

Quality control analysis of crab meat products in Mitra Bersama Miniplant Bandar Surabaya, Central Lampung

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ABSTRACT

In this increasingly sophisticated era of globalization, Small, Micro and Medium Enterprises (MSMEs) can be found in various places, from big cities to remote villages. This is what encourages business people to improve the quality of the products they produce in order to compete in the midst of intense competition in the business world. Mitra Bersama Miniplant is an MSME engaged in the processing of marine products, especially crabs with crab meat output. Mitra Bersama Miniplant continues to maintain and improve product quality by conducting supervision, but there is still a high level of damage that requires strict quality control to obtain high quality products. In controlling product quality, it can be done by using the Statistical Process Control analysis tool. The purpose of this study was to analyze whether the level of damage to crab meat products is still within tolerance limits or not and to determine the factors that influence the occurrence of defective products. This research was conducted for 30 days of production starting on 15 December 2022 to 15 January 2023 which obtained the result that the level of product defects was still within tolerance limits. The dominant factors that cause defects in crab meat can be seen from the cause and effect diagram, namely humans (labor), raw materials, work methods and machines. The most dominant product defect is soft crab meat (crushed) with a total of 68,03 kg of defective product. Therefore, it is expected that quality control at Mitra Bersama Miniplants will be improved again by carrying out stricter supervision of the production process, especially on labor factors, production process methods, raw materials, machinery and the environment so that the level of product defects decreases and the product remains good.

KEYWORDS

Quality Control; Statistical Process Control; Crab Meat

Received: 2 March 2023
Accepted: 10 April 2023
Published: 12 April 2023

Introduction

Small, Micro and Medium Enterprises (MSMEs) in the increasingly sophisticated era of globalization as it is today can be found in various areas ranging from big cities to remote villages; therefore, competition between business people is getting stronger and cannot be avoided, especially those engaged in food. Consistency of product quality produced by the demands of consumers needs to be done through quality control. Initially, quality control was carried out based on inspection, namely acceptance of products that met the requirements and rejections that did not meet the requirements, problems that existed in quality so that mistakes that had occurred were not repeated. In an industry, of course, it cannot be separated from the production process, which begins with raw materials and then processed according to procedures and can become a final product. According to Heizer & Render (2015), operations management is an activity related to creating goods and services through a process of transformation from input to output. Product quality, according to Prawirosentono (2020), is a product's physical condition, function, and characteristics that can satisfactorily meet the tastes and needs of consumers according to the value of money spent. According to Kiki et al. (2019), quality control is a control tool in producing a product or service to conform to predetermined quality standards so that the resulting product can meet customer needs and satisfaction, increase profits, and reduce production costs. According to Lysander (2013), a quality product is very important for creating customer satisfaction related to the benefits that the company will obtain; the higher the quality of the product provided, the higher the satisfaction felt by the customer.

Rajungan (*Portunus pelagicus*) is a marine animal widely found in Indonesian waters. The crab is still included in one type of crab, but it does not live in two realms because it is very dependent on the water, so it cannot survive without seawater for a certain period. This is the basis for the crab being nicknamed a swimmer crabs. According to Supriadi et al. (2019), crab is one of the marine products which is generally perishable (perishable food). Blue swimming crab is one of the fishery commodity groups with high economic value; the export volume of Indonesian crab in the first semester of 2022 was USD 295.19 million or 9.65 per cent of Indonesia's total fishery export volume (Suhana, 2022). Bandar Surabaya sub-district is a sub-district in Central Lampung district; there are ten villages or villages in the sub-district. Of the ten villages, only a few villages have mini plants. The whole mini plants in the Bandar Surabaya subdistrict are five mini plants, of which one is certified A and four are certified B.

Mini plants in the Bandar Surabaya District compete fiercely for quality meat and better certification. Thus the Mitra Bersama mini plant is required to manage the business by paying attention to every existing process to get a quality product. Full attention will have a positive impact on the business, namely the impact on production costs and the impact on revenue, as well as the impact that can improve the Mitra Bersama Miniplant certification to be better so that it can be equivalent to the Comara Miniplant, which is certified A. The impact on production costs occurs during the production process, which the output produced can be by the specified standards to reduce the level of damage that may occur, taking into account that the production process will produce quality products and avoid waste so that production costs incurred will be low and product prices will be higher.

The clean crab meat (separated from the shell) is packaged and ready to be sold or sent to the factory. Mitra Bersama Miniplant sends crab meat to factories offering the highest price; these include PT Tonga Tiur Putra (TTP) Cirebon, Siger Jaya Abadi (SJA) Lampung, Kelola Mina Laut (KML) Gresik and Phillips Seafood Indonesia Lampung. The owner of the Mitra Bersama mini plant always tries to produce crab meat products according to the quality standards set by the company. Jumiati and Zainudin (2019) suggest that the characteristics of a good crab meat product can be observed from the appearance of meat that looks bright and clean, fresh aroma, and dense texture. The owner and the workforce have tried to carry out their duties as well and as optimally as possible, but the production of crab meat is still experiencing failures and damage to the product, so the Mitra Bersama mini plant must implement quality control to overcome product damage problems. Quality control is measured using statistical quality control methods because indirect quality control is useful for monitoring the efficiency level and is used to prevent damage by rejecting and accepting various products produced by the company.

