods with production supervisors and production operators. The data used is data on the type of product defect from November 28 – December 30, 2022, I made it 5 weeks. To support the quality of production using Fatimah (2023) the Six Sigma method is an alternative method with a flexible system approach to achieve, support, and maximize business processes to reduce the level of cost of lost, improve quality, and make decisions

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based on existing data in the company. Fahroni (2021) the six sigma method has a sequence of stages commonly referred to as (DMAIC), namely:

1. Define is the stage of identifying process or product problems with critical to quality depictions.
2. Measure is a data collection stage that includes current performance data to make DPO and DPMO calculations with formulas.
   DPO = Number of Defective Products/Units produced x CTQ
   DPMO = DPO x 1,000,000
3. Analyze is the analysis of the subject matter, analysis of the solution that will be provided and analyze the capillarity of the existing process.
4. Improve is the implementation stage to set suggestions for improving problems in the company
5. Control is the stage as a process of documenting the results of improvements that have been made, and serves as a supervision so that the process continues to be maintained.

To strengthen the idea at the improve stage, it is done with SWOT analysis Surino (2021) stands for Strengths and Weaknesses for the internal environment, Opportunities and Treaths for the external environment which aims to determine the analysis strategy of Strength Opportunity, Weakness Opportunity, Strength Treaths and Weakness Treaths. The following is a flowchart of the six sigma method for quality control of kremes noodles.

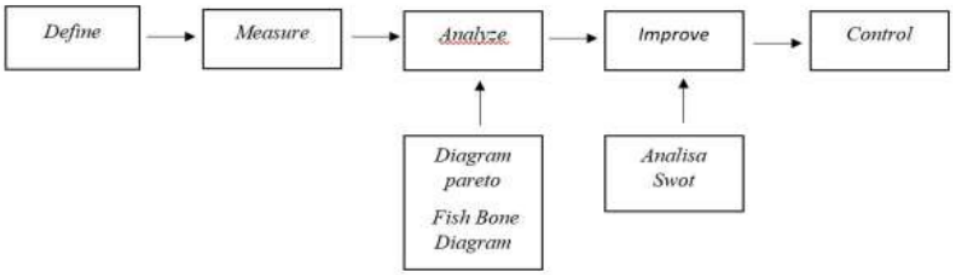

Figure 1. Six Sigma method flowchart.

RESULTS AND DISCUSSION

Define

In this study, data collection was obtained from interviews with production supervisors and asked for data on production results and defects from November 28 – December 30, 2022 for the past 5 weeks so as to obtain targets and improvement goals, which will be the object of the kremes noodle production process. Identification on this product is sourced from QC and standard specifications in the company PT. CDE. The condition of the product that is marketed must be free from the word defect and the next steps determine Critical To Quality. CTQ is a characteristic or key that can cause defects in the product so that it does not meet product standards or does not meet consumer expectations. The type of

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CTQ in snack noodle products is determined based on the type of critical defect, from the results of observations, discussions with the production and QC which includes CTQ is not suitable shape, weight is not appropriate, product color is not appropriate, cooking tests are not appropriate and sachets are not perfect.

M Diky Ariyanto. Critical To Quality (CTQ).

Types of defects	characteristic	code
Weight standards	Weight over or less than standard	A1
Untaian mie	The development of noodles is not as good as	B1
Color standards	Too dark or light color	B2
Noodle Power	Noodles crumble easily	B3
Bag	Leaking sachets or pictures not flashlights	C1

From the table above, it can be seen that the weight standard, noodle strands, color standard, noodle strength, and sachets are Critical To Quality from PT. CDE

Table 2. Cremes noodle defect data.

Sunday	Types of Defects					Total Defects	Production Quantity
	A1	B1	B2	B3	C1		
1	65	47	43	40	49	244	12661
2	43	43	34	58	43	221	13141
3	52	47	44	52	29	224	12629
4	40	57	52	37	47	233	12139
5	99	75	74	23	19	290	14001
Total	299	269	247	210	187	1212	64571

Measures

At this measure stage , measurements are made of the problems that have been set to be solved. Measurement is done by taking data. The data used is product defect type data, measuring the characteristics and capabilities of the process to determine the steps that must be taken to make improvements and improvements. The data obtained is then measured by the initial process performance to determine the amount of DPO and DPMO. The table below is the result of the calculation of DPO and DPMO data.

