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Analysis Of Quality Improvement And Quality Cost Reduction In The 5S Tempeh Production Process At Sirajussaadah Limo Islamic Boarding School Depok

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ABSTRACT
Increasingly tight business competition encourages entrepreneurs to always give the best to consumers such as maintaining product quality. Quality is a factor that can improve the competitiveness of a product. With the improvement of quality, the cost of production will be more minor to reduce waste. Product failure occurs due to several factors: raw materials, machinery, equipment, people and the environment. To maintain the quality of the products produced and by the market's needs, it is necessary to conduct quality control (Quality Control) on the process activities carried out. This study aims to find out the quality control of tempe SS products in Pondok Pesantren (Ponpres) Limo Depok using the Kaizen PDCA and move 5S (Seiri, Seiton, Seiso, Seiketsu dan Shitsuke)

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INTRODUCTION

Globalization and ease of access to information, the rapid development of products and services have changed how customers transact with a company. The old business model can no longer be run. The current competition situation does not leave the slightest room for companies to make mistakes. The company must genuinely satisfy its customers and strive to find new ways to meet customer demands exceeding customer expectations. For this reason, a reliable business strategy based on a solid basic management philosophy is always needed to appear as the forefront of value creation to customers.

Today many companies focus more on customer satisfaction through competition in terms of product quality or service quality. Therefore, companies should pay more attention to controlling production quality to compete better and support the company's long-term program, namely maintaining market share or even increasing the company's market share. Production quality should be the most critical and essential priority carried out by the company so that the products produced are by the standards set by the company and the standards set by local and international bodies that manage quality standardization. To get

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production quality that can compete, a continuous method of product quality control is needed.

According to Tanjong (2013) the quality of the goods produced is determined by the activities carried out at the beginning of the production process until the finished goods. Quality control is needed for the resulting product to be of good quality. In fact, as well as the production activities carried out by the company, there are still products that are damaged or deviate from the standards set by the company. Product damage can cause increased production costs, so it is necessary to carry out reasonable quality control.

The lack of supervision of work standards in drinking water companies results in frequent production defects. The existence of these defects will have an impact on the production process which will cause additional costs so that it is considered waste and cannot use resources appropriately so that there is a need for production quality control. Quality control is an effort to ascertain whether the policy in quality or quality can be reflected in the final quality results as a guarantee. In other words, quality control is an effort to maintain the quality and goods produced by product specifications previously determined based on company policy according to Assauri (2004).

Essential factors in quality control activities are determining or reducing the volume of errors and repairs, maintaining quality according to standards and reducing consumer complaints. For the implementation of the production process, the company must set quality standards obtained and market research results, but in reality the company's production activities experience obstacles, this is reflected by the deviation of defective, damaged or defective products that are not by the established standards—quality improvement with Kaizen PDCA method and 5S movements. Product quality improvement is an improvement system from the initial stage of a process to the finished product, even to the distribution of products to consumers.

It is making Tempeh SS students. Alhamdulillah, the students' business through the production of SS tempeh has run smoothly, so that in addition to providing benefits for the students, it is also in order to help the community to get hygienic and quality tempeh. Because SS student tempeh is made from soybeans and made hygienically which can now be enjoyed by the people of Limo and its surroundings. The production of tempeh SS students has now reached 170 kg of soybeans per day and the students handle all.

Improvements and improvements continue to be made to the SS tempeh production process to overcome obstacles and problems that often occur to help the students' welfare. SS tempeh business in Limo Depok is one of the long-running tempeh productions in Jakarta, starting from the 1900s to the present day with approximately 1000 artisans. The average tempeh produced every day is 50 kg per household. Many local people have a high interest in consuming tempeh. Tempeh sales are directly distributed to sellers of vegetable stalls and local traditional markets, because the demand for tempeh is very high, SS tempeh production continues to control.

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It is making Tempeh SS students. The business of students through the production of SS tempeh provides benefits for students as well as in order to help the community to get hygienic and quality tempeh. Because SS student tempeh is made from soybeans and made hygienically which can now be enjoyed by the people of Limo and its surroundings. Based on the background and theory described above, this study takes the title "Analysis of Quality Improvement and Quality Cost Reduction of the Tempeh Production Process SS Sirajussaadah Limo Depok".

