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Sardines product quality control in terms of HACCP to improve food security in Blambangan Foodpacker Indonesia company limited, Banyuwangi

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Abstract

Blambangan Foodpackers Indonesia company limited is a company engaged in manufacturing with its primary products sardines. Application of HACCP in the company has been conducted in order to maintain consumer trust and produce a quality product in accordance with the guidelines applicable quality standards. This study aims to determine how the implementations of quality control in terms of the HACCP system. The research method used is the six sigma method and causal analysis using fishbone diagrams. The results showed that the calculation of the six sigma method generates the value of DPMO (Defects Per Million Opportunities) at 3.4 and not at 6 sigma. The results of the causal analysis using fishbone diagrams to mismatches that occurred on product sardines show needs improvement in the HACCP plan that is by looking for other fish raw material suppliers who provide good quality and improvement of the seaming machine and operator.

Introduction

Competitive world of growing the industry today, it is in giving the best service to consumers, the industry has committed to improve the quality and image of sardines in the future. The emergence of food safety quality management system that has given rise to new changes to the food safety management system of world food products including fishery products. Raw fish and seafood is highly perishable commodity compared to fresh meat and other commodities have short durability even at refrigeration temperatures (Lauzon *et al*., 2010; Popovic *et al*., 2010; Can, 2010). Fish is a rich source of marine products of protein, minerals and vitamins but low in fat, cholesterol and sodium (Gamal and Shamery, 2010; Saritha and Patterson, 2012: Jianadasa *et al*., 2014). Consumption of fresh and processed fish has increased along with an understanding and awareness of the nutritional quality of fishery resources (Emberg *et al.*, 2001).

Handling of fresh fish products are usually produced by applying the method long as salting, fermentation, drying and curing. Modification in this technique is also known as a food safety problem and a new generation of customer preferences change. Although the method of processing/preserving long been known as a technique for many years, they have still wide acceptance across the world because of their special taste and aroma. Due to their special characteristics for a variety of many types, they have advantages and disadvantages associated with seafood health risks that make them difficult to identify, establish procedures to prevent and effective monitoring. in this paper, the most common health hazards seafood evaluated under the five main methods of traditional fish processing. Monitoring and application of HACCP is essential (Kose, 2010). The goal of HACCP is to maximize the value, quality freshness of the fish and the presence of proper handling during cooling, processing, packaging, transport and storage must maintain freshness and shelf life extension (Lauzon *et al*., 2010, Jayasinghe and Rajakaruna, 2005). The quality of the freshness of the fish plays an important role in human health and consumer acceptance as well as in the international fisheries trade (Cheng *et al*., 2013).

Quality and food safety in the processed fish will be maintained, if the manufacturer implements the use of the seven principles of HACCP in food safety management concepts applied to the whole food chain from producers, distributors to the consumer. ISO 2000 with the development of food safety activities become increasingly integrated to the development and implementation of HACCP programs at several fish processing industry.

Another aspect that is important is the documentation system and monitoring system activities independently, so the failure to achieve conformity of production processes can not be detected. Based on this, we need a study on the

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evaluation of the application of the HACCP system and its implementation so that it can produce the products according to their specifications and market buyers. This study focused on the optimization of data processing (record keeping) the processing of sardines as a foundation to implement the evaluation of the application of HACCP in perusahaan.Sistem HACCP as a food safety guarantee system and make the system more efficient production in the long term.

Blambangan Foodpackers Indonesia company limited is an industry that is engaged in manufacturing, which manages the fish into canned food. Blambangan Foodpackers Indonesia company limited every day can produce 20 to 40 tons of fish. To meet the needs of consumers, Blambangan Foodpackers Indonesia company limited hopes to maximum satisfaction to consumers in the form of taste, appearance, and food safety. In the production process of sardines in Blambangan Foodpackers Indonesia company limited still no standards for food safety by implementing a HACCP quality system and a lot of defects in the products, because the production process is not well controlled. It is therefore necessary to find the cause to reduce defects in products resulting product sardines defects in the production process by using control product sardines quality integrate with six sigma into HACCP for improving food safety in Blambangan Foodpackers Indonesia company limited in Muncar, Banyuwangi.

Methods

This research was conducted at Blambangan Foodpackers Indonesia company limited in Banyuwangi and implemented in July to August 2014. Analysis of data using the map control C. Map control C has the ability to detect or separate the unexpected causes of variability of quality, so it can be used to locate and fix a disorder that arises during the production process. The basic form chart consists of three horizontal bands, which contains a center line and two lines control. Line middle is the average value of the quality characteristic and two control lines serves as the upper control limit and lower control limit. Control line distance from the center line is calculated based on statistical theory, therefore, if the process under control then all sample points will fall between the two lines (Gaspersz, 2002). Data processing was followed by using six sigma to compute the value of DPMO (Defects Per Million Opportunities). Calculation of DPMO is obtained from the formula:

DPMO = [Many of the products are defective / (Many products are inspected x CTQ Potential)] x 1,000,000

After calculation using the six sigma method, this was followed by a causal analysis using fishbone diagrams.