Table 3. DPO and DPMO data

Sunday	DPO	DPMO	Nilai Sigma
1	0.003854	3854.356	4.16
2	0.003364	3363.519	4.21
3	0.003547	3547.391	4.19
4	0.003839	3838.866	4.16
5	0.004143	4142.561	4.14
War - war	0.00375	3749.34	4.17

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From the table above, it can be seen that the average DPO value for 5 weeks is 0.00375, the average DPMO value for 5 weeks is 3749.34, and the average sigma value is 4.17.

Analysis

In the analyze phase, namely looking for and finding the subject matter with the target of improvement opportunities by identifying the root cause or source of product failure. In the implementation of this phase, it is carried out by collecting data from the previous phase to determine the cause of defects in each Critical To Quality. The analysis used is to use a pareto chart and fishbone diagram. The cause of the impairment in each CTQ is used as a factor that will be analyzed at the improvement stage**.**

Diagram Pareto

Pareto diagram is a diagram made with the aim of knowing the type of defect with the highest percentage and the most important so that it needs to be corrected first. Through making a pareto diagram, it can be seen that there are 5 types of defects, namely leaky sachets, uncentered images, no easy open, no stripcuts and unstable grammations. The following is a table of product defect type data for 5 weeks from interviews with production during identification and analysis using pareto charts. Pareto chart analysis can be seen in the figure below.

Table 4. Percentage of types of disability

Types of Defects	Sum	Cumulative Percentage
Weight standards	299	25%
Untaian mie	269	47%
Color standards	247	67%
Noodles crumble easily	210	85%
Leaking sachets or pictures not flashlights	187	100%

The table above is a table of the prevalence of types of defects during the production process for 5 weeks. Of the types of severe standard defects totaled 299, the types of defects of the noodle strands totaled 269, the types of color standard defects totaled 247, the types of defects of easily crushed noodles totaled 210, and the types of defects of leaking sachets or non-flashlight pictures totaled 187. From the table, the next pareto diagram will be called.

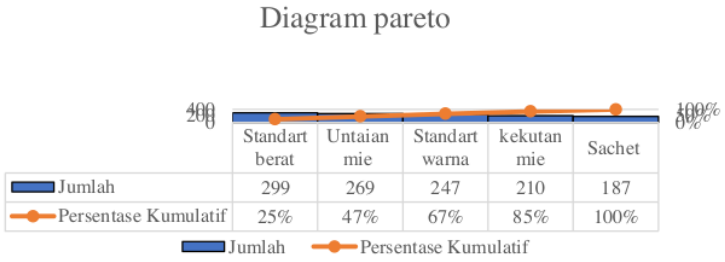

Figure 2. Pareto diagram

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Based on the pareto diagram, it is found that the dominant defects contribute above 20% and the highest defects are the severe standard with 299 of all defects during 5 weeks and the lowest type of defect in leaky sachets with 187 of all defects during 5 weeks that occur so that they can qualify as CTQ.

Fishbone Diagram

The use of fishbone diagrams based on key quality characteristics (CTQ) obtained from observations and interviews with the company. The result of the analysis of the fishbone diagram is that there are two factors. Factors that cannot be controlled include human and environmental factors. While factors that can be controlled include material factors, methods and machines. From the results of Fishbone, it was found that the biggest causative factor was material

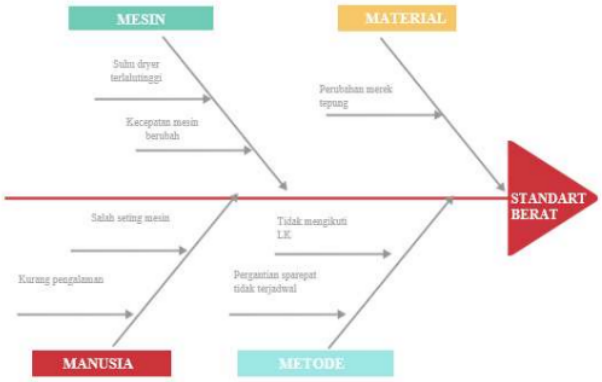

Figure 3. Fishbone weight diagram is not as standard

In the fishbone diagram, it is explained the cause of severe defects exceeding or less than the standard including, machine factors where the dryer temperature is too high to cause the noodles to hang out and result in less weight than the standard, this can be because the workers do not control the heat of the dryer so they do not know that the heat increases. Human factors where there are machine setting errors caused by inexperience, this is caused by lack of training on work instructions and machine control received by operators.

