

## The Quality Control At Keripik Tempe Abadi Malang

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### **Abstract**

*Changes in the industrial world such as the emergence of the Coronavirus have had a huge impact on companies because consumers are more selective in choosing good quality products for consumption. Quality is a very important factor for the survival of the company. Therefore, this research was conducted to apply quality control methods at the Company of Keripik Tempe Abadi in Malang City to improve the quality of their production. The tools used in this study are Seven tools and the table Failure Mode and Effect Analysis (FMEA). The results of this study indicate that there are product defects that exceed the tolerance limits of the company, namely in the form of deformities, broken products, burnt products, and defects in the packaging. Then based on the analysis with a Fishbone diagram to find out the root cause of product damage. The final step is to use the FMEA.*

**Keywords:** *Quality Control, Pareto Chart, Fishbone Diagram, and FMEA.*

### **Abstrak**

Adanya perubahan dalam dunia industri seperti munculnya virus Corona sangat berdampak bagi perusahaan, dikarenakan konsumen lebih selektif dalam memilih produk yang berkualitas baik untuk dikonsumsi. Kualitas merupakan faktor yang sangat penting bagi kelangsungan hidup perusahaan. Karena itu penelitian ini dilakukan untuk menerapkan metode pengendalian kualitas pada Perusahaan Keripik Tempe Abadi di Kota Malang untuk meningkatkan kualitas hasil produksinya. Alat yang digunakan dalam penelitian ini adalah tujuh alat dari TQM dan tabel Failure Mode and Effect Analysis (FMEA). Hasil penelitian ini menunjukkan bahwa masih terdapat kecacatan produk yang melebihi batas toleransi perusahaan, yakni berupa kecacatan bentuk, produk patah, produk gosong, dan cacat pada kemasannya. Kemudian berdasarkan analisis dengan diagram sebab akibat untuk mengetahui akar permasalahan dari kerusakan produk dengan menggunakan tabel FMEA.

**Kata kunci:** *Pengendalian Kualitas, Diagram Pareto, Diagram Sebab Akibat, dan FMEA*

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## INTRODUCTION

Some changes are taking place in the industrial world today, such as the emergence of the Coronavirus which was present during society at the end of 2019 until now has attracted attention. The changes that occur provide an opportunity to maintain and develop the type of business that the company is running, but can also be the beginning of a threat to the company if it is unable to keep up with these changes. To maintain and develop a company-run business, the company needs to have a good plan. Success in a company cannot be separated from the decisions taken by the company itself so that the company can progress and develop. Even though the company produces a product on a large scale, of course, this is not a guarantee that the product or goods produced will last long in the market, considering that consumers are more selective in choosing products to consume, especially during the Covid-19 Pandemic, which of course consumers will prefer good quality products for consumption.

This Eternal Tempe Chips Company, located in Malang, is one of the UKM in the culinary field that provides Malang souvenirs, especially tempe chips with various flavors. At first, the company operated every day, but during the Covid pandemic the 19 company only produced when there was a request from consumers or its partners, the production process started from preparation, looking for raw materials, cutting, mixing dough, frying, packaging, packing, to distribution to each of its partners at home and abroad. In the production process, sometimes the product is damaged. At least in a month of production, some products are considered damaged beyond the tolerance limits of the company which are recorded in the following table:

**Table 1.** Defective Products for the Period July 2019 - June 2020

No	Month	Number of Production (pcs)	Number of Defects (pcs)	Data on Percentage of Disability
1	July 2019	3900	348	8.92%
2	August 2019	3750	330	8.80%
3	September 2019	4650	468	10.06%
4	October 2019	5382	486	9.03%
5	November 2019	4530	492	10.86%
6	December 2019	5112	438	8.57%
7	January 2020	4884	444	9.09%
8	February 2020	4752	456	9.60%
9	March 2020	4128	402	9.74%
10	April 2020	1416	126	8.90%
11	May 2020	2148	168	7.82%
12	June 2020	3588	282	7.86%
Total		48.240	4.440	109.25%
Average Defective Product				9.10%
Limits Of Tolerance Company				7%

Source: Production of the Keripik Tempe Abadi Company July 2019 - June 2020

Based on the data above, this company requires quality control so that the products produced can meet consumer expectations because in the production process there are still products that have not yet been identified. comply with the quality standards set by the company.