The crab meat that is damaged is the company's responsibility because, on average, the crab meat is damaged during production. Three types of defects can be observed in crab meat (Jumiati & Zainudin, 2019), namely the appearance of the meat is not fresh and dirty, unfresh aroma, and soft meat texture (crushed). Damages to the crab meat are called rejected products. Data on the number of produced and rejected products in September 2022 during the productive period can be seen in Table below:

Table 1. Produced and rejected products in September 2022

Month	Year	Total Production of Crab (Kg)	Number of Meat Products (Kg)	Reject type			Damaged Amount (Kg)	Damaged Percentage (%)
				Not fresh/Dirty (Kg)	Soft or Crushed (Kg)	Unfresh Aroma (Kg)		
Sept	2021	11,363	3,996.35	20.8	50.34	10.77	81.11	2
Oct		10,560	3,520.25	25	53.5	10.5	89	3
Nov		9,874	3,526.42	10	37	8	55	1.6
Dec		10,342	3,447.33	20.5	43	11.3	74.8	2
Jan	2022	7,351.5	2,450.5	10	40	8.5	74.33	2
Feb		10,977.5	3,686.72	23	63.2	10.5	96.7	3
Mar		10,550	3,520.6	20.15	40	15.35	75.5	2
Apr		9,202	3,142	11	35	7	53	1.6
Jun		8,760	3,054.22	17	48.8	12.6	78.4	3
Jul		5,650	2,092.59	12	34	10	56	2.6
Aug		9,553	3,184.3	13	25	15	53	1.6
Sept		11,988	4,076.73	27.3	66.23	11.49	112.35	3
Total		116,171	39,698	209.75	536.07	131.01	899.19	27.4
Average		9,680.91	3,308.16	17.47	44.67	10.91	74.93	2.28

The table above shows that the amount of production carried out by Mitra Bersama mini plant daily is not the same; production yields and defects fluctuate daily. This is because fishermen catch the raw materials used from the sea, which will differ daily. The owner of the Mitra Bersama mini plant said that the product was of high quality if production results conformed with the quality standard targets set by the mini plant with a damage tolerance limit of 1-1.5% of the crab production or crab meat products obtained. Table above shows that the average defective product in September 2021 - September 2022 is 2.28%; of this percentage, most defects are in soft or broken meat. The level of defects or damage is outside the tolerance limits set by the mini plant, so quality or quality control measures are needed. Quality or quality control measures have two objectives: to obtain product quality that is by company standards and by customer wishes, to provide customer satisfaction and ensure the company's survival. Mitra Bersama Miniplant always tries to maintain the quality of its crab meat products by carrying out the best possible production process to reach consumers. Production activities still encounter errors such as soft or crushed meat, odours that are not fresh and appearance dirty; this is what causes products to be damaged and not by established quality standards, so the mini plant must control the level of damage so that the products produced are of high quality. If the product is of high quality, the selling price is high, and vice versa. If the product is damaged, the selling price is low, which will cause losses for the company.

Literature review

Operations management

According to Heizer and Render (2015), operations management is an activity related to creating goods and services through a process of transformation from input (input) to output (result). The definition of operations management according to Assauri (2008), production and operations management is an activity to regulate and coordinate the use of resources in the form of human resources, tool resources and financial and material resources effectively and efficiently to create and add utility to a good or service. In conclusion, Operations management is a process carried out to create goods or services, wherein a process certainly has the goal of obtaining goods or services by paying attention to the efficiency of the resources used in it in order to obtain maximum profit.

Quality control

Based on a book entitled Operations Management, Heizer and Render (2015) defines quality as used by the American Society for Quality (ASQ: www.asq.org), the overall features and characteristics of a product or service that rely on its ability to satisfy promised and implied requirements. Product quality, according to Prawirosentono (2020), the quality of a product is the physical condition, function and characteristics of a product concerned that can satisfactorily meet the tastes and needs of consumers by the value of money spent by consumers. According to Sihombing (2017), quality is important in products and services because if a company has high quality, customer loyalty will increase. According to Gaspersz (2005), control is an activity carried out to monitor activities and ensure that the actual performance carried out is in accordance with what was planned. According to Kiki (2019), quality control is a control tool in making a product or service produced to comply with predetermined quality standards so that the resulting product can meet customer needs and satisfaction, increase company profits and reduce production costs. According to Norawati and Zulher (2019), quality control in service and industrial companies is necessary. With the quality of services or goods produced, of course, the company hopes to attract consumers and meet the needs and desires of consumers. Quality control that is implemented properly will impact the quality of the products produced by the company. For this reason, control is needed to ensure that the products produced are by applicable quality standards. The quality standards are raw materials, production processes, and finished products.

Factors influencing quality control

Quality control is influenced by factors determining whether an item can fulfil its purpose. Here are several factors that affect the quality (Assauri, 2008):

- a. Function of an Item
The level of quality depends on the level of fulfilment of the satisfaction function of the use of goods that can be achieved
- b. Outer Form
One of the factors that consumers often use when viewing an item for the first time to determine the quality of the item is the external appearance of the item.
- c. Cost of the Goods
Generally, the cost and price of an item will be able to find quality of the item. Goods with an expensive cost can show that the quality of these goods is relatively better and vice versa. This happens because, usually, getting good quality requires a high cost. The costs of these items need to be realized that actual costs are not always often inefficient.

Statistical processing control

Statistical Processing Control (SPC) is a statistical technique that is widely used to ensure that processes meet standards. In addition, Statistical Processing Control is a process that is used to monitor standards, make measurements and take corrective actions when goods or services are produced (Heizer & Render, 2015). Definition of Statistical Processing Control (SPC) according to Norawati and Zulher (2019), SPC is a process used to monitor standards, make measurements and take corrective actions while a product or service is being produced. Quality control with the SPC method is useful for monitoring efficiency levels. So, it can be used as a tool for detection that tolerates damage and prevention that avoids/prevents damaged products from occurring (Norawati et al., 2019).

