The International Journal of Business Management and Technology, Volume 9 Issue 1 January 2025
ISSN: 2581-3889

Research Article Open Access

Analysis Quality Control of Milk Pie at Cv. Dhian Mandiri Company

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ABSTRACT: *CV. Dhian Mandiri is a company engaged in the souvenir industry, especially the production of milk pies. In its production activities, the company often experiences problems related to product defects. The purpose of this research was to determine the factors that cause damage to milk pie products at CV. Dhian Mandiri along with proposed improvements. The method used in this research is Statistical Process Control (SPC). The data used is data on the number of defective products in milk pie production for the July 2024 period. Data analysis using flow diagrams, histograms, pareto diagrams, control charts (p-charts), and fishbone diagrams. After conducting research, the product defects experienced in the company's production process were, defects in the deffect category, defects in the burnt category, and defects in the diameter category that did not match. In the Pareto diagram, it was found that the largest defect rate was defects in the deffect category of 48.78% and defects in the burnt category of 39.02%. In the p-chart there is no out of control data or defective product data is still under control. Fishbone diagram shows the causes of production defects due to factors of less careful labor, factors of oven machines that do not have temperature and time settings, kneading machines that do not have time settings, material factors that do not standards yet, and method factors that do not have written standard operating procedures. The results of the research are expected to be positive feedback for the company to be able to reduce product defects.*

Keywords: *Quality control, Statistical Process Control (SPC), milk pie*

I. Introduction

The creative industry is an industry that utilizes a person's creativity, talent or skills in creating a job field that can improve welfare by producing a creative power that can be created by individuals. One of the creative industries supporting tourism is the Balinese souvenir industry. One of the typical Balinese souvenirs is milk *pie* . *Pie* is one of the many *pastry products* with milk in the middle which is usually chosen as a snack. Milk *pie* has a relatively small size with a round and thin shape. Making milk *pie* consists of several ingredients such as low-protein wheat flour, butter, eggs and powdered sugar (Hudiah*et al.*, 2023). As one of the typical Balinese souvenirs that is in demand by tourists, there are many milk *pie industries* that are developing in Bali. The company CV. DhianMandiri is one of the businesses engaged in the food industry, which produces milk *pie*.

Based on interviews with company management at CV. DhianMandiri, there are still obstacles in production results, namely the existence of defective products. Defective products produced can reach 7% of the total number of products per day or during 8 working hours. Defective products produced are usually sold at a price far below the standard price, which is Rp15,000.00 per 25 pieces, where the standard price for original milk pie is Rp1,800.00 per piece. Quality control is needed in the production process to further minimize the number of defective products. In addition to being able to cause cost waste ,product quality is a very important factor for a product in determining consumer satisfaction.

In this research, the researcher will use the *Statistical Process Control* (SPC) method. The *Statistical Process Control* (SPC) method was chosen because it is one of the statistical tools in quality control by analyzing the production process so that its quality can be controlled from the beginning of production to the final production process. Several previous studies that have been conducted such as the research(Norawati & Zulher, 2019) used the *Statistical Process Control* (SPC) method which was conducted at Kampar Bakery Bangkiang. Research (Primasanti & Susilo, 2019) entitled Controlling Bread Production Quality with the Statistical Process Control Method at Roti Rahmat SMEs. Research conducted

(Marlina et al., 2023) entitled Controlling Bread Quality with Statistical Process Control at Roti Albatsit Payakumbuah SMEs.

Based on the problem of production defects faced by the company CV. Dhian Mandiri, it is necessary to conduct research to determine the cause of the production defects so that they can be minimized and become a continuous quality improvement.

II. Research and Method

2.1 Place and Time

Research conducted at CV. DhianMandirilocated at Jl. Prof. Dr. Ida Bagus Mantra, Batubulan, Sukawati, Gianyar, Bali. And in data processing will be carried out at the Industrial Engineering and Management Laboratory, Faculty of Agricultural Technology, Udayana University. The research time will be carried out during July to October 2024.

2.2 Population and Sample

The population of data used in this research is the total number of milk *pies* in each production produced by CV. Dhian Mandiri . According to the results of interviews with management, in the production of Dhian Milk *Pie* , the production volume can be between 70,000 and 125,000 milk *pies* . The production process at CV. Dhian Mandiri is usually carried out every day if purchases are busy, but when purchases are not too busy, the company will produce three times a week. Sampling was carried out eight times during the production process, with sampling twice a week. This is done because if CV. Dhian Mandiri is not in production every day, then by taking samples eight times it can represent the production time carried out in one month.