Literature Review

Quality

The quality of a product can have an essential role in the company, because it can have a valuable symbol of trust in consumers' eyes. The efforts that the company has made to achieve the excellent name of the company itself depend on the quality of the products that have been produced. According to Roger G. Schroeder (1995), quality is defined as "suitability of use" meaning that the product or service meets customer needs, meaning that it matches customer users about the value received by customers and with consumer satisfaction. Meanwhile, according to (Assauri, 2004), quality is a collection of some and several characteristics that are partly described in the product or service concerned.

Some opinions about the definition of quality include: (1) Juran (1962) "quality is conformity with its purpose or benefit" (2) Crosby (1979) "quality is conformity with needs which include availability, delivery, reability, maintainability, and cost effectiveness." (3) Deming (1982) "quality should aim at meeting customer needs now and in the future." (4) Feigenbaum (1991) "Quality is the overall characteristics of products and services which include marketing, engineering, manufacture, and maintenance, in which the products and services in use will be in accordance with customer needs and expectations." (5) Scherkenbach (1991) "quality is determined by the customer, the customer wants products and services that match his needs and expectations at a certain price level that indicates the value of the product." (6) Elliot (1993) "quality is something different for different people and depends on time and place, or is said to fit a purpose." (7) Geoetch and Davis (1995) "quality is a dynamic condition relating to products, services, people, processes, and environments that meet or exceed what is expected."

Quality Improvement Through Kaizen

Kaizen Definition

Cane (1998) in Paramita (2012: 4) explained that kaizen means continuous improvement in Japanese. Critical features of kaizen management include paying more attention to processes rather than results, cross-functional management and using quality circles and other tools to support continuous improvement. Kaizen is improvement that focuses on continuous development and improvement. This can be started from discovering specific errors, so it needs to be corrected.

Kaizen Concept

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According to Heizer and Render (2005) Kaizen is an umbrella concept that encompasses most of the typical Japanese practices known today worldwide. The concept of the umbrella can be seen in the picture below:

Picture 1. Kaizen Concept

Kaizen Goals

Ferdiansyah (2011: 5) stated that the purpose of kaizen is to increase QCD (Quality, Cost, Delivery) where the main target of these things is to increase customer satisfaction and increase consumer loyalty.

Steps to Create Kaizen

Kato and Art Smalley (2011: 38) state that there are 6 steps (Steps) in making a kaizen. The six steps can be seen in the picture below:

Picture 2. Steps to make kaizen

Kaizen Concept in Making Improvements

Paramitha (2012: 10) states that kaizen has several concepts that companies can use in making improvements, including:

a) 3M Concept (Muda, Mura, Muri)
b) 5S Movement Concept (Seiri, Seiton, Seiso, Seiketsu and Shitsuke)
c) PDCA Concept (Plan, Do, Check, Action)
d) 5W+1H Concept

Quality Improvement Program Steps

a) Defining the Problem and Defining the Quality Improvement Theme
b) Search for all possible causes

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c) Analyze the root cause of the problem
d) Plan Corrective Action
e) Carry Out Improvements
f) Studying the Results of Improvement
g) Standardizing Solutions and Best Practices
h) Create a Final Report and Determine the Next Quality Improvement Plan

METHOD

In conducting data processing in this study, control the quality of the Seventools method by using the analysis tool of the Kaizen cycle PDCA (Plan, Do, Chek, Action). The steps are as follows:

a. Collect data by using check sheets.
b. Create a histogram.
c. Determine the priority of improvement (using a pareto chart), by: Calculation of percentage (%) of defects =(Jenis Cacat)/(Jumlah Cacat) x 100%
d. Create a control map p.

With the control map formula P

$$P=np/n$$

Information:
Np : number of failures in subgroups
n : the number checked in the subgroup

Calculates the Central Line (CL) and the center line which is the average product damage ($\bar{P}$)

$$CL=\bar{P}= \sum np/\sum n$$

Information:
∑np : total number of defects
∑n : total amount received

Determining UCL value

$$UCL = \bar{P} + 3 \sqrt{((\bar{P}(1-\bar{P}))/n)}$$

Information:
p : average product non-conformity
n : production quantity

Determining the LCL value

$$LCL = \bar{P}E - 3 \sqrt{((\bar{P}(1-\bar{P}))/n)}$$

Find the dominant cause with a fishbond diagram.
She proposed Kaizen concepts with PDCA cycles and 5S movements.

