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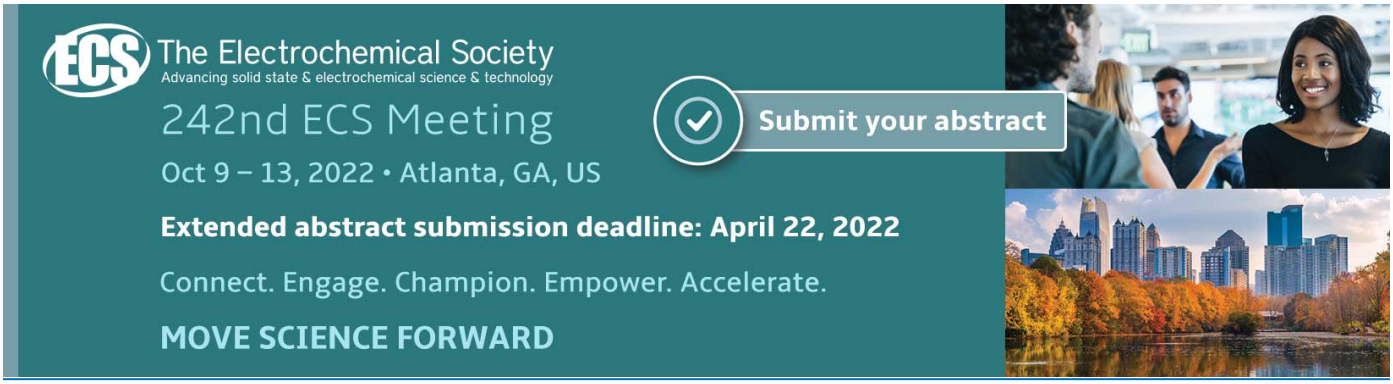

A potential inefficiency management: Kaizen application in the fillet processing of frozen demersal fish at PT. X Makassar-South Sulawesi

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Abstract. PT. X is constantly lost profit allegedly due to inefficiencies in the processing of demersal fish fillets. This research was aimed to analyze the problem using the Kaizen method, a systematic analysis approach for continuous improvement. The research included the definition of the main problem, identification of the root causes on the employees, methods, materials and machine aspects, as well as identification of actions that are technically implementable and financially require less cost but produce maximum impact. The analysis of the production data in the frozen grouper fillets processing found differences in maximum yield in two production lines: 31.20% in Line 1 and 35.25% in Line 2, while the company's overall standard yield was 33%. These results indicated that interventions in Line 1 are needed to increase the yield by 2%. Root cause analysis found a numbery internal aspects that could be improved through Kaizen intervention, namely sorting raw materials, filleting, skinning, and trimming. Two interventions were recommended including employees training who in those aspects, and calibrating the main equipment. With such interventions, the inefficiencies worth Rp. 6.000,-/Kg of final product equivalent to Rp. 1.000.000.000,-/year of production could be overcome.

Keywords: increasing, kaizen, PT. X, yield

1. Introduction

In January 2018, according to BKIPM statistics, Indonesia ranked first for operational volume of fishery products. Indonesia had a total export value of 97,011 tons (53.18%), import of 27,106 tons (14.86%), domestic entry of 11,047 tons (6.06%), domestic outside of 44,780 tons (24.55%), and transit of 2,492 tons (1.37%) [1]. The data indicated an increasing international demand for Indonesian fisheries products.

According to the Quarterly Performance Report I of the Directorate General of Strengthening Competitiveness of Marine and Fisheries Products in 2017, to keep up with the increasing global demand for quality and safe fish products, various efforts to improve post-harvest production, product diversification, logistics systems, and business sustainability need to be continuously carried out in order to strengthen competitiveness. But until now support such as facilities and infrastructure, technology, human resources, and financial sectors are still inadequate. This is due to several internal

factors, such as the limited number of post-harvest units and fish markets that have not met the standards, the limited availability of raw materials for fish processing units, the limited competency in the post-harvest and marketing workforce, and not yet effective coordination between stakeholders in the processing and marketing of fishery products [2].