The sample determination in this research used the Slovin formula with the error tolerance limit used being 0.1 (10%), so the Slovin formula used to determine the sample is as follows.

$$n = \frac{N}{N(e)^2 + 1}$$

$$n = \frac{95{,}621}{95{,}625(0{,}1)^2 + 1}$$

$$n = 99{,}89$$

2.3 Research Instruments

Research instruments are tools used to collect data and information needed in research. This research uses several instruments, namely check sheets used to record data on the amount of production, samples, and the number of reject products from each type of reject that occurs, interview sheets containing questions about the packaging process and the rejects that occur.

III. Resultand Discussion

1.1.1. Flow diagram

Based on the results of the research that has been conducted, it is known that the process flow of making milk *pie* at CV. Dhian Mandiri is as follows:

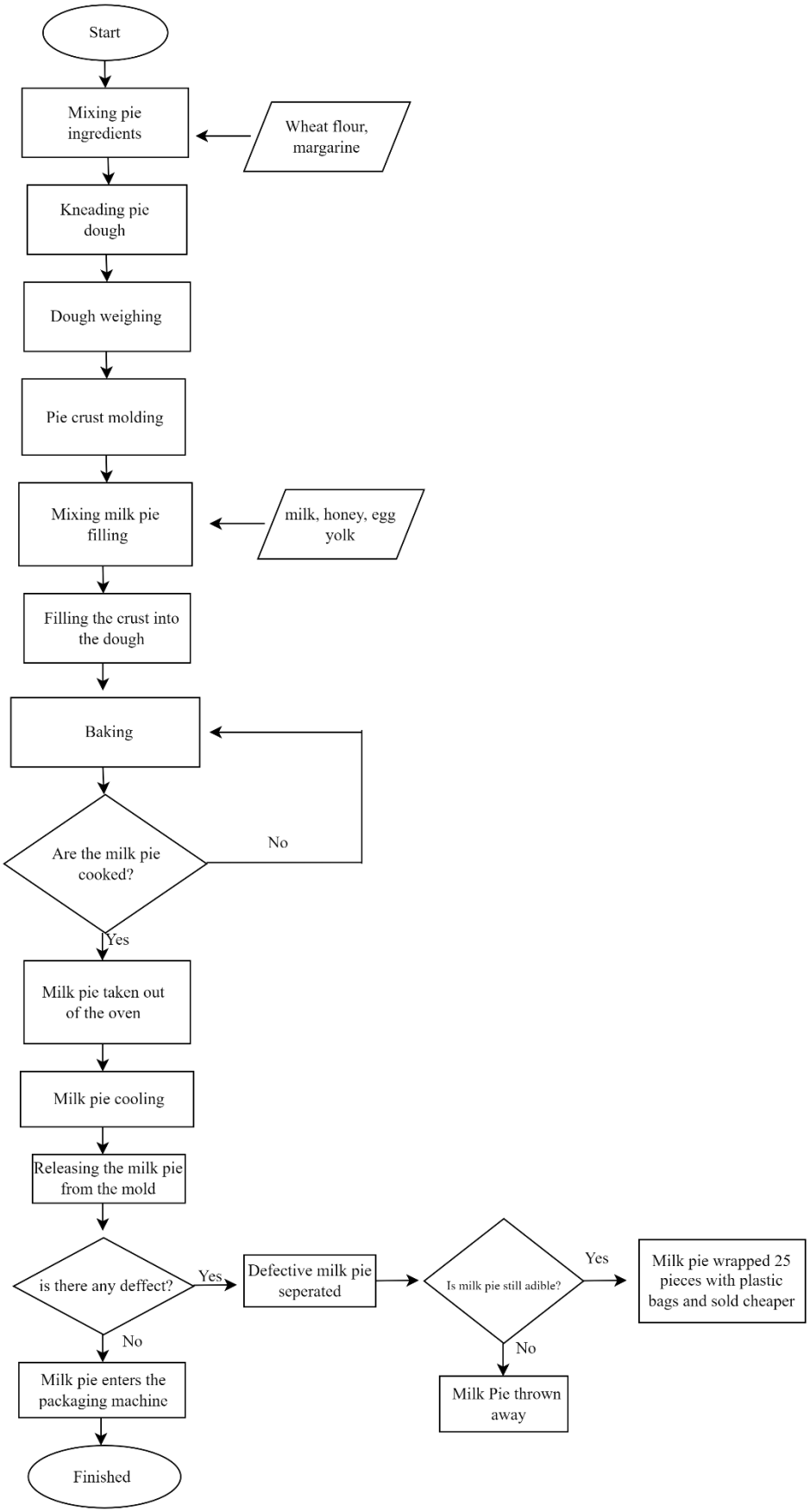

Figure 1Flowchart of Milk Pie Making

CV. DhianMandiri has a standard that is used as a reference in the finished product of milk *pie* produced. This standard is used to assess the quality of the milk *pie product* produced whether it is suitable for distribution or not. The Dhian Milk *Pie standard* set by the company can be seen in table 1.

Table 1Characteristic Standards of Dhian Milk Pie

No	Characteristics	Information
1	Color	Golden brown
2	Heavy	10 grams
3	Diameter	6 – 6.5 cm

1. Color

The color produced from the *Pie* Susu Dhian production stage is golden brown with a minimum standard of 10 percent emptiness. If the *Pie* Susu Dhian product has a dark color due to emptiness of more than 10 percent, then the product can be said to be a production defect.

2. Heavy

The weight resulting from the production stage of *Pie* Susu Dhian is 10gr. The measurement of the weight of *Pie* Susu Dhian starts from the division of the pie dough, namely with a size of 10gr with the addition of 3gr of milk custard.

3. Diameter