Results and Discussion

The receipt of raw materials of fish

Blambangan Foodpackers Indonesia company limited every day can produce 20 to 40 tons of fish. Because there are many products that defects in it then needs to be investigated further to reduce the number of defective products. In Blambangan Foodpackers Indonesia company limited there are already tools or machines used for production equipment such as rotary tool, double seaming, exchoust box, to retort. In this process there are still defects, it is necessary for improvement in the production process with quality control methods using the map controls C.

The results of the analysis showed that the C control map data that is outside the control limits (out of control) which is above the upper control limit and the lower control limit is below the upper control limit results at 111.26, average at 83.8 and control limits below at 56.34, it is necessary to conduct the examination in the production process to find the cause of the data coming out of the control limits. The results of examination of the data out of control due to the declining power of human labor and raw materials. The number of all types of fish raw material receiving disability for 25 days at Blambangan Foodpackers Indonesia company limited shown in Table 1.

Table 1. Data of all types of fish raw material receiving disability

No	Type of defects	Total of defects (cans)	Percentage (%)
1	Pale skin	260	12.4
2	Scales easily separated	267	12.8
3	Eyes grim sink	269	12.8
4	Murky brown gills	273	13
5	When pressed meat imprint	256	12.2
6	The meat easily separated from the bone	335	16
7	Sour-smelling mucus gills cloudy	435	20.8
	Total	2,095	100

Table 1 is a table of the total number of defective product types including pale skin, scales easily separated, gloomy eyes sunk, murky brown gills, an impression when pressed meat, meat easily separated from the bone, gill mucus sour smelling cloudy in the process of receiving raw materials for fish 25 days in Blambangan Foodpackers Indonesia company limited with a total sample size of 10,000 cans of sardines. Furthermore, through the conversion

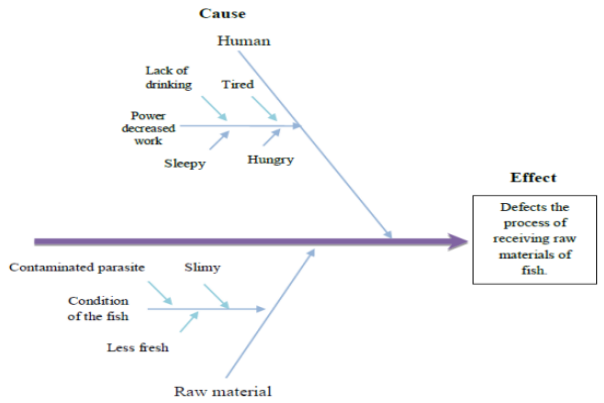

Figure 1. Analysis cause-effect of defects in the process of receiving raw materials of fish

of DPMO to sigma value by looking at the table appendix 5 of the book Gaspersz (2002), note that for DPMO = 29,928.57 is closest to the DPMO = 301.532 on the value of sigma = 2.02. Because this number is less than 6 sigma, it is necessary to repair. For next step is to use a fishbone diagram. Figure 1 shows the causal analysis of defects in the process of receiving raw materials of fish in the Blambangan Foodpackers Indonesia company limited.

Figure 1 shows that the causes of the defects in the process of receiving raw materials of fish in Blambangan Foodpackers Indonesia company limited is; 1) the use of raw materials also need to be considered and must be adapted to other raw materials, as this is the most significant cause of a defect in the manufacture or processing of products sardines and 2) the human condition must also be fully awake when man is negligent in sorting contaminated fish will lead to defective products.

Raw material handling fish, especially tuna fish was good at the time of arrest will greatly affect the quality or fish for processing (Silva *et al*., 2011) and cause harm to the health of histamine poisoning (Guillier *et al.*, 2011). Control of Salmonella in raw materials and processed fish, particularly for raw materials canning fish should still be considered, as it will give adverse impact on the environment and human health (Amagliani *et al.*, 2012). Examination with HACCP is essential to produce quality good fish canning processing, especially tuna fish. Inspection activities starting from the raw material inspection, cleaning, cooling, defrozen, precooking, and sealing (Li *et al*., 2013; Sakul and Gosal, 2014).

Double seaming machine process

At this stage the data that has been collected will then be re-processed for input to analyze and process the data with the method based on control charts and control charts. So it should be looking for the cause and how to overcome them. Based on the observations

Table 2. The number of all types of defects in double-seaming machine

No	Type of defects	Total of defects (cans)	Percentage (%)
1	Dented	219	26.4
2	Scratched	151	18.2
3	Drop	169	20.4
4	Skider	97	11.7
5	Floating	78	9.45
6	Leak	114	13.8
	Total	828	100

that have been implemented are defective products, among others, dented, scratched, dropped, skider, floating, leaking, it needs to be further investigated to reduce the number of defective products, it is also necessary for improvements in the production process with quality control methods using the map controls C.