PT. X, located in Makassar Industrial Area, South Sulawesi province, is a company engaged in fisheries that processes various types of fish, both demersal and pelagic fish. One of their products include frozen (skinless) demersal fish fillets, which are produced for export. This company is also inseparable from problems in the processing process, such as low yield value or below-target yield. Yield meat can be used after processing. The yield is used to estimate how many parts of the body can be used as food ingredients [3].

In light of these problems, there needs to be a way to overcome this and improve the production process. This is consistent with the statement of [4], namely that the improvement of the production process needs to be carried out continuously so that material waste and time can be minimized. Kaizen is a Japanese term for the concept of Continuous Incremental Improvement. *Kai* means change and *zen* means good. Kaizen means continuous improvement that involves everyone. This approach can only work well when accompanied by the right effort of human resources. The human factor is the most important dimension in improving quality and productivity. The high Kaizen spirit in Japanese companies has made them progress rapidly and excel in quality. Kaizen is basically a comprehensive and integrated unity of view that aims to carry out continuous improvement. Kaizen's spirit is based on the following views [5]: today must be better than yesterday, and tomorrow must be better than today; no one day must pass without improvement/improvement; problems that arise are an opportunity to carry out improvements/improvements; appreciate improvements/improvements even though small; improvements/upgrades do not have to require a large investment.

2. Materials and Methods

2.1. Data collection

The data that were already collected were entered in processing stage. We obtained both primary data and secondary data.

2.1.1. Primary data. Primary data was obtained directly from the object under study by means of observation, testing and others. In this practice, the primary data were obtained through direct observation to the field or to the location of the practice, about how to handle and process demersal fish fillets (skinless) since they are received until the storage process. Data were obtained by participating in fish processing activities and conducting direct interviews with the parties that had authority over the data needed.

2.1.2. Secondary data. Secondary data were obtained indirectly, collected from several parties by conducting literature studies as a reference or material for the data in the field. Secondary data collection methods were carried out by the author, including company data collection, literature study from various writings, and consultation with supervisors and related parties.

2.2. Data processing

Data processing was done to resolve the problem under study. The steps taken in data processing included:

1) Secondary Data Analysis

Secondary data were obtained from the company as reference material to determine the beginning of the problems that occured at PT. X, especially in the processing of frozen demersal fish fillets.

2) Fish Bone Diagram
The quality of the product (goods/services) is the basic factor of customer satisfaction in determining the product to be purchased or used. Thereforem the quality of the product is a key factor for the success of the company. Factors that affect the quality commonly referred to as 9M include: market, money, management, man, motivation, materials, machines and mechanization, modern information methods (mounting product requirements) [6]. The writer applied causal analysis with 4 factors, namely man (human), machines, method, and material.

3) Primary Data Analysis
Primary data were data obtained from the results of sampling or sampling directly by observing the processing and also calculating the yield value and the level of productivity of employees at each stage. The processing stages that were observed were filleting, thorn removal, skinning, and trimming.

4) Assumption of profit
The profit assumption was made to look at the level of profit that would be obtained if the action changed or improved, which included the value of profits per day, week, month and year. According to [7], profit and loss were a description of the company's performance regarding income, costs and losses/ profits obtained from a company during a certain period. The formula for calculating the value of profit and loss can be seen in the formula below:
5) Provide Proposed Action

$$\text{Profit / Loss} = \text{Total Sales} - \text{Total Cost} \quad (1)$$

At this stage there would be a showing of the provision of proposed actions to the problem or source of problems that had been obtained from the evaluation of the causes of direct problems.

3. Results and Discussion

3.1. Yield of processing result at the company
The yield as result from processing at the company was used as a reference material to determine the beginning of the problem. This yield as secondary data was obtained in April 2018. The yield data for April 2018 can be seen in the diagram in figure 1.