Pie has a diameter of 6-6.5 cm. If the milk *pie* has a diameter of less than 6 cm and more than 6.5 cm then the milk *pie* is included in the defective category.

3.1.2. Check Sheet

The check sheet table contains the amount of production, the number of samples checked, the type of defect and the number of defects in each defect category. In the production of milk pie at CV. DhianMandiri, there are three types of defects that are visible, including burnt milk pie, deffect milk pie, and the diameter of the milk pie that is not appropriate. The following is the production data for Dhian Milk Pie in the period July 2024.

Table 2Check Sheet of Defective Products CV. Dhian Independent

Day -	Total Production	Sample	Type of Damage			Total defects	Percentage disabled (%)
			Burnt	Deffect	Diameter no in accordance		
1	100,000	100	7	3	0	10	10
2	125,000	100	6	5	1	12	12
3	100.000	100	0	8	2	10	10
4	100.000	100	0	9	2	11	11
5	85.000	100	8	0	0	8	8
6	85.000	100	5	7	0	12	12
7	70.000	100	0	5	3	8	8
8	100.000	100	6	3	2	11	11
total	765.000	800	32	40	10	82	82
average	95.625	100	4	5	1,25	10,25	10,25

3.1.3. Histogram

A histogram is created to see the variation of defect types that occur according to the frequency of defects in Dhian's*Pie* Susu products. Based on the *checksheet table* obtained from the results of observations at CV. DhianMandiri in July 2024, it can be displayed with a histogram as follows.

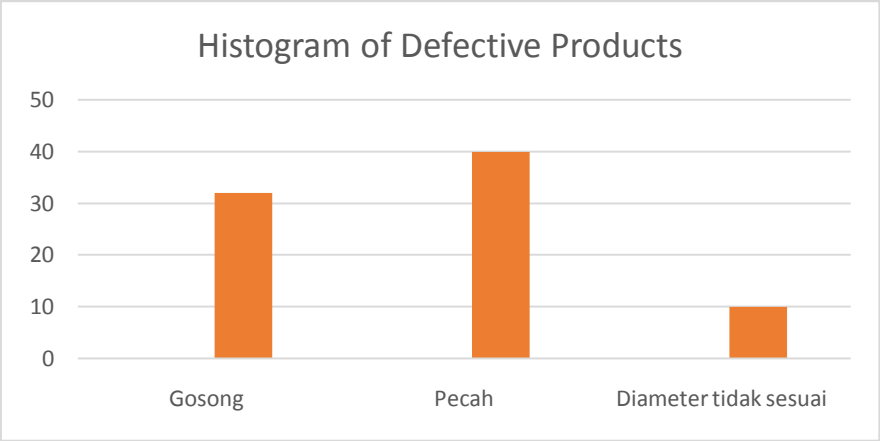

Figure 2. Histogram of Defective Products of Milk Pie

3.1.4. Pareto Diagram

Pareto diagram can be used to show the variation of defect types that occur with the *ranking order* from highest to lowest from left to right. This *ranking* is made to see the highest defect problems so that the problem can be prioritized for repairs that must be resolved immediately. The following table shows the frequency of *rejects* and the cumulative percentage *of rejects* on CV. Dhian Mandiri products.