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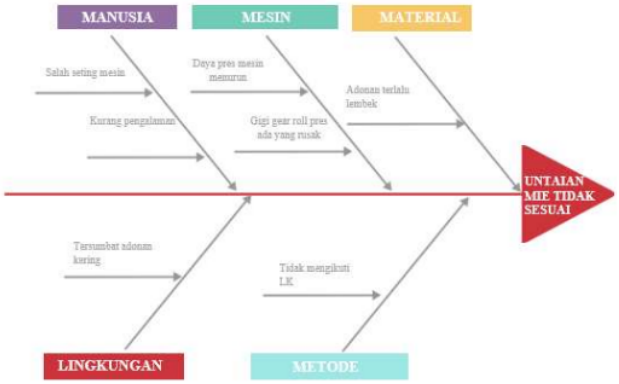

Figure 4. Fishbone noodle strand diagram does not match

In the fishbone diagram, it is explained that the causes of defects in the noodle strands are not appropriate, including machine factors where the engine press power decreases resulting in development or noodle strands are not according to standards, this can be caused by the workers not controlling the pressure of the slitting machine so that the strands are not suitable. Human factors where there are machine setting errors caused by inexperience, this is caused by lack of training on work instructions and machine control received by operators.

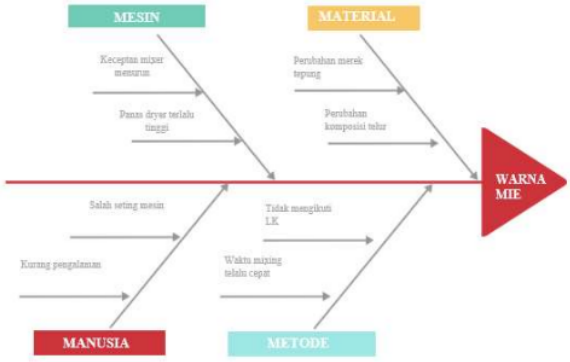

Figure 5. Fishbone diagram The color of the noodles does not match

In the fishbone diagram, it is explained the cause of the defect of warana that is too dark or bright from the standard, including the engine factor where the temperature of the dryer is too high to cause the noodles to be too curing to cause burning, this can be caused because the workers do not control the heat from the dryer so they do not know that the heat increases. Material factors where the main ingredient, namely flour, changes brand or composition of eggs is lacking, this is caused by the company asking to change the composition or exhausting the old stock of the flour brand.

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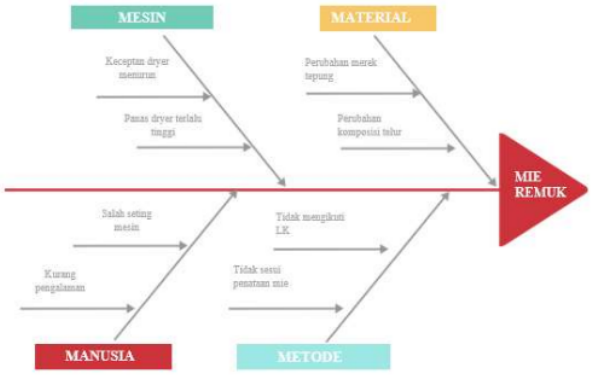
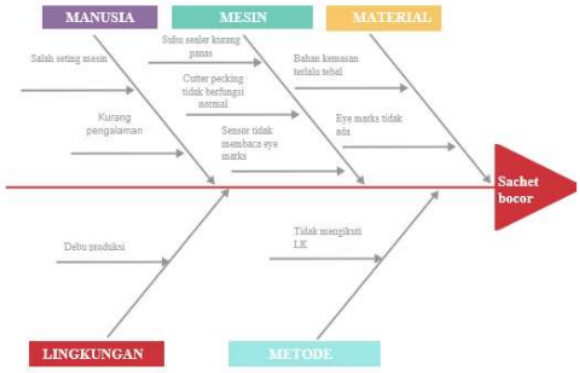


Figure 6. Fishbone diagram noodles crumble easily

In the fishbone diagram, it is explained the causes of noodle defects that are easily crushed, including machine factors where the temperature of the dryer is too high and the decrease in dryer speed decreases causing the noodles to be too dry so they crumble easily, this can be because the workers do not control the heat from the dryer so they do not know that the heat increases. The composition of the egg is less so that the adhesion of the noodles is reduced and easily crushed. Human factors where there are machine setting errors or noodle arrangements caused by inexperience, this is caused by lack of training on work instructions and machine control received by operators.