Quality control tools

Seven quality control tools are used to identify and analyze quality problems that are being faced so that these problems can be controlled, which are mentioned by Heizer and Render (2015) in their book entitled Operations Management, including check sheets, Bar Charts (Histogram), Control Chart, Cause and Effect Diagram, Scatter Diagram, Pareto Diagram, and Flow Chart.

Methods

Research object

The object of this research is the Mitra Bersama Miniplant located in Surabaya Ilir, Bandar Surabaya District, Central Lampung Regency. The variable of this research is the quality control method applied by Mitra Bersama Miniplant. This is in line with the problems faced by Mitra Bersama Miniplant, namely not fully paying attention to the production process resulting in several rejected products and not complying with quality standards that exceed the tolerance limits set by Mitra Bersama Miniplant.

Research methods

According to Sugiyono (2013) the research method is a scientific way to obtain data with specific purposes and uses. Determining research methods is very important in conducting research. Because with the method, research will be easier to do and to obtain reliable data, thus research can achieve certain goals and uses. This study uses a type of survey research using data analysis methods. According to Sugiyono (2013), the survey method is a quantitative study using structured or systematic questions to company owners and employees. Data and information in this study were obtained directly from Mitra Bersama Miniplant. After the data is obtained, then the results will be presented. Ultimately, the research will be analyzed to determine whether the crab meat product is still within tolerance limits and to know the current system of quality control methods and the right quality control methods to minimise product defects in crab meat.

Data sources

The data sources used in this research are two groups of data, there are primary data and secondary data. Primary data is data taken directly from Mitra Bersama Miniplant; in this case, the author directly observes company owners and workers in the field to collect data regarding the quality control of crab meat products carried out by Mitra Bersama Miniplant through surveys and interviews; while secondary data is data taken from existing sources such as journals or articles. According to Sugiyono (2013), data collection techniques are the most strategic steps in research because the main goal is to obtain data. The data collection techniques used in this study are Library Studies, Interviews, and Documentation.

Observation time

According to Sugiyono (2013), the population is a generalized area consisting of objects/subjects with certain qualities and characteristics determined by researchers to be studied and then conclusions drawn. The population in this study is the result of all crab meat production in Mitra Bersama Miniplant. Every day Mitra Bersama Miniplant carries out the production process and produces products. This research will be carried out for 1 month (30 days) after the proposal seminar, which starts on December 15 2022, to January 15 2023. Direct observations were made in this study every morning and afternoon.

Data analysis

This study uses statistical Process Control (SPC) tools to analyze the data. The steps consist of making a check sheet, a histogram, and a control chart, calculating the lower control limit (LCL), making a cause and effect diagram, and making suggestions for improvement. The methods explain clearly how the author carried out the research. The method must describe the research design clearly, the replicable research procedures, describe how to summarize, and analyze the data.

Results

Description of the Research Object

Mitra Bersama Miniplant is an MSME engaged in processing marine catches, especially crab stripping. Mitra Bersama Miniplant was established in 2014. Until now, Mitra Bersama Miniplant continues to operate by having field workers buy raw crabs, namely 3 fishermen supervisors and in the mini plant section (stripping crabs), there is 1 mini plant manager, 1 supervisor, 2 operators and 50 peeling employees.

Organizational structure of the company

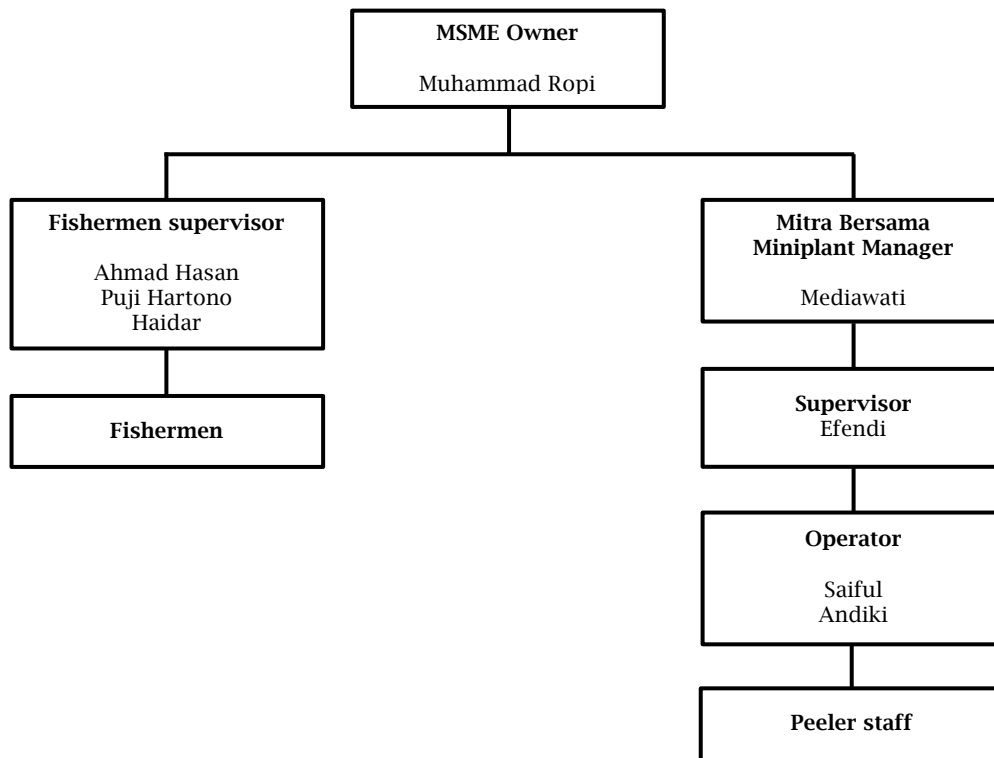


Figure 1. Organizational structure of the company

Company production activities

Production activities carried out by Mitra Bersama Miniplant to obtain output (crab meat) are as follows:

1. Buying raw materials or raw crabs is obtained directly from fishermen. To get these raw materials, field employees have to travel for 2 hours by driving a speedboat.
2. The next raw material or crab that has been purchased is the steaming process. This steaming process is carried out on the beach using a special large boiler for steaming crabs. Steaming crab is done for 30 minutes.
3. The crab sorting process, in this process, the crabs are sorted and separated based on the size and freshness of the crab (allows it to be peeled or not)
4. Mitra Bersama Miniplant employees strip or separate the meat and shells. After the stripping process, the product is obtained as crab meat.
5. The process of sorting the crab meat, in this process, the crab meat that has defects (soft, looks dirty and smells bad) will be separated because if it is not separated, it will affect other meat, or the good meat will be contaminated.
6. The packing process, after carrying out a series of processes and getting the output as crab meat. Then the crab meat is packed and ready to be sent to the factory.

Quality control at Mitra Bersama Miniplants

Raw Material Control

Selecting raw materials is one way to minimize the damage or defects in the product. Mitra Bersama Miniplant chooses to buy fresh crab directly from fishermen without intermediaries so that the products produced are of high quality and have a high selling value because the quality of the raw materials has a big influence on the output. Thus, field employees who work to buy raw materials must be observant in sorting raw materials.

Production Process Control

The production process is the most important stage in a company; at this stage a series of activities are carried out to produce a product. Supervision during the production process is very important because when the production process takes place without supervision, the chances of a damaged or defective product are even greater. Mitra Bersama Miniplant supervises every process, starting from monitoring the steaming of raw materials to the stripping process.

Calculation and data analysis

Checksheets

Table below shows the number of production processes and types of defective products at the Mitra Bersama Miniplant; production is carried out every day except for major holidays such as Christmas, New Year's Day, Eid al-Fitr and others. The raw materials produced daily are not the same or change, so the amount of product (output) produced differs. The highest number of defects occurred in the type of defects in soft or broken crab meat, and the highest defects occurred on the fifth day of observation, which was 6.30 kg or 3.60% of the total meat produced on the fifth day. Therefore, quality control of crab meat products is very important to do in order to reduce the level of defects in crab meat products.

Table 2. Check Sheet Report on the Amount of Production and Damaged Products of Mitra Bersama Miniplant in December 2022 - January 2023

Num.	Number of crab production/day (Kg)	Number of Meat Products/day (Kg)	Reject type			Damaged Amount (Kg)	Damaged Percentage (%)
			Not fresh/dirty (Kg)	Soft or Crushed (Kg)	Unfresh Aroma (Kg)		
1	454	154.17	2.15	2.55	0.45	4.15	2.69
2	425	141.62	1.55	2.25	0.35	3.15	2.22
3	400	138.29	1.35	2.15	0.45	3.95	2.86
4	548.5	193.26	1.73	2.00	0.55	4.28	2.21
5	500	175.02	2.20	3.25	0.85	6.30	3.60
6	480	151.21	1.25	2.33	0.55	4.13	2.73
7	509	162.71	1.85	2.22	0.33	4.40	2.70
8	475	152.92	1.15	1.85	0.25	3.25	2.13
9	505	177.48	1.75	1.25	0.45	3.45	1.94
10	480	159.2	1.68	2.25	0.65	4.58	2.88
11	663	244.5	1.23	2.82	0.23	4.28	1.75
12	424	146.49	1.45	2.75	0.43	4.63	3.16
13	462	162.82	1.34	2.15	0.33	3.82	2.35
14	556	191.35	1.24	2.55	0.25	4.04	2.11
15	459	165.22	1.35	2.32	0.33	4.00	2.42
16	495	155.12	1.35	2.15	0.74	4.24	2.73
17	532	175.82	1.51	2.32	0.43	4.26	2.42
18	530	183.61	1.64	2.13	0.65	4.42	2.41
19	515	168.99	1.55	2.10	0.75	4.40	2.60
20	458	146.33	1.12	2.23	0.33	3.68	2.51
21	425	141.62	1.11	2.05	0.25	3.41	2.41
22	454	154.17	1.37	2.23	0.81	4.41	2.86
23	447	126.22	1.12	2.15	0.25	3.52	2.79
24	402	138.49	1.13	2.05	0.15	3.33	2.40
25	461	146.96	1.15	2.00	0.23	3.38	2.30
26	548	193.26	1.35	2.25	0.22	3.82	1.98
27	500	175.02	1.43	2.58	0.45	4.46	2.55
28	532	175.12	1.20	2.65	0.18	4.03	2.30
29	580	182.21	1.61	2.33	0.75	4.69	2.57
30	557	192.55	1.34	2.12	0.35	3.81	1.98
Total	14,776.5	4,802.76	42.14	68.03	12.99	12.27	
Avg.	492.55	165.61	1.45	2.26	0.43	4.07	2.48

Histograms (bar charts)

The histogram or bar chart in Figure below shows the types of defects or damage to the crab meat produced by Mitra Bersama Miniplant. It can be seen that the highest or dominant type of defect is soft meat (crushed) with a total of 68.03 kg, then the lowest defect is the type of meat aroma defect which is not fresh as much as 12.99 kg.