Table 3. Reject Frequency Table

Type of Damage	Number of Defects	Percentage	Percentage Cumulative
Deffect	40	48.78%	48.78%
Burnt	32	39.02%	87.80%
Diameter no inaccordance	10	12.20%	100.00%
Total	82	100.00%	

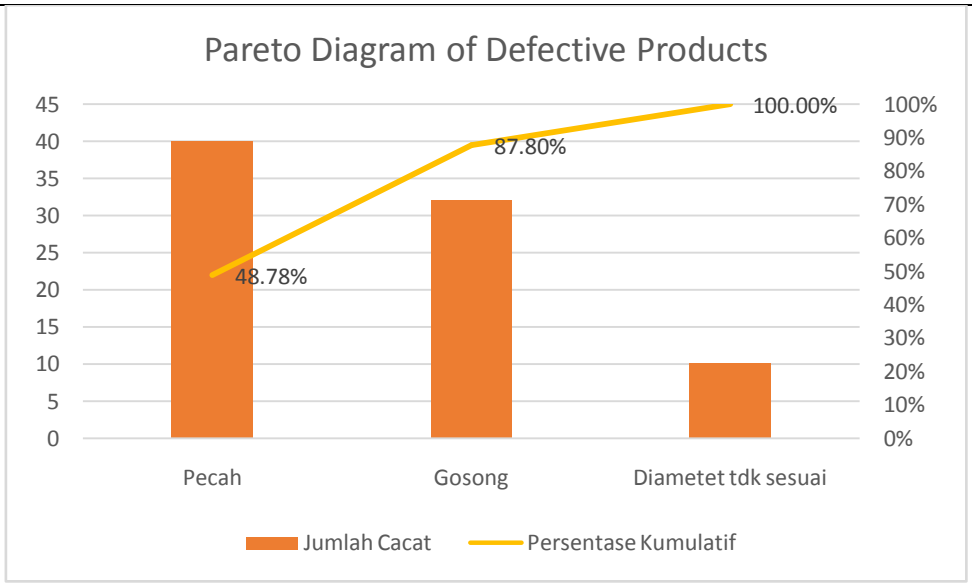

Figure 3. Pareto Diagram of Defective Products

Based on the data in the Pareto diagram above , it can be seen that type biggest *reject* occurs in the type *reject* deffect with percentage 48.78% , and the smallest *reject* is type heavy *reject* No in accordance with percentage 39.02% . This *reject* can occur due to several factors such as raw materials used, labor negligence factors, machines used are no longer functioning properly or inappropriate processing methods.

3.1.5. Control Chart (p-chart)

After getting the results from the Pareto diagram, the next step is to create a control chart (*p-chart)* to find out whether the damage that occurred in July 2024 in production at CV. DhianMandiri is still within the control limits or is beyond the control limits. Creating a p-control chart consists of several stages, namely, calculating the percentage of damage, calculating the central line ,calculating the upper limit line , and calculating the lower limit line or *low central line* . The following are the calculations and control charts for milk *pie production* at CV. Dhian Mandiri in July 2024.

Table 4. p-chart table

Day-	Production	Sampel	Type of defect			Total defect	Deffect persentation (%)	Proportion of defect	CL	UCL	LCL
			Burn	Broken	Diameter no inaccordance						
1	100.000	100	7	3	0	10	10	0,1	0,103	0,135	0,070
2	125.000	100	6	5	1	12	12	0,12	0,103	0,135	0,071
3	100.000	100	0	8	2	10	10	0,1	0,103	0,135	0,071
4	100.000	100	0	9	2	11	11	0,11	0,103	0,135	0,071
5	85.000	100	8	0	0	8	8	0,08	0,103	0,135	0,071
6	85.000	100	5	7	0	12	12	0,12	0,103	0,135	0,071
7	70.000	100	0	5	3	8	8	0,08	0,103	0,135	0,071
8	100.000	100	6	3	2	11	11	0,11	0,103	0,135	0,071
total	**765.000**	**800**	**32**	**40**	**10**	**82**	**82**				
rata-rata	**95.625**	**100**	**4**	**5**	**1,25**	**10,25**	**10,25**				

From the results of the data calculations above, a control map can be made as follows.