Gambar 7. Fishbone diagram sachet bocor

In the fishbone diagram, it is explained the cause of the defect of the leaking sachet or the image of not the flashlight including, the engine factor where the temperature of the sealer is less hot and the eye mark sensor cannot read so that the piece will not match the size, this can be caused by spare parts that have reached their service life and need to be replaced or repaired the spare parts. Material factors where the packaging material is too thick cause the temperature produced by the sealer does not glue the front and back

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packaging, this is caused by differences in the quality of packaging materials obtained from suppliers and changes are needed from the containerized material. Human factors where there are machine setting errors caused by inexperience, this is caused by lack of training on work instructions and machine control received by operators

Improve

The next stage is Improve, this stage is a set of activities to determine, select, and select several alternative improvements to improve the company's performance in improving the quality of its products with the help of IFAS and EFAS matrices to determine SO, WO, ST, and WT improvement strategies

Table 5. IFAS and EFAS matrix

	Internal factors	weight	rating	bobot X rating
strength:	haccp	0.12	4	0.48
	Lebel Halal	0.13	4	0.52
	Working operation standards	0.13	3	0.39
	Quality Standards	0.12	3	0.36
	Packaging	0.10	2	0.20
				1.95
Weaknesses:	HR employees	0.09	3	0.27
	Work system	0.09	3	0.27
	machine	0.10	2	0.20
	Work steps	0.12	2	0.24
				0.98
	total	1		2.93
	External factors			
chance:	The number of suppliers	0.14	3	0.42
	Working Method	0.13	3	0.39
	Age of employees	0.14	3	0.42
	Clean working environment	0.11	3	0.33
	potential market share	0.10	3	0.30
				1.86
ancaman	late material	0.09	3	0.27
	Employee demands	0.10	2	0.20
	Bored consumers	0.09	2	0.18
	Technology Development	0.1	2	0.2
				0.65
		1		2.51

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Table 6. Matrix IE

	strong	3,0 flat flat	2,0 lemah1,0
4,0 tall		2,93	
3,0 keep	2,51		
low 2.0 1.0			

From the matrix table above shows that the total IFAS score of the X axis and EFAS Y axis. the total IFAS score is 2.93 and the total EFAS score is 2.51 which means the strategies used to determine Strength Opportunity, Weakness Opportunity, Strength Treaths and Weakness Treaths are as follows:

Strategi Strength Opportunity:

1. Innovation in packaging to make it look more attractive
2. Developing innovative and creative work culture systems
3. Recheck the machine and its cleanliness

Strategi Weakness Opportunity

1. Waiting for old machines to more sophisticated machines
2. The organizational structure is strengthened to anticipate future changes
3. Existing SOPs must be paid more attention to so that they are uniform and there are no errors in machine operation.

Strategi Strength Treaths:

1. Feedback related to the quality of raw materials and production supporting materials to suppliers so that adjustments are made
2. Provide detailed specifications related to the quality of the desired packaging material to suppliers.
3. Perform material specification improvements

Strategi Weakness Treaths:

1. Improve skills by paying attention to work instructions
2. Strengthening the human resources management system
3. Expanding and expanding innovation in products

Control

The last stage is control. This phase is used to control the results of Six Sigma improvement. To carry out the control stage in the process of making snack noodles, namely using a check sheet to ensure that the combination of factor levels used is in accordance with the optimal combination of factor levels after research. Proposed controls that can be applied at PT. CDE includes:

1. Recheck raw materials or other supporting materials.

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2. Record all defective products every day of each type carried out by employees in the production process.
3. Conduct inspections before the process starts and monitoring throughout the process. The activity aims to ensure that the machine has been set correctly according to the SOP.
4. The total defective products in the one-month period are included in the monthly book to be reported to the leadership in order to make continuous improvements.
5. Increase the weight of employee training before starting to operate machines or joining the work environment.
6. Material control of raw materials and spare parts is tightened, both starting from the material entering from the supplier to before the material is processed.

Inspection of product quality in the production process is not only carried out by QC but the operator of each machine must carry out inspections.

CONCLUSION

Based on data analysis and discussion, it can be concluded that: Based on critical to quality and fishbone diagrams, improvements that must be made by PT. CDE to correct the cause of the occurrence Weight exceeds or less than the standard, Noodle development is not appropriate, Color is too dark or light, Color is too dark or light, Noodles crumble easily, and Sachet leaking or image not flashlight is to make improvements to human, machine, and material factors. Based on production data obtained by PT. CDE is known amount. production of 64571 kremes noodles with the number of defective products that occur in production of 1212 kremes noodles, average DPO value 0.00375 and average DPMO value 3749.34. In reducing defects during the production process, improve with SWOT analysis, a strategy is carried out, namely checking raw materials or other supporting materials, recording all defective products every day of each type carried out by employees in the production process, conducting inspections before the process starts and monitoring during the process. The activity aims to ensure that the machine has been set correctly according to the SOP.

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