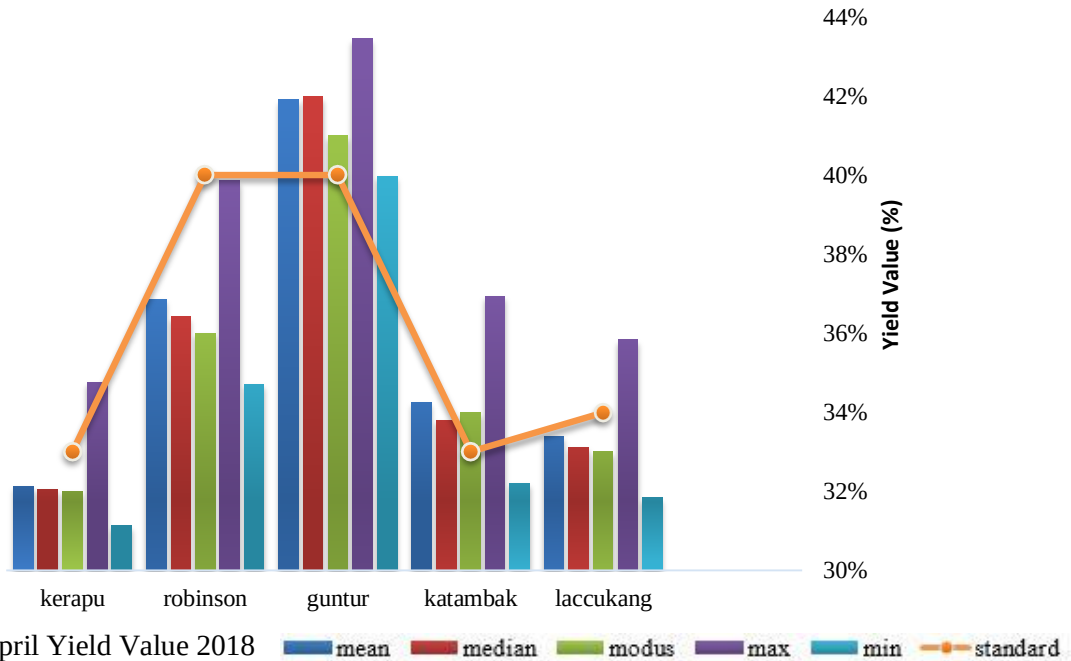

Figure 1. April Yield Value 2018

Figure 1 shows that the yield value in April 2018 did not meet the standard, namely by Milihat from the mean value of grouper, which was 32.13% with 33% being the standard. Robinson had a mean value of 36.87% with a standard value of 40%. Laccukang/kakatua had a mean value of 33.40% with 34% standard value. Meanwhile, guntur fish met the standard with mean value of 41.92% (standard value of 40%) and lencam fish with mean value of 34.26% (standard value of 33%). With these values it could be concluded that the yield value achieved by the company still did not meet the standards for several types of fish, namely grouper, robinson, and laccukang/kakatua.

3.2. Result of causal diagram

The causal diagram is presented in the form of a fish bone diagram which includes observations of man (human / employee), machine (equipment), method, material (raw material). Fish bone diagrams can be seen in figure 2.