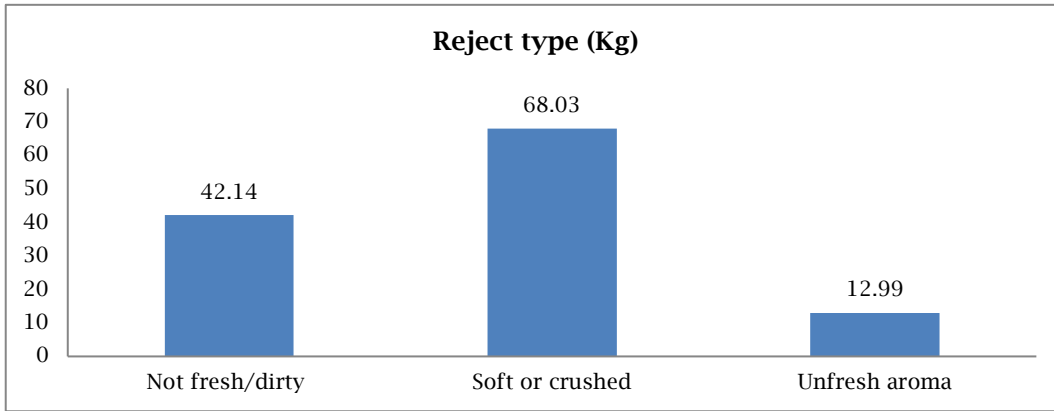


Figure 2. Histogram of Types of Damage of Crab Meat Products in Mitra Bersama Miniplants December 2022 - January 2023

Control chart

Data on the amount of product obtained in this study (checksheet report results) varies every day. Therefore the next step is to make a control chart. The control chart aims to see whether the level of damage or defects in crab meat products is within the control limits. Calculations performed using the formula obtain a result and then obtain the control chart image below. The figure shows that the proportion of defective crab meat products in the Mitra Bersama Miniplant is still below the Upper Center Line (UCL), so the defects in crab meat products are still within tolerance limits. However, there were defective products quite far above the Central Line, which existed on day 5, namely 6.30 kg of defects with a defect proportion of 3.60% and on the 12th day, as many as 4.63 kg with a defect proportion of 3.16%.

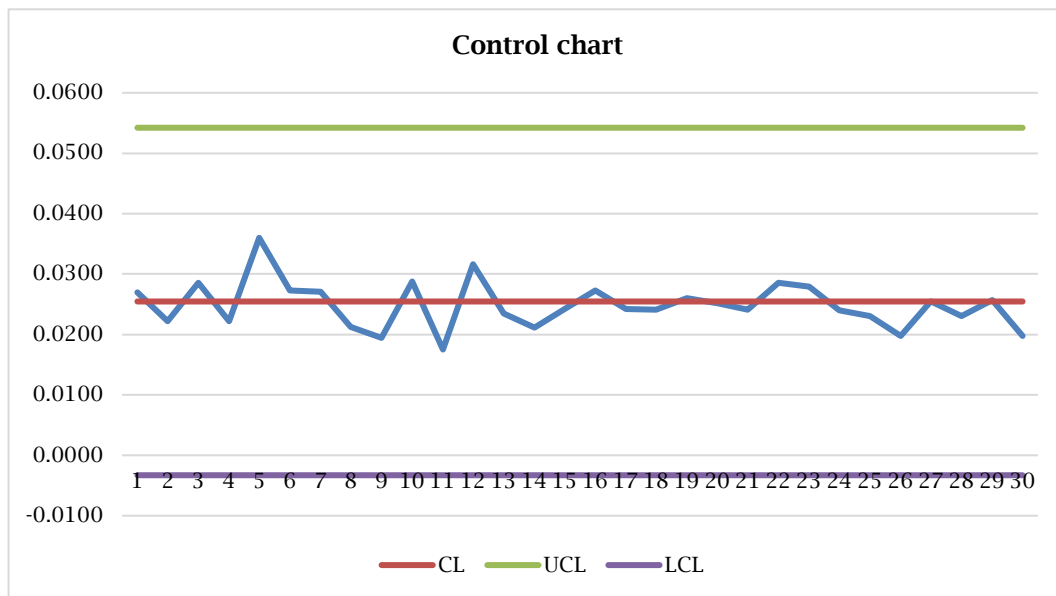


Figure 3. Control chart on Supervision of Crab Meat Products at Mitra Bersama Miniplant in December 2022 - January 2023

Cause and effect diagram

The last step is making a causal diagram, often called a fishbone diagram. This causal diagram can help to see what factors cause defects in the product. These factors can be seen from the raw material (material), machine (machine), labour (man), method (method), and environment (environment). This study will examine three types of defects for the causes of existing defects, including crab meat that looks not fresh or dirty, soft or crushed and smells not fresh.