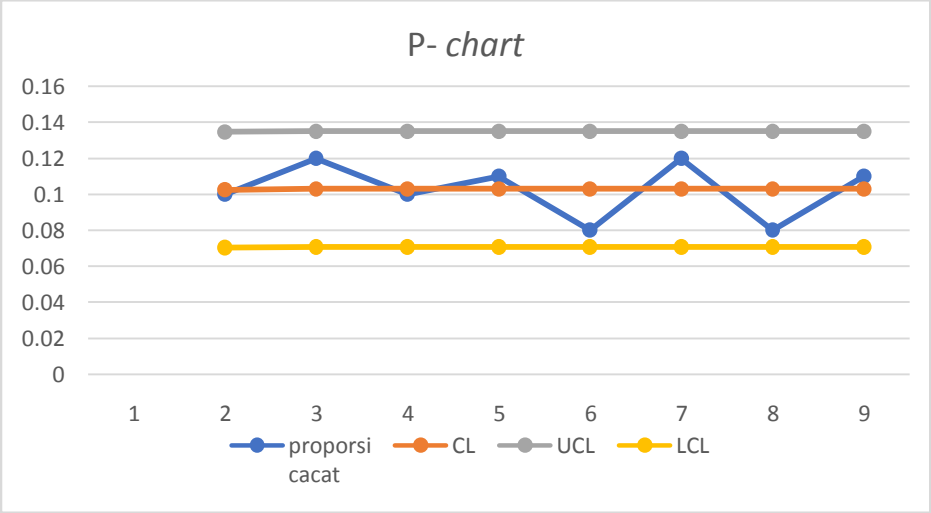

Figure 4. Control Chart (p-chart)

From the results of the control chart analysis above, it can be seen that the damage that occurred in the production of milk *pie* at CV. DhianMandiri is still within the control limits, this can be seen from all points that are still within the lower control limit and the upper control limit so that the process can be said to be under control. However, in this research, improvements will still be made to minimize the occurrence of production defects at CV. DhianMandiri.

3.1.6. Fishbone Diagram

Cause and effect diagram or *fishbone* diagram is used in this researchfor identify reason the occurrence damage to production milk *pie* at CV. Dhian Mandiri. Damage to milk *pie* products at CV. DhianMandiri can be caused by several factors including labor factors (*man*), machines, raw materials (*material*), methods. The cause and effect diagram in this research was made based on the results of interviews and brainstorming together with the manager of CV. DhianMandiri. The results of the identification of milk pie damage can be seen in the following diagram.