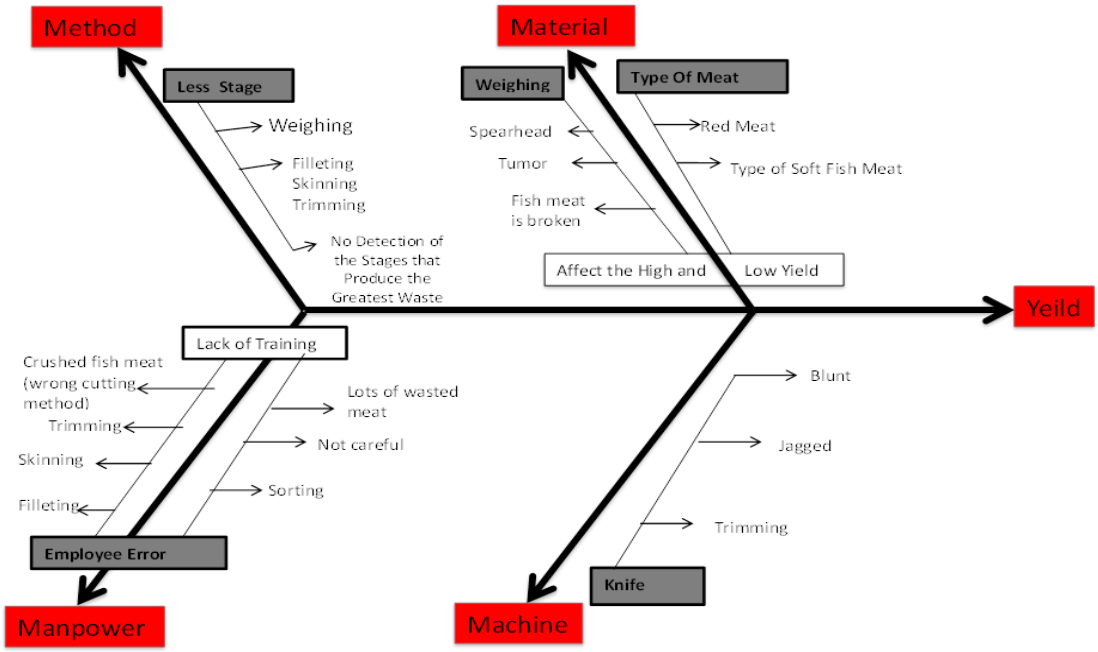

Figure 2. *Fish bone diagram.*

Figure 2 is a fish bone diagram consisting of man (human/employee), machine (machine/equipment), method (method), material (raw material). Fish bone diagrams are described in table 1.

Table 1. Cause and effect table.

Parameter	Cause	Effect
Method	The lack of well-defined processing stages because the weighing process was only done at the stage of raw material acceptance and after trimming so that if the yield did not meet the standards, the company would not know what stages produced the biggest loss.	No detection of the stages that produced the greatest waste
Material	1. Tumors and the presence of spear marks on fish meat that required fish meat to be cut or scraped by employees 2. Types of fish meat (soft and lots of red meat)	A lot of meat was wasted
Man	1. Low knowledge of employees at the sorting stage 2. Inadequate employee competency in filleting, quenching, skinning, and trimming.	The amount of white meat was wasted
Machine	The knives used for trimming were blunt and the knife starts to turn on because the change period has exceeded the limit.	The amount of white meat was wasted

Table 1 shows that the yield was influenced by several factors, namely from employees, raw materials, methods and equipment so that in the sampling data were needed in the form of yield and productivity processing stages, namely at the stages of filleting, removal of fish bones, skinning, and trimming.

3.3. Result of yield value

Yield value, also known as primary data, was data obtained from the results of sampling or sampling directly by observing the processing and also calculating the yield value and the level of productivity in employees at each stage. The stages of the process observed were at the stages of filleting, bone removal, skinning, and trimming. The yield data can be seen in the diagram in figure 3.

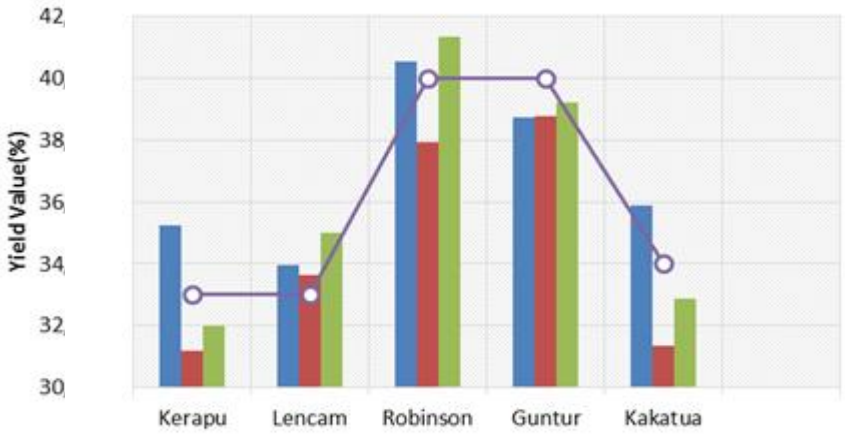

Figure 3. Yield value/line.

Figure 3 explains that the yields produced by different groups were those that met the standards and that there are those that did not meet the standards and from productivity diagrams we can see that this type of fish affected the speed of employees. Group 1 rendement value for grouper showed a value that exceeded the standard value, namely with a yield value of 35.25% with a standard value of 33%, lencam which is 33.95% with a standard of 33%, and kakatua at 35.88% with a standard of 34 %. In group 2 the yield value for lencam showed a value that exceeded the standard, namely the yield of 33.63% with a standard yield of 33%. In group 3 the yield value for lencam showed a value that exceeded the standard with a yield value of 35.01% with a standard of 33%, and Robinson with a yield of 33.63% with a standard of 33%. From the results above it can be concluded that the actual yield standard can be increased for example in grouper. The standard rendement value of 33% can be increased to 35%.