Cause and effect diagram on the type of not fresh/dirty crab meat

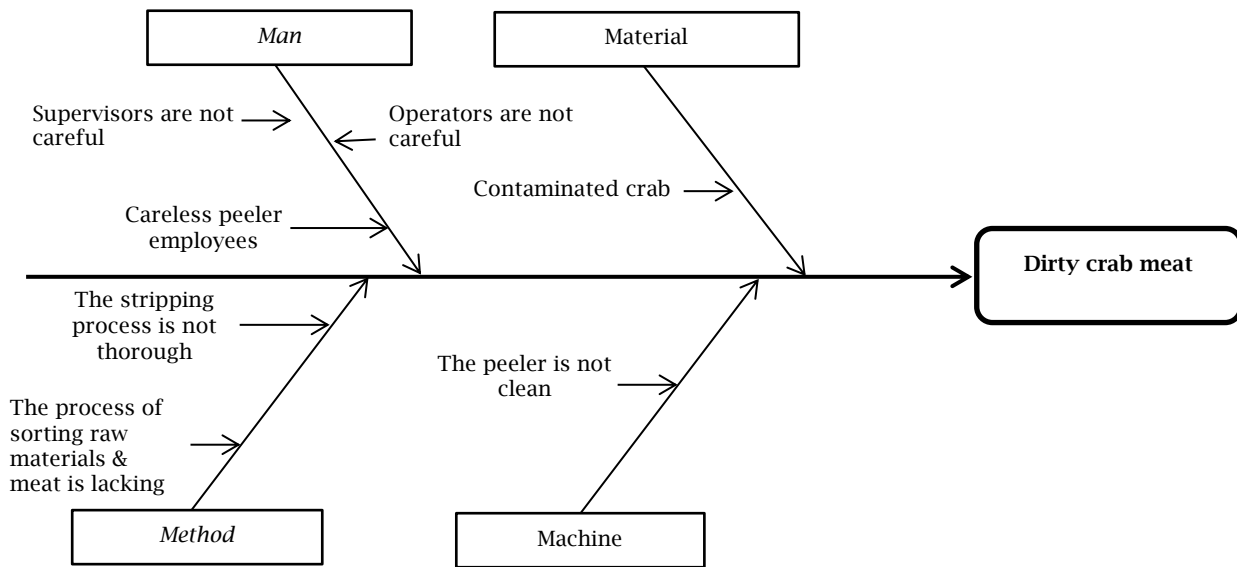


Figure 4. Cause and effect diagram on the type of not fresh/dirty crab meat

Cause and effect diagram on the type of defect in soft or crushed crab meat

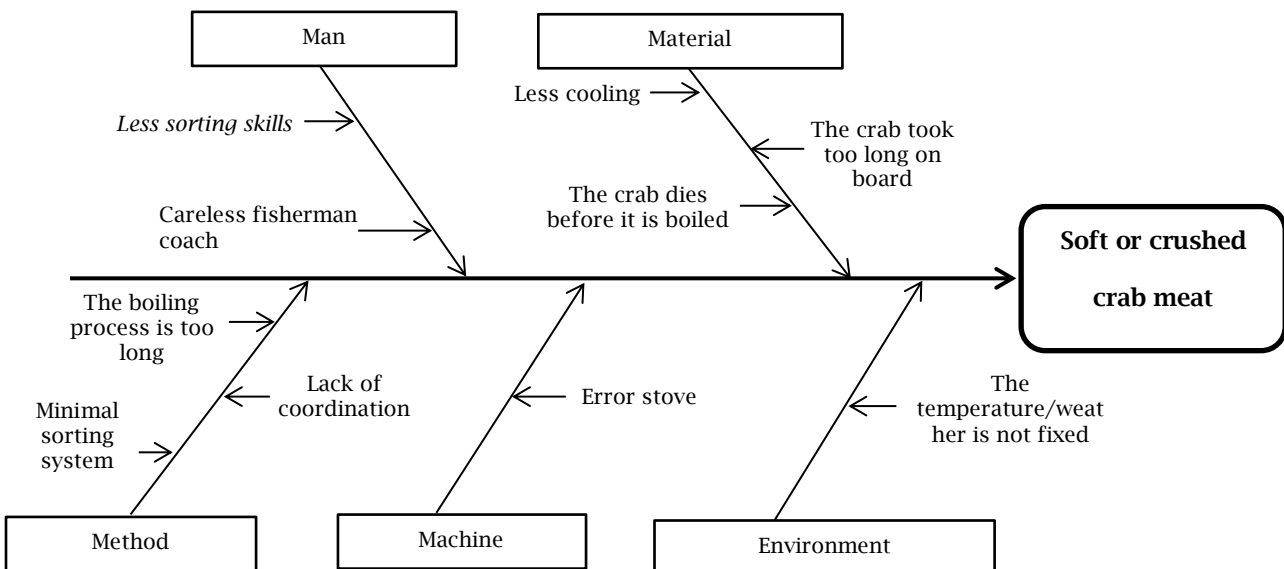


Figure 5. Cause and effect diagram on the type of defect in soft or crushed crab meat