**LITERATURE REVIEW**

Heizer and Render (2015) define the notion of quality as described by the American Society for Quality (ASQ: [www.asq.org](http://www.asq.org)), namely: "Quality is the totality of features and characteristics of a product or service that bears on its ability to satisfy stated or implied need (overall features and characteristics of a product or service that rely on its ability to satisfy promised and implied needs). Quality or quality is important and is one of the factors of competitive advantage. The position of quality is very important since world market competition is getting tighter. This intense competition is triggered, among others, by the increasingly stringent conditions of globalization (Haming & Nurnajamuddin, 2013; Nasution, 2010). Total quality management (TQM) refers to the emphasis on quality that covers the organization as a whole from suppliers to customers. TQM emphasizes the management's commitment to have a continuous path of excellence in all aspects of goods and services that are important to customers. Each of the 10 decisions made by the operational manager relates to some aspect of identifying the emphasis on TQM if the firm will compete as a leader in the world market. (Heizer & Render, 2015).

Heizer & Render (2015) states that there are seven quality control tools used to identify and analyze quality problems that are being faced so that these problems can be controlled, including (1) Pareto diagram, (2) Cause and Effect Diagram, (3) Checklist, (4) Bar Chart (Histogram), (5) Scatter diagram, (6) Map control (Control Chart) and (7) Flowchart. Failure mode and effect analysis (FMEA) is an approach that is taken step by step to identify all failures that may occur in the design, manufacturing process, or assembly of a product or service (Haming & Nurnajamuddin, 2013; McDermott *et al*, 2009). This research refers to several previous studies, namely to determine the causes of defects that occur within the company by using causal diagrams and several other TQM tools (Hidayatullah Elmas, 2017; Idris *et al.*, 2016; Junaidi *et al.*, 2014; Kadek & Sari, 2018; Musran Munizu, 2013; Optimasi *et al.*, 2018; Riani, 2016; Tanjong, 2013; Widiatama, 2017; Windarti, 2014). Based on the review of the theoretical basis and previous research, a framework of thought can be drawn up which can be described as follows:



**Figure 1.** Conceptual Framework

## RESEARCH METHOD

The location was conducted at the Tempe Abadi Chips Company in Malang City. This research is quantitative descriptive. This type of research can also be referred to as applied research (H. Sugiyono, 2016; P. Sugiyono, 2015). Data collection techniques used in this study were interviews, observation, and documentation. Data analysis was performed using several tools from TQM and FMEA. The steps are to manage data from the company using a check sheet, create a Pareto diagram, create a control chart, create a cause and effect diagram, and determine the priority for improvement with FMEA (Failure Mode and Effect Analysis).

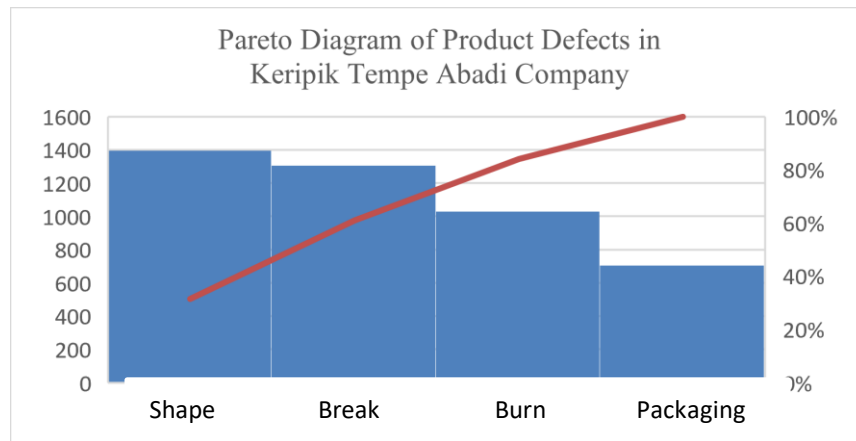
## RESULT AND DISCUSSION

Grouping of this data collection will be based on a table that was created earlier form, and the data will then be calculated by summing the result (types) of occurrence for each category based on the size of the existing label. The following is data on the number of product defects for the period July 2019 to June 2020. The data can be seen in Table 2 below.