3.4. Result of estimated profit

After analyzing the yield value by looking at the yield and productivity, the results showed that the standard yield in the company could be increased, for example, the standard yield of grouper fish from 33% could be increased to 35%. Table 2 shows the estimated benefits of increasing the yield.

Table 2 shows that if the standard yield in grouper is 33% then the profit obtained is Rp 15,000, -/ 1 kg of the final product. If the standard yield in grouper is 35% then the profit obtained is Rp 21,000, - / 1 kg of the final product. The estimated value of the benefits in the time cycle can be seen in table 3.

Tabel 2. Estimated profit.

Estimated	Calculation
Price of fish / kg	Rp 40,000
Final product price / Kg	Rp 135,000
Type of fish and size	Kerapu (1-1,6 kg)
Yield value	33% 330 gr 0,33 kg
3 kg of raw material produces 0.99 kg of final product	
Initial capital	Raw material x raw material prices
	= 3 kg x Rp 40,000
	= Rp 120,000
Profit	Selling price x initial capital
	= Rp 135,000 - Rp 120,000
	= Rp 15,000,00 / 1 kg the final product
Yield value	35% 350 gr 0,35 kg
2.85 kg of raw material produces 0.99 kg of final product	
Initial capital	Raw material x raw material prices
	= 2,85 kg x Rp 40,000
	= Rp 114,000
Profit	Selling price x initial capital
	= Rp 135.000 - Rp 144.000
	= Rp 21.000,00 / 1 kg the final product

Table 3. Estimation of profit value in the time cycle.

Time		Final product (kg)	Yield	
			33%	35%
Kerapu		1	Rp 15,000	Rp 21,000
Day	1 day	500	Rp 7,500,000	Rp 10,500,000
Week	6 days	3.000	Rp 45,000,000	Rp 63,000,000
Month	24 days	12.000	Rp 180,000,000	Rp 252,000,000
Year	336 days	168.000	Rp 2,520,000,000	Rp 3,528,000,000
Difference Increase 2%				Rp 1,008,000,00,-

From the results of the estimation of profit in table 3 above, we can conclude that the benefits to be achieved by a company will increase if the standard of yield is also increased, with an estimated increase of 2% resulting from the difference. Profit can increase by Rp 6,000/1 kg of the final product and if estimated in the time cycle (years) it can increase by Rp 1,008,000.00,-/168,000 kg of the final product.

3.5. Provision of solutions

From the results of several analyzes above, there are some conclusions and improvement solutions to increase the yield value of a company. Conclusions and improvement solutions can be seen in table 4.

Table 4. Conclusions and improvement solutions.

Conclusions	Improvement solutions
Employees: Less competent employees at the stages of filleting, skinning, and trimming	There needs to be training for employees, especially for employees at the filleting, skinning, and trimming stages
Raw Materials: The high and low quality of raw materials will affect the yield level	The need for a level of accuracy in the selection of raw materials so that the raw materials received are of high quality and there are no scars (spear marks) on the fish that will be used as raw material
Equipment: The equipment used (knife) is blunt so that a lot of meat is wasted on the trimming stage	There needs to be a knife check every day to see the level of sharpness and the equipment used
Method: the biggest waste will not be detected if it is not weighed at each stage of the fillet process until trimming.	It is necessary to add scales to the fillet stage to control the level of waste that is wasted
The yield standard needs to be improved even if only with an increase of 2%	By increasing the capacity of 4 M (man, material, machine, method)

4. Conclusion

After implementation of the Kaizen method, this research draws three conclusions: there were four factors causing the low yield value of the factors, where the most influential ones are the level of employees expertise and also the raw materials used; the lowest yield for grouper is on Line 2 (31.20%) and the highest value is on Line 1 (35.25%), while the standard value of the company's yield is 33%, therefore the standard of yield can be increased by 2%; if the estimated increase of 2% resulting from the difference in the increase in profits can increase by Rp.6,000/1 kg of the final product and if estimated in the time cycle (years) it can increase by Rp 1,008,000.00,-/168,000 Kg of the final product.

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