RESULT AND DISCUSSION

From the results of research on SS tempeh production at the Limo Depok Islamic Boarding School by taking production samples in May 2023, the amount of damage to SS tempeh

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production in May 2023 was obtained which is presented in the cheek *sheet* table as follows:

Table 1. Cheek Sheet Total Damage Tempeh SS Production May 2023

No	Production Quantity	Number of Defective Products	Proportion of Damage	Percentage Damage
1	851	22	0,0259	2,59%
2	810	19	0,0350	2,35%
3	910	16	0,0176	1,76%
4	870	26	0,0299	2,99%
5	840	18	0,0214	2,14%
6	750	17	0,0227	2,27%
7	985	25	0,0254	2,54%
8	960	30	0,0313	3,13%
9	815	18	0,0221	2,21%
10	860	20	0,0233	2,33%
11	770	14	0,0182	1,82%
12	980	22	0,0224	2,24%
13	995	25	0,0251	2,51%
14	853	19	0,0223	2,23%
15	914	23	0,0252	2,52%
16	910	20	0,0220	2,20%
17	870	24	0,0276	2,76%
18	915	22	0,0240	2,40%
19	995	26	0,0261	2,61%
20	810	17	0,0210	2,10%
21	980	30	0,0306	3,06%
22	791	17	0,0215	2,15%
23	912	19	0,0208	2,08%
24	845	23	0,0272	2,72%
25	915	17	0,018	1,86%
Total	22106	529	0,0600	60%
Average2	683	22	0,0238	2,38%

Table 1 above shows that the highest damage is at number 21 with a percentage damage value of 3.06%. From the research results on SS tempeh production at the Limo Islamic Boarding School in Depok by taking production samples in May 2023. From the data collection, SS tempeh production was 22,106 units with 529 units damaged during 25 data collections. The data collection of research results is presented in the *cheek sheet* table as follows:

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Table 2. Cheek Sheet SS Tempeh Damage

No	Production Quantity	Number of Defective Products			Total Defective Products	Percentage of Defective Products
		Damaged Eaten by Animals	Shred Failed Fermentation	Broken Sales		
1	851	5	10	7	22	2,59%
2	810	4	9	6	19	2,35%
3	910	3	8	5	16	1,76%
4	870	6	11	9	26	2,99%
5	840	3	8	7	18	2,14%
6	750	4	7	6	17	2,27%
7	985	5	12	8	25	2,54%
8	960	6	15	9	30	3,13%
9	815	3	10	5	18	2,21%
10	860	4	9	7	20	2,33%
11	770	3	6	5	14	1,82%
12	980	6	12	4	22	2,24%
13	995	3	15	7	25	2,51%
14	853	4	9	6	19	2,23%
15	914	5	10	8	23	2,52%
16	910	3	12	5	20	2,20%
17	870	6	9	9	24	2,76%
18	915	4	12	6	22	2,40%
19	995	5	14	7	26	2,61%
20	810	3	9	5	17	2,10%
21	980	8	12	10	30	3,06%
22	791	4	7	6	17	2,15%
23	912	4	8	7	19	2,08%
24	845	6	9	8	23	2,72%
25	915	4	7	6	17	1,86%
Total	22106	111	250	168	529	60%
Average/ Unit	885	4,44	10	6,72	22	2,38%

Based on the data in table 2 above, it can be explained that during May 2023, within 25 days of production, the total production of SS tempeh is 22,106 units with 529 units of damage. consists of 111 units (eaten by insects), as many as 250 units (fermentation damage) and 168 units (sales defective) With an average amount of SS tempeh production as many units and an average damage of 22 units with defects in SS tempeh production caused by inadequate facilities and infrastructure (in open space) and also environmental