**Table 2.** Total Disability Product

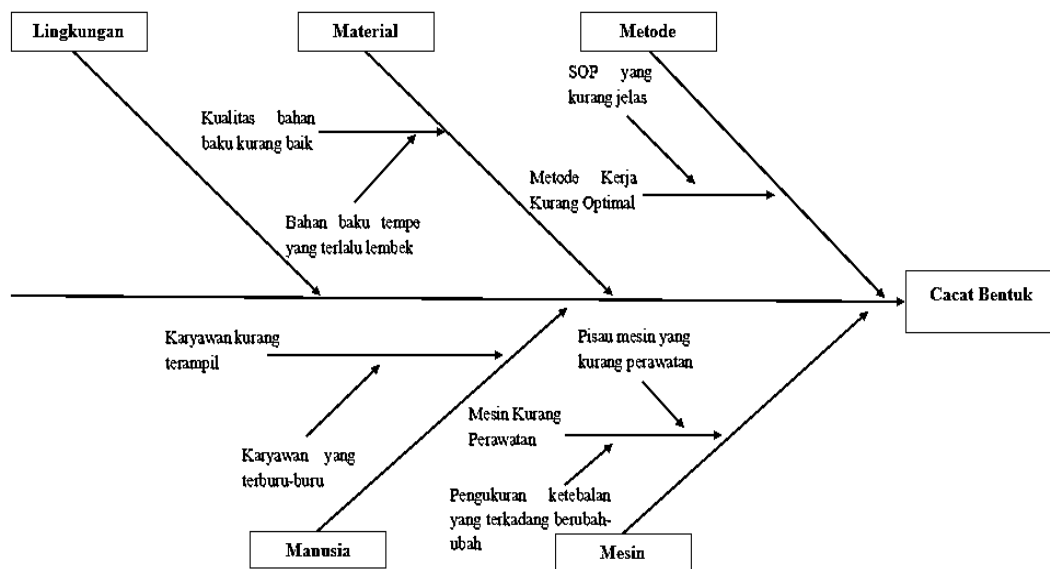
Period	Product Type Defective				Number of defects
	Break	Burn	Shape	Pack	
July 2019	112	75	103	58	348
August 2019	97	83	95	55	330
September 2019	135	123	140	70	468
October 2019	145	118	142	81	486
November 2019	143	127	133	89	492
December 2019	132	97	137	72	438
January 2020	142	92	152	58	444
February 2020	140	96	144	76	456
March 2020	106	107	132	57	402
April 2020	26	20	62	18	126
May 2020	54	32	58	24	168
June 2020	76	61	98	47	282
Total	1308	1031	1396	705	4440

It can be seen in the table of the number and types of product defects experienced at the Abadi Tempe Chips company, which is 31.44% resulting in deformities, broken dough (not round / perfect box) with a percentage damage was 29.46%, burnt tempeh chips was 23.22%, and damage to packaging was 15.88%.



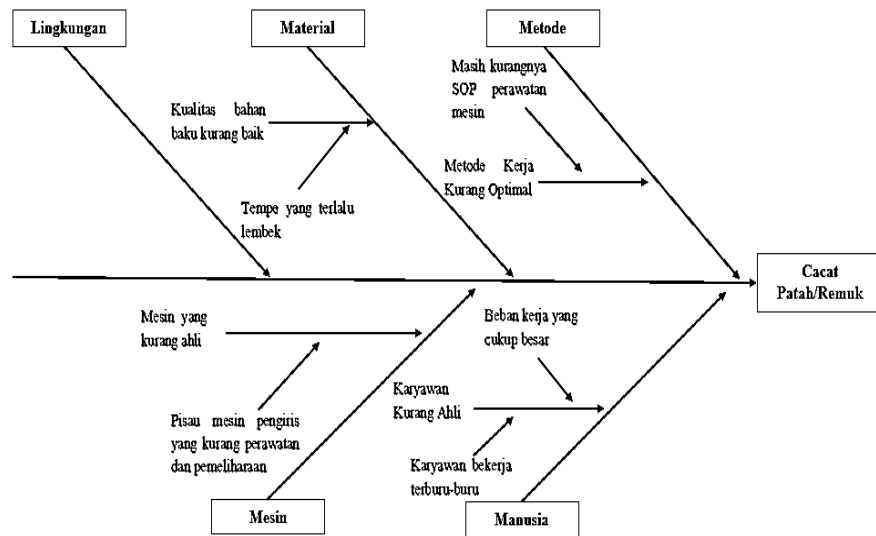
**Figure 2.** Pareto Diagram of Tempe Chips Product Defects