Cause and effect diagram on the type of defect in unfresh aroma crab meat

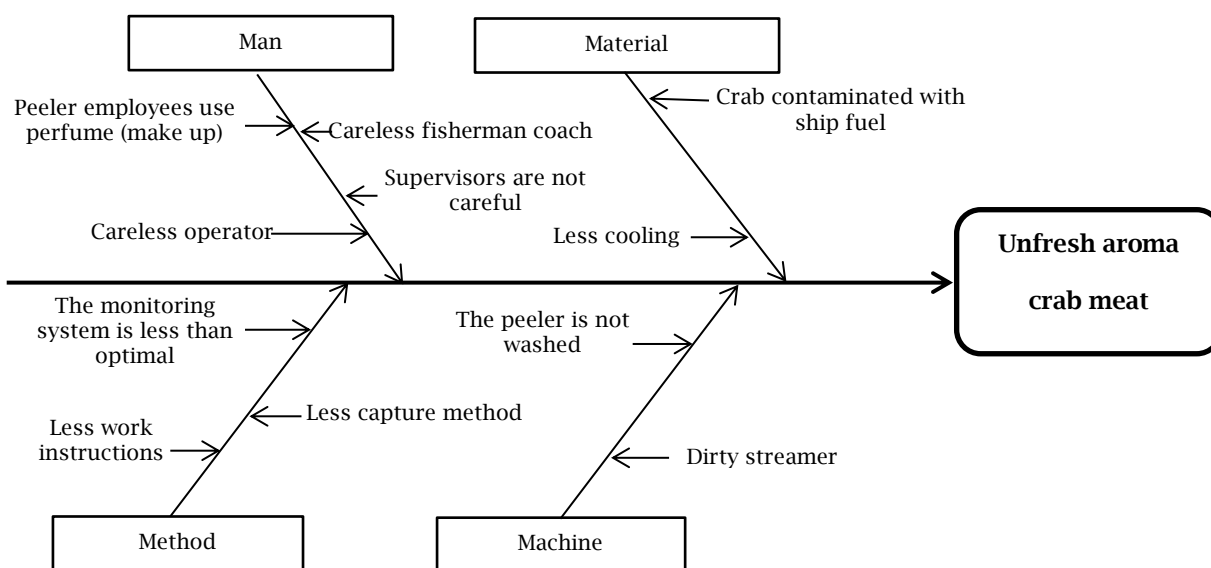


Figure 6. Cause and effect diagram on the type of defect in unfresh aroma crab meat

Discussion

Proposed Corrective Actions for Not Fresh/Dirty Crab Meat

Table 3. Proposed Corrective Actions for Not Fresh/Dirty Crab Meat

Factor	Reasons	Proposed Action
Man	<ul style="list-style-type: none"> Supervisors are not thorough The operator is less thorough Careless peeling employees 	<ul style="list-style-type: none"> Mitra Bersama Miniplant Managers must advise and guide supervisors to be more thorough in supervising each stripping process. The supervisor advises the operator to carefully sort the raw materials before the crab reaches the peeler. The supervisor gives instructions to the peeling employees before doing the peeling and supervises carefully during the production process so that the peeling employees not doing things that are not desirable (negligence in separating the shell and crab meat).
Material	<ul style="list-style-type: none"> Contaminated crab 	<ul style="list-style-type: none"> Miniplant managers and supervisors must often supervise operators when sorting raw materials.
Method	<ul style="list-style-type: none"> The process of sorting raw materials & meat is lacking The stripping process is not thorough 	<ul style="list-style-type: none"> Miniplant managers guide supervisors to sort meat carefully, and supervisors warn operators to be more thorough in sorting raw materials. Minipant managers must provide training and direction to peeler employees regarding proper and correct stripping of crabs, and supervisors must supervise employees optimally.
Machine	<ul style="list-style-type: none"> The peeler is not clean 	<ul style="list-style-type: none"> Before carrying out the stripping process, the inspector must check the tools (knife and tray) used for peeling whether they are clean or not.

*Proposed Corrective Actions for Soft or Crushed Crab Meat Product***Table 4.** Proposed Corrective Actions for Soft or Crushed Crab Meat Products

Factor	Reasons	Proposed Action
Man	<ul style="list-style-type: none"> Careless fishermen coach Less sorting skills 	<ul style="list-style-type: none"> Miniplant owners must monitor the working system of the fisherman supervisor as often as possible when buying and boiling crabs so that eggs are minimized during the boiling process. Miniplant owners provide knowledge or directions regarding the sorting system when buying small crabs.
Material	<ul style="list-style-type: none"> The crab took too long on board The crab dies before it is boiled Less cooling 	<ul style="list-style-type: none"> The fisherman supervisor gives a warning to fishermen to immediately bring the crabs to the beach when they have got the crabs so that the crabs do not take too long on the ship. Fishermen coaches must also provide training or learning for fishermen to overcome so that the crabs can survive for quite a long time (do not die before boiling). Miniplant owners advise fishermen so they do not run out of ice stock for cooling ripe crabs so they do not go bad during the transportation process.
Method	<ul style="list-style-type: none"> Lack of coordination The boiling process is too long Minimal sorting system 	<ul style="list-style-type: none"> Miniplant owners coordinate with fisherman coaches regarding the correct steps in buying materials. Fisher coaches occasionally need to be supervised and reminded at least three times a month again by mini plant owners so that they are not negligent in the boiling process. Miniplant owners must provide a review once a week to the fisherman supervisor regarding the raw material sorting system.
Machine	<ul style="list-style-type: none"> Stove error (cannot be set) 	<ul style="list-style-type: none"> Before boiling, the fisherman supervisor should check the tools that will be used, one of which is the stove, and if there is damage, report it to the owner of the Mini plant to immediately service it or buy a new tool.
Environment	<ul style="list-style-type: none"> The temperature/weather is not fixed 	<ul style="list-style-type: none"> Proposed corrective actions on environmental factors for mini plant owners must provide lessons to fishermen and fisherman supervisors so that they can quickly overcome this. For example, when fishermen transport ripe crabs to the stripping site and the weather is rainy, then transport using baskets, the supervisor must be swift to cover the crabs. Proposals for corrective actions on environmental factors for mini plant owners must provide lessons to fishermen and fisherman supervisors so that they can quickly overcome this. For example, when fishermen transport ripe crabs to the stripping site and when it is raining, they are transported using baskets, the supervisor must be quick to cover the crab with plastic or tarpaulin provided by the mini plant owner.