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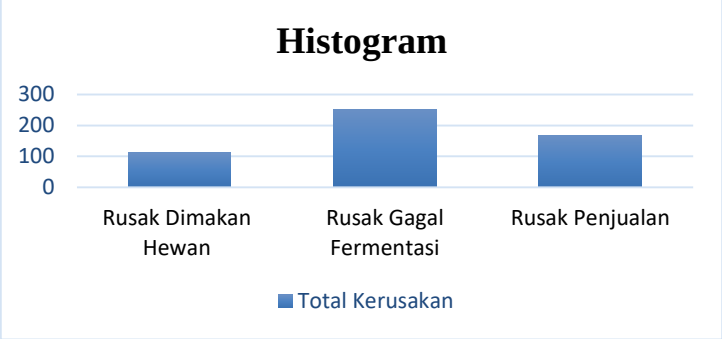
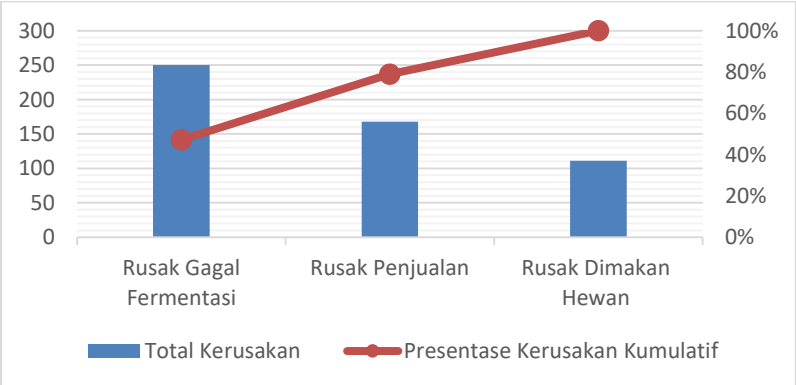
factors and after-sales damage. Based on the results of the examination sheet (cheek sheet) then a histogram is made, where this histogram is helpful to make it easier to read the process of defective products and find out the product according to standards or not. The histogram of the type of SS tempeh defect is as follows:



Picture 3. SS Tempeh Disability Type Histogram May 2023

From the calculation results in table 2, SS tempeh data in May 2023 was obtained as many as 529 production defects. The types of defective SS tempeh production due to damaged fermentation failure with a yield value of 250 (47.2%), damaged sales with a yield value of 168 (31.7%), damaged eaten by animals with a yield value of 111 (20.9%). The data shows that SS tempeh defects due to fermentation failure are a significant concern, so optimization of quality control improvements must be prioritized for the cause of this defective product. From the calculation of the factors that cause tempeh SS defects are then grammed into a pareto diagram. The pareto diagram image is as follows:



Picture 4. SS Tempeh Damage Pareto Diagram May 2023

Then the results of the calculation of the control limit of damage proportion, center line (CL), upper control limit (UCL) and lower control limit (LCL) were obtained from the results of SS tempeh production research for 25 days presented in the following table:

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Table 3. SS Tempe Control Limit Calculation May 2023

No	Production Quantity	Total Defective Products	Proportion	CL	UCL	LCL
1	851	22	0,026	0,024	0,027	0,021
2	810	19	0,023	0,024	0,027	0,021
3	910	16	0,018	0,024	0,027	0,021
4	870	26	0,030	0,024	0,027	0,021
5	840	18	0,021	0,024	0,027	0,021
6	750	17	0,023	0,024	0,027	0,021
7	985	25	0,025	0,024	0,027	0,021
8	960	30	0,031	0,024	0,027	0,021
9	815	18	0,022	0,024	0,027	0,021
10	860	20	0,023	0,024	0,027	0,021
11	770	14	0,018	0,024	0,027	0,021
12	980	22	0,022	0,024	0,027	0,021
13	995	25	0,025	0,024	0,027	0,021
14	853	19	0,022	0,024	0,027	0,021
15	914	23	0,025	0,024	0,027	0,021
16	910	20	0,022	0,024	0,027	0,021
17	870	24	0,028	0,024	0,027	0,021
18	915	22	0,024	0,024	0,027	0,021
19	995	26	0,026	0,024	0,027	0,021
20	810	17	0,021	0,024	0,027	0,021
21	980	30	0,031	0,024	0,027	0,021
22	791	17	0,021	0,024	0,027	0,021
23	912	19	0,021	0,024	0,027	0,021
24	845	23	0,027	0,024	0,027	0,021
25	915	17	0,019	0,024	0,027	0,021

The next step of the research results of SS tempeh production for 25 days is then depicted in the control map diagram of the proportion of SS tempeh damage in May 2023 which can be seen in figure 5. The data obtained shows that some damage is beyond the control limits, shown from numbers 4, 8, and 21, meaning that the production process carried out in the SS tempeh business has not been controlled. So that irregularities still occur and quality control in the SS tempeh business still requires improvement.