Based on the above diagram it can be concluded that the results of the analysis using the Pareto diagram are damaged products that dominate, namely deformity, which then breaks, burns, and damage to the packaging. In this case, it becomes a follow-up in the assessment of the analysis using FMEA (*Failure Mode and Effect Analysis*). Based on the results of research on the company with data collection methods such as interviews and observation it can be seen as a result of the disability factor is as follows:



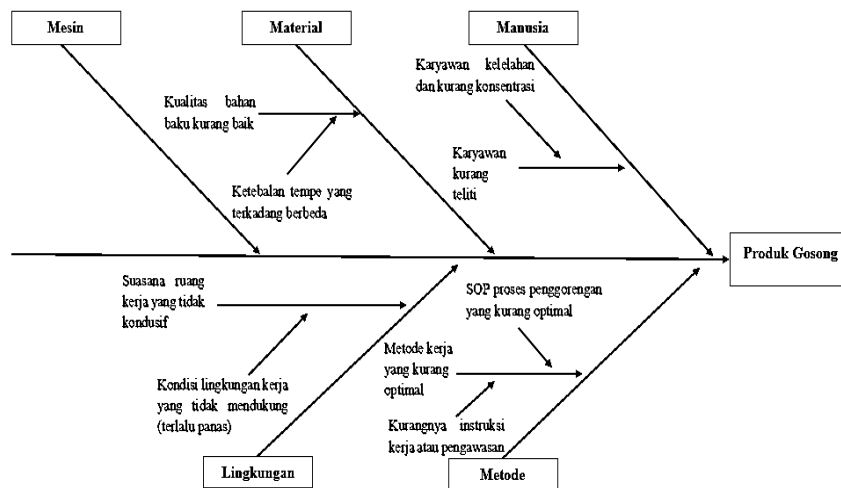
**Figure 3.** Cause and Effect Diagram Defects Form

Disability products being the result of a damaged shape like the picture above is one of the defects whose causes are dominated by machine and material factors. Tempe shape defects that occur such as different thickness levels, and also in the form of folded tempe.



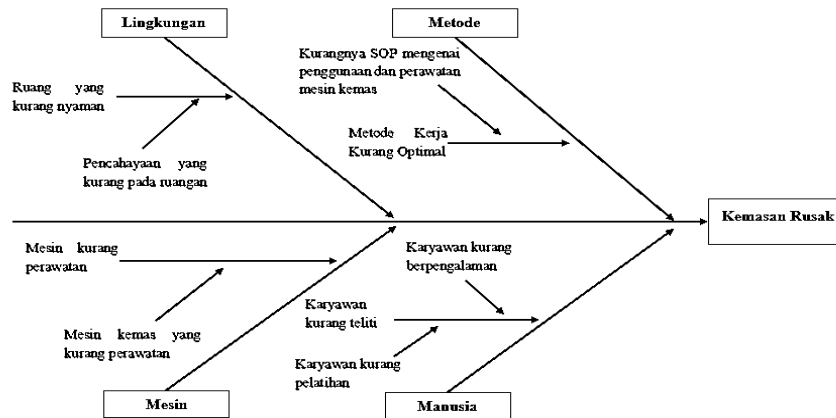
**Figure 4.** Cause and Effect Diagram of Broken / Crushed Defects

The defect factor that causes broken tempeh chips (not perfectly round/square) as in the picture above is a problem that is largely due to the quality of raw materials and maintenance of the slicing machine which is not good because the quality of the raw materials which sometimes fluctuates results in defects in the product so that the processed raw materials are softer and break easily. Another thing that triggers the defect of this product is also due to the lack of maintenance of the slicing machine, such as the less maintenance slicer blades that become dull.