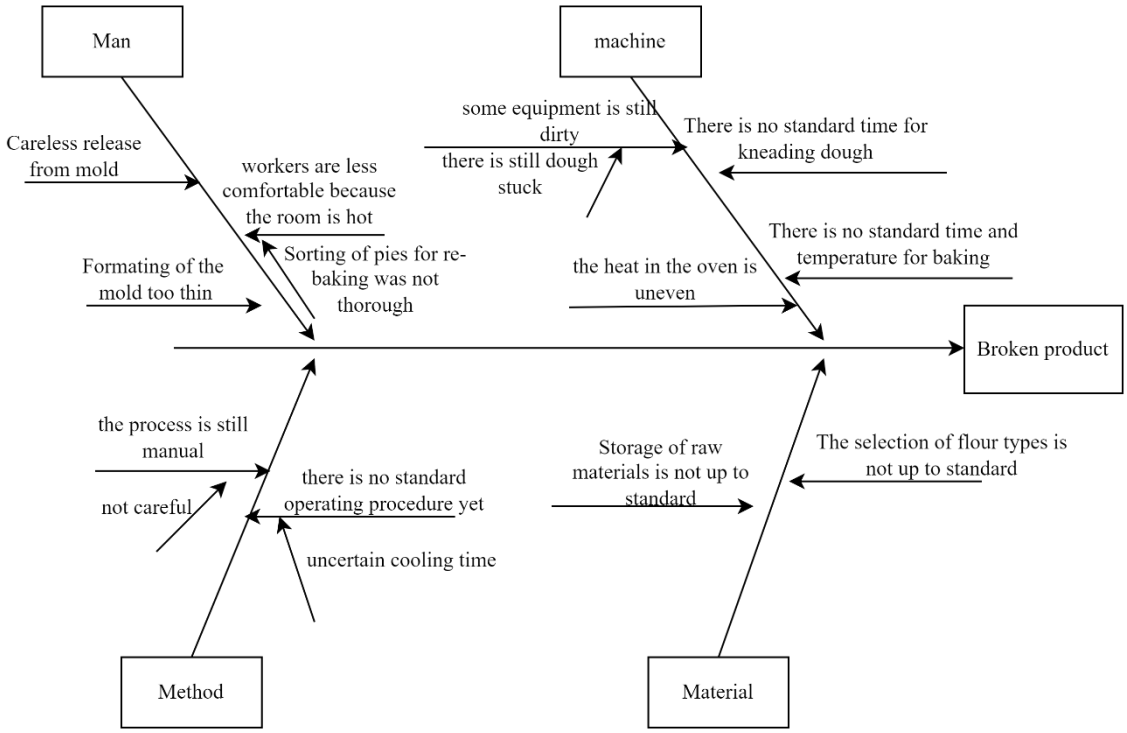

Figure 5. Fishbone Diagram of Broken Products

Based on the analysis above, it can be seen that the factors causing the occurrence of broken products in the production of milk pies at CV. DhianMandiri are caused by:

1. Human factors

The human factor in question is all workers or employees in the *Pie* Susu Dhian production process. In the production of *Pie* Susu Dhian, damage to the deffect category can be caused by the formation process in the mold being too thin. In addition, damage to the deffect category also occurs because the process of releasing the milk *pie product* from the mold is not careful. *Human error* can occur because the amount of production is quite large every day. In addition, a hot room can also reduce employee focus during production, this is in accordance with research conducted by (Kadek et al., 2018) .

2. Machine Factors

pie dough mixing machines that do not specify the time for kneading the *pie dough* , so that kneading for too long or not kneading for long enough can cause the final *pie* to break (Tamba et al., 2020) . In addition, equipment that has been washed but is not clean enough, so that there is still dough residue stuck, also causes the *pie dough* in the next session to be sticky and difficult to remove which causes it to break (Andriani et al., 2018) . High temperatures and baking times that are too long can also cause *pie products* to break (Tamba et al., 2020)

3. Raw material

According to Pramono, *et al.,* (2020) in the manufacture of snack products such as biscuits, *pastries* and *pies* , the type of wheat flour that is good to use is medium protein wheat flour because the gluten content in medium protein flour is not too low and not too high so that it can produce a texture that meets the standards for milk *pie products* . In the production of Dhian Milk *Pie* , the raw materials used are taken from 2 different flour *suppliers* with different types of flour. The *suppliers* taken are high protein wheat flour and low protein wheat flour. The manufacture of milk *pie dough* uses both flours mixed together. This can certainly cause the texture of milk *pie* to not meet standards. In addition to the type of wheat flour used, flour storage can also be a factor causing damage to milk *pie* . According to Pramono, *et al.,* (2020) flour storage should not be attached to the wall and must be on a *pallet block* and should not be stored for a long time, because it can cause increased water content causing the tendency of wheat flour to clump and affect the dough mixing process, so that the dough is easily deffect and cracked. In the *Pie* Susu Dhian warehouse, flour is stored on *pallet blocks* but attached to the wall, this can be one of the damages to the flour that causes the final result of the milk *pie* to crack or break. The mixing of raw materials in making the dough also affects the final result of the *pie product,* because if the mixing of the dough is not right between water and flour, the final result of the product can break (Tanjaya, 2017) .

IV. Method

Improper production process methods can certainly cause damage to a product. In the production process of *Pie* Susu Dhian, the method that can cause damage to the category of deffect can occur because in the cooling process, the milk *pie product* has not cooled evenly, causing the product to still stick to the mold so that *the pie* is sticky and deffect or cracked. This is in accordance with research conducted by (Kadek et al., 2018) and (Andriani et al., 2018) . The manual process in releasing the milk *pie* can also cause the milk *pie product to break* due to the low level of accuracy of the workforce.

In addition to the deffect category damage, based on the analysis with the Pareto diagram, the burnt category damage also has a high percentage so that repair priorities are needed. The results of the identification of burnt category milk *pie damage* can be seen in the following diagram.