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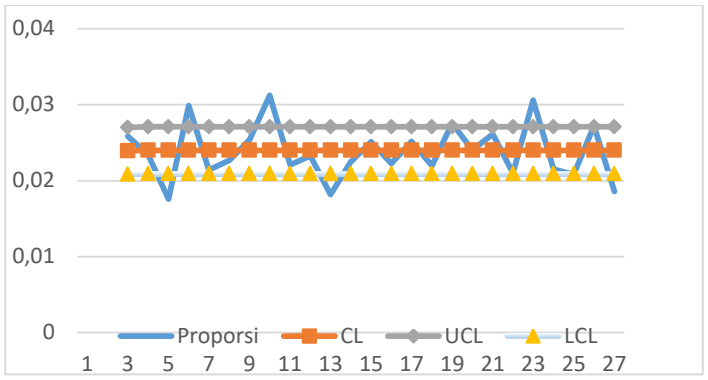
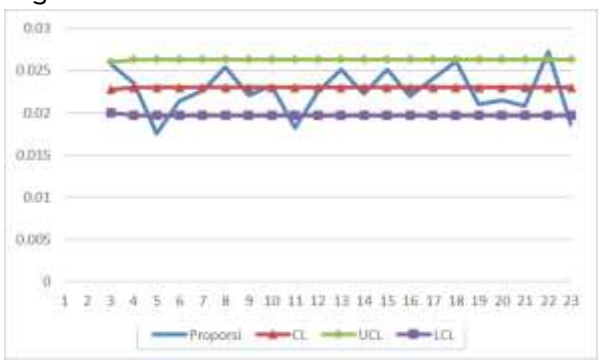


Picture 5. SS Tempeh Damage Proportion Control Map Diagram May 2023

Furthermore, recalculation is carried out by removing research data numbers 4, 8, and 21, so the calculation results described in the revised control map diagram in figure 6 will be obtained. The results of the calculations showed no damage value outside the control limit of both the upper control limit and the lower control limit, with the UCL value being 0.0066 and the LCL being 0.



Picture 6. SS Tempeh Damage Proportion Control Map Diagram May 2023

Failure of fermentation, damaged sales, damaged by insects are some of the factors that make tempeh production defective. However, these defects can occur because human resources, working methods, production tools, and materials affect the event. The next step is to make a fishbone *diagram*. This stage is carried out when the calculation and creation of the pareto chart have been carried out. The following is a fishbone diagram explaining the cause of tempeh product defects.

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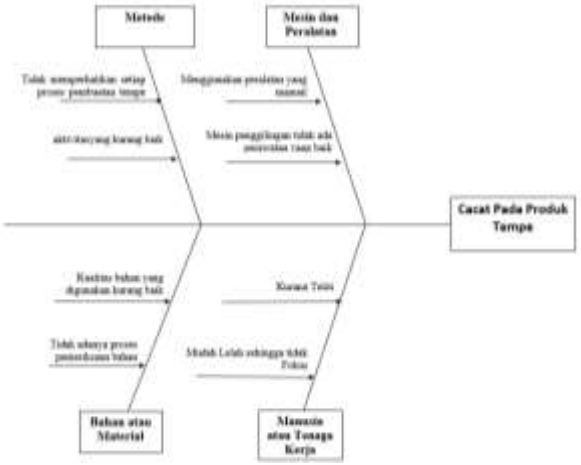

Picture 7. *Fishbone Diagram* SS Tempeh Product Defects

Factors that cause defects in tempeh products are machinery, equipment, methods, materials / materials, and humans or labor. From these causes, it can be explained as follows:

1. Machinery and equipment
   The use of machinery or equipment in the production of SS tempeh is done for packaging still manually. So that the packaging of SS tempeh results is not so good. From the existing problems, a way to overcome it is to have a unique tool for the packaging stage.
2. Method
   The method carried out in the tempeh packaging process is not good, so the final product is also not good. From these problems, there are ways to overcome them, namely:
   1) Looking for the development of packaging methods.
   2) The method used must be updated regularly to adjust to the conditions.
3. Material or material
   The ingredients used in making soybean tempeh are not sufficiently available (unstable) because the supply is not always available, so the availability of existing ingredients is of less quality. . In addition, additional ingredients used as complements to the tempeh making process do not go through the inspection stage by workers so that from the main ingredients that are not good and the supporting materials that are not good quality are produced.
   How to counteract:
   1) The materials used in making tempeh must be checked well and must use materials that have good quality.
   2) Additional materials used must be checked so that quality is maintained.
4. Human or Labor.
   Human or labor is the most crucial factor of all existing indicators. Because the

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quality of the product is very influential on the quality of the workforce. If the quality of the workforce is not good and does not have experience, the products produced will be less good. The quality of the workforce must be maintained and debriefed, so that the products produced are by expectations. How to overcome by providing socialization related to production activities.