**Figure 5.** Cause and Effect Diagram of Charred Products Defects

The factor that dominates the effect of burnt tempeh chip defects is the influence of environmental conditions. A less conducive workspace atmosphere is caused by a work environment that is not supportive or too hot, this causes an uncomfortable environment for employees so that it makes employees tired, thereby reducing the level of concentration when frying tempeh chips.



**Figure 6.** Cause and Effect Diagram for Packaging Defects

Defects that cause damage to packaging so that the packaging is not tightly closed and the packaging is perforated due to workers being less careful in the packaging process. FMEA (Failure Mode and Effect Analysis) The following results of the FMEA analysis in the Eternal Tempe Chips Company can be seen in Table 3 below.

**Table 3.** Results of Analysis FMEA

Line	Potential Effect of Failure	Severity	For Process Recent	Occurrence	Recommendations Improvement	Detection	RPN
1	Break	7	Quality of raw poor materials and employees were less expert in the use and maintenance of the machine.	7	Improving the standard of the quality selection of raw materials supervision during the production process, as well as providing training on usage standards machine		7343
2	Burn	7	Rooms were less ventilation in place so hot and stuffy frying resulted in employees easy fatigue and lack of concentration	6	Restructuring back of the room, and increase ventilation so the room is comfortable to use.	7	294
3	Shape	7	Lack of maintenance and maintenance of machines production	8	Perform maintenance and maintenance routine with existing standards on machines	8	448
4	Broken packaging	5	The light entering the room is lacking so that it makes employees less careful in packaging and seems rush, maintenance of use machine inadequate	4	Restructuring back room and add lighting, and supervise directly to employees regarding the use and maintenance of the machine.	5	100

The table above shows the results of FMEA analysis which have been adjusted with separate criteria for each benchmark for *Severity*, *Occurrence*, and *Detection* which have been adjusted to the ranking table, the results of the RPN calculation above will be used as an alternative decision making in determining repairs to be made. The repair priorities recommended for the Abadi Tempe Chips company can be seen in Table 4 below.

**Table 4.** Priority Results Recommendations

RPN Ranking	Potential Effect of Failure	RPN	Action Taken
1	Defects Form	448	Improve quality standards for raw material selection, carry out routine maintenance and maintenance with existing standards on machines, and provide supervision during the production process.
2	Broken Defects	343	Collaborate with other suppliers, carry out routine maintenance and maintenance with existing standards on machines
3	Burnt Defects	294	Provide supervision during the production process, provide clear work instructions and carry out rearrangement of the room by increasing room ventilation so the room is comfortable to use.
4	Packaging defects	100	Carry out rearrangement of the room and add lighting, as well as direct supervision of employees regarding the use and maintenance of machines.

The table above shows the results of the recommendations for priority improvements to product defects based on RPN calculations. Please provide the results systematically, concisely, and clearly. Next, compare your findings with various literature, both of which tend to support or contradict. If there is a contradiction, convey the possible cause based on your analysis accompanied by supporting theories or other relevant research results.

## CONCLUSION

Based on the results of research and data processing using the check sheet method, Pareto diagram, control chart, and cause and effect diagram, it can be concluded that there are several types of product defects experienced by the Tempe Abadi Chips company, the type of defect is defects. 31.44% form, 29.46% broken / crushed dough, 23.22% burnt products, and 15.88% damage to packaging. From the observation on the cause and effect diagram, it is known that the causes of product defects experienced are mostly due to poor quality of raw materials, less-skilled employees, less than optimal work methods, and less supportive working conditions. As a form of settlement using FMEA, it can be seen that the priority for improvement based on the RPN as an alternative for decision making in determining the improvements that will be carried out first. The priority order decision recommended that disability forms of products with a value of RPN 448, product defects broke/crushed with a value of RPN 343, the disability Hirst products with a value of RPN 294, and disability packaging products



to the value of the RPN 100. Based on the above conclusions, the researchers gave suggestions for the company, that is, the company should make quality improvements based on the priority order that has been analyzed by FMEA to make it easier to reduce or reduce product defects experienced by the company with the suggestions or solutions we previously recommended. And for the next researcher who will research in the same field, namely quality control, the researcher hopes that the next researcher can carry out further and in-depth research related to improvement efforts to the control process after repairing the recommended solutions based on the priority order of improvements with the FMEA table.

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