*Proposed Corrective Actions for unfresh aroma Crab Meat Product***Table 5.** Proposed Corrective Actions for unfresh aroma Crab Meat Product

Factor	Reasons	Proposed Action
Man	<ul style="list-style-type: none"> Careless fishermen coach The supervisor is less thorough Careless operators Employee peeler Using fragrance (make-up) 	<ul style="list-style-type: none"> Miniplant owners give advice and guidance to fisherman coaches to be more careful and not negligent during the process of buying and boiling crabs. Miniplant managers must diligently remind supervisors that before the stripping process is carried out, it is better if the peeling employees are checked one by one using fragrance (make-up) or not.

Material	<ul style="list-style-type: none"> Crab contaminated with ship fuel Less cooling 	<ul style="list-style-type: none"> Supervisors must also supervise and remind operators not to be negligent in sorting. If a peeling employee is found using fragrances (make-up), the supervisor must give a warning or sanction so that this is not done and not imitated by other peeling employees. Fishermen coaches must be more careful and careless when purchasing raw materials. Miniplant owners must provide adequate ice stock.
Method	<ul style="list-style-type: none"> Less capture method The supervision system is less than optimal Less work instructions 	<ul style="list-style-type: none"> Fishermen coaches must be more careful and careless when purchasing raw materials. Miniplant owners must provide adequate ice stock. Fishermen coaches must provide training and learning to fishermen regarding good and correct fishing. Miniplant managers must often see and check the work system carried out by supervisors when supervising the crab-stripping process.
Machine	<ul style="list-style-type: none"> Dirty boiling boiler The peeler is not washed 	<ul style="list-style-type: none"> Miniplant owners urge fishermen coaches to check the equipment before boiling. The supervisor reminds the peeler employees to wash the tools used to peel or separate the crab meat from the shell.

The stages of the crab production process start from the purchase of raw materials to the final process, namely packing, which is carried out for sending the crab meat to the factory. Raw materials or raw crabs, crabs are obtained directly from fishermen. To get these raw materials, field employees must travel for 2 hours by driving a speedboat and stripping or separating meat and shells by Mitra Bersama Miniplant peeler employees. After the stripping process, the product is obtained, namely in the form of crab meat, and then sorting the crab meat; in this process, the crab meat that has defects will be separated because if it is not separated, it will affect other meat, or good meat will be contaminated. Mitra Bersama Miniplant has carried out quality control. Two quality controls are carried out: control of raw materials and the production process. However, these two controls were not optimal because, if seen from the results of direct observation for 30 days, there were still defects or damage to crab meat products. Damage or product defects still occur and fluctuate every day. The highest record for crab meat products was in the type of defect in soft or broken crab meat, the second highest defect was in the type of defect in crab meat that was not fresh or dirty, and the lowest defect was the type of damage to crab meat that had an unpleasant aroma.

Damage or defects in crab meat products are still within tolerance limits. The control chart image shows that the proportion of defective crab meat products is below the UCL line or does not exceed the tolerance limit. The three types of damage or defects in crab meat products have different causative factors for each type of defect. For the type of not fresh crab meat defects, there are four contributing factors, namely the workforce (man) who oversees the stripping process is not thorough, operators who are not careful in the process of sorting raw materials and peeling employees who are careless, raw materials (materials) that are contaminated, lack of methods (methods) of sorting raw materials and crab meat as well as peeling process is not thorough.

Five factors cause defects in soft or broken crab meat: the workforce (man) who lacks sorting skills and fishermen coaches who are careless in boiling raw or small crab materials, raw materials (material) that take too long on the ship so that the crabs die. Before boiling and insufficient cooling, minimal sorting system method, lack of coordination and the boiling process taking too long, machine damage to the boiling equipment (stove), and unstable temperature/weather environment. There are four causative factors for the type of defects in crab meat that have an unpleasant aroma: the negligent fisherman supervisor, inaccurate supervisors, negligent operators and peeling employees who do not comply with existing regulations such as the prohibition on using fragrances (make-up), raw materials).

Conclusion

The number of crabs produced from December 2022 to January 2023 at the Mitra Bersama Mini plant was 14,776.50 kg, and the amount of crab meat produced was 4,802.76 kg, with 122.27 kg of defective products. In line with the results and discussion in this thesis, it can be concluded that the results of data processing using control chart tools or control charts using + 1 in the UCL and LCL formulas can be concluded that the damage found in crab meat products is still within tolerance limits. Three types of damage to crab meat products are the appearance of not fresh or dirty meat, the texture of soft or crushed crab meat and the unpleasant aroma of crab meat (no crab aroma). The results of the analysis of the causal diagram can be identified factors that cause product defects, namely originating from human factors (labour), raw materials, production methods, production machines (equipment) and the environment. The results of research conducted at Mitra Bersama, researchers suggest that it is better if the company continues to expand the awareness of its employees regarding the importance of product quality through organizing training for the production department (fisherman coaches, supervisors of the stripping process, operators

and peeler employees), giving an appeal to employees to carry out the process production by company regulations and business owners improve supervision in order to minimize the level of damage or defects in the product.

Acknowledgements

We would like to thank all the parties involved in this research.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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