5. Control

   This stage is the last stage carried out in the DMAIC method. The tempeh factory in Ponpres Sirajussa'adah Limo Depok has not carried out this stage. Control stages can be done by:

   1) Strict procedures must be carried out to control the stages in making SS tempeh. The most critical stages to control are washing and planting.
   2) Every improvement process carried out must have supervision.
   3) Training must be carried out for workers to improve the quality of the products produced.

After receiving the proposed improvement, the next step is to structure the PDCA cycle so that it can continuously make improvements to every aspect of the defect, as described below:

1. Plan, from the diagram because a plan is made to overcome the problem of defects in SS tempeh products from 4 problem factors, namely raw materials, methods, equipment and labor.
2. Do (Implementation), the stage of implementation of the problem of dealing with defective products.
3. Check, improvements that have been made check whether the results are promising, if the results are not good repeat the initial steps until the results are satisfactory. Each time a pareto chart, histogram, cause and effect diagram is made to determine the improvements achieved.
4. To prevent the recurrence of the same problem, regulations or procedures for working quality standards must be made: work methods, maintenance of machinery and equipment used, quality of materials and meticulous labor.

Based on the tempeh production process of SS Sirajussaadah Limo Depok, the proposed 5 S movement is as follows:

1. Seiri (sorting), focused on sorting the quality of soybean raw materials.
2. Seiton (styling) at the time of normal temperature fermentation.
3. Seiso (cleanliness), the implementation of cleanliness in all areas of the process.
4. Seiketsu (treatment), the implementation of treatment is carried out in all areas of the process.
5. Shitsuke (habituation), which is discipline in understanding every work rule.

The example of calculating the cost of quality repair for tempeh production is as follows: suppose you have a tempeh manufacturing business and want to calculate the cost of quality repair for a certain period. You will consider several factors that contribute to

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the cost of quality repairs (figures in thousands of dollars):

1. Raw Material Cost:
   a. Soybean ingredients : 500
   b. Tempeh culture starter material : 50
   c. Total Cost of Raw Materials : 550
2. Production Cost:
   a. Electricity costs for the fermentation process : 100
   b. Production labor wages : 300
   c. Total Production Cost : 400
3. Internal Failure Cost:
   a. Disposal of deformed tempeh due to fermentation failure : 150
   b. Reprocessing tempeh that does not reach quality standards : 200
   c. Total Cost of Internal Failure : 350
4. External Failure Cost:
   a. Warranty claims from customers related to tempeh quality : 100
   b. Tempeh returns from retailers due to poor quality : 250
   c. Total Cost of External Failure : 350
5. Total quality repair cost = Internal Failure Cost + External Failure Cost
   Total quality repair cost = 350 + 350 = 700

In this case, the total cost of quality repair for a certain period in tempeh production is Rp 700. 000,- This fee involves disposal of defective products, reprocessing, warranty claims, and product returns from customers or retailers. The calculation of quality repair costs helps to understand the magnitude of costs associated with product defects and provides insight into areas that need improvement in the production process. Reducing the cost of quality improvement can increase business efficiency and profitability.

CONCLUSION

Based on the analysis and discussion that has been carried out, the conclusions of this study are as follows: Defects in the product are caused because the plastic used to wrap tempeh is eaten by animals until it has holes, so the defective product cannot be marketed to consumers. In addition, the tempeh in the plastic has not been made perfectly due to uneven packaging. Other factors that cause defects in tempeh products are inadequate environmental conditions, the raw materials used are of poor quality, the packaging process is still not good, and the last is that the room used for the fermentation process is inadequate. The control stage carried out by SS tempeh production at Ponpres Sirajussaadah is discovering the cause of the lack of quality tempeh produced. This stage provides several solutions, namely adequate fermentation space, buying automatic machines for the fermentation and packaging process, and training workers to reduce the cost of defective products in the production process. Good training or guidance is held to existing workers and uses machines in the process of fermentation and packaging as well

as maintaining the cleanliness of the production area environment

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