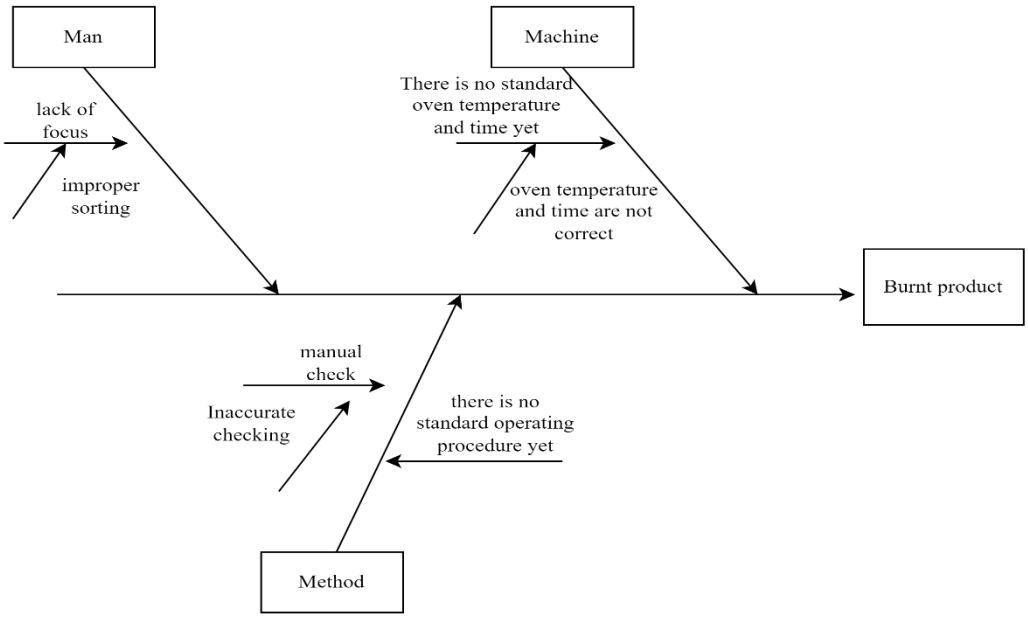

Figure 6. Fishbone Diagram of Burnt Products

Based on the analysis above, it can be seen that the factors causing burnt products in the production of milk *pie* at CV. DhianMandiri are caused by:

1. Engine factors

Machine factors can be the main cause of burnt milk *pie damage* because there is a heating process in it. Burnt category damage can occur due to the absence of clear standards for oven temperature and the duration of the baking process. If the oven temperature is too high with a long baking time, the product can become burnt, especially in products stored in the oven on the edge near the fire wall of the oven. The uneven difference in oven heat can cause burnt pies *(* Tamba et al., 2020)

2. Method factors

The production method used will certainly affect the final result of a product. In the defect category, the production method that must be considered is the *pie baking process.* During the research, the milk *pie baking method* did not have a definite standard. There is no definite standard for the temperature and duration of the baking. Each oven machine operates at a different temperature with a time of 40 minutes each, but after 40 minutes there are still *pies* that are not cooked so they have to be put back in the oven. This causes the baking time to be less efficient and can cause emptiness if not checked regularly.

3. Human factors

In the burnt category damage type, the negligence factor of the workforce is one of the causes of the damage. Negligence of the workforce in setting the standard temperature and time for baking. This of course affects the level of maturity of the final result of the milk *pie* . In addition to setting the temperature and time in the oven, the role of the workforce in checking each pan of milk *pie* is certainly an important thing that must be done. The lack of focus of the workforce when checking the maturity of the milk *pie* can cause inaccurate sorting of *pies* that should be re-baked.

V. Conclusion

Based on the results of research that has been conducted on the milk *pie production process* at CV. DhianMandiri, the dominant damage categories are deffect 48.78% and burnt 39.02%. Factors causing damage include labor factors that are less focused and less careful because the work space is less conducive, machine factors that have not been set standards, the absence of written standard operating procedures for the production process method, and raw materials such as flour that do not meet the standards for making *pie products* and storage of flour that is still attached to the wall.

Recommendation

Suggestions for improvement that can be given to minimize product damage include creating standard operating procedures (SOP) so that they can be read, understood, and implemented by workers in the production process, setting the temperature and baking time for milk *pies* , choosing low protein wheat flour as the raw material for *pie dough,* and implementing work *shifts* for workers so that the production space is more conducive.

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