The results of the analysis showed that the C control map data that is outside the control limits (out of control) which is above the upper control limit and under the lower control limit with the results of the upper control limit at 50.38, average at 33.12 and control limits under at 15.86, it is necessary to conduct the examination in the production process to find the cause of the data coming out of the control limits. From the results of the data is out of control is because the power of human labor and machinery declined. Table 2 shows data on the number of all types of defects in double-seaming machine for 25 days at Blambangan Foodpackers Indonesia company limited.

Table 2 shows the total number of types of defective products including dented, scratched, dropped, skider, floating, and leak during the production process 25 days in Blambangan Foodpackers Indonesia company limited with a total sample size of 10,000 cans of sardines. Furthermore, through the conversion of DPMO to sigma value by looking at the table appendix 5 of the book Gaspersz (2002), note that for DPMO = 13,800 is the closest to the DPMO = 13,903 on the value of sigma = 3.70. Because this number is less than 6 sigma, it needs to be fixed. To repair the next step is to use a fishbone diagram.

Figure 2 shows the analysis of the causal occurrence of defects in the product output double seaming machine at Blambangan Foodpackers Indonesia company limited. The results of the causal analysis shows that the causes of product defects in the process of closing or double seaming cans at Blambangan Foodpackers Indonesia company limited, among others:

a) The decline of human labor power which

Table 3. HACCP Plan for Making Process Sardines in Blambangan Foodpackers Indonesia company limited

Danger (*hazard*)	Critical limit	Monitoring				Corrective action	Verification
		What	How	When	Who		
Parasites in fish	Upper control limit : 111,26 Lower control limit : 56,34	Acceptance of fish raw material	Examination or fish samples	Each fish raw material receiving ongoing	Staff procurement of raw materials and labor	Looking for new suppliers of fish.	Examination by the head of the fish raw material procurement to be processed.
growth of bacteria	Upper control limit : 50,38 Lower control limit : 15,86	Closure cans or double seaming	Examination of double seaming machine	2 hours for the process	Operators and QC staff	Seamer machine must be set back	QC and inspection by the head of the operator visually

causes the output work less well as the emergence of defective products on sardines, as a further improvement in the process of Blambangan Foodpackers Indonesia company limited should make changes to the work performance of employees so that intonation is always stable and produce a good product.

b) Treatment of double seaming machine at Blambangan Foodpackers Indonesia company limited still room for improvement as it still leaked obtained sardine products, blisters and defects after the closure of the tin with a double seamer machine such use.

c) The condition of the equipment should also be considered because it also affects the quality of the resulting sardines. If using the manual way possible defects in the product will be greater and if the machine is damaged it can not be done making of sardines. Therefore, the condition of the equipment must be properly addressed.

d) The narrowness of the work environment, poor lighting, lack of ventilation, and the room temperature heat can hinder the work of the workers can not move freely. In doing his job at the time of production processes running so that workers are less comfortable and less flexibility in work that resulted in a lot of time spent in vain, in addition to the lighting in the room was still not working provide illumination that can support the performance of the operator to operate the machine production so that the results less than the maximum.

Production and marketing factors that greatly affect the competitiveness of processed tuna fish due to the quality of the processed tuna, the government's role in the development of tuna processing industry, and the availability of human resources capable of handling quality (Lestari *et al*., 2013). Utilization of by-products such as heads, frames and off-cuts from filleting fish can be used directly as food while the high economic value (Olsen *et al.*, 2014).

HACCP plan development process sardines in Blambangan Foodpackers Indonesia company limited

HACCP plan here was obtained from the processing or manufacturing process sardines, which in this HACCP plan began processing steps identified hazards until corrective action and Verification to be done by Blambangan Foodpackers Indonesia company limited in order to achieve maximum results. HACCP plan for the process of making sardines in Blambangan Foodpackers Indonesia company limited shown in Table 3.

Implementation of HACCP in the food industry is the most important approaches to food security (Jonnalagadda *et al*., 2009). Aquatic product processing industry became one of the three pillar industries in the fish farming industry of China and more and more companies have introduced advanced equipment and management standards to improve processing technology and quality products (Li *et al*., 2009). Application of HACCP in fish products can be grouped into two, namely, at the time of receipt and storage of raw materials before processing (Kose, 2010).

The application of HACCP and Good Aquaculture Practices (GAqPs) has been recommended as a good approach to limit the introduction of potential hazards in the food fishery products (Bagumire *et al.*, 2010) and increase food security and reduce food-borne diseases (Milios *et al*., 2012). Improvement and implementation of HACCP through inspection, control and monitoring for the processing and packaging of seafood is highly recommended, as it will have an impact on the safety of seafood products processed for consumption (Okonko *et al*., 2009).

Risk analysis is very important to do the food processing company, as it aims to identify the hazards that can occur in the production cycle, as well as preventive measures through inspection procedures HACCP/ISO22000 effective (Douieb and Benlemlih, 2010), but the hazard analysis conducted by most food

industry are often ineffective and unsuccessful (Ryu *et al.*, 2012). Critical Control Points (CCPs) can be minimized in fishery products, if the company wants to apply HACCP (Arvanitoyannis and Varzakas, 2009). Failures in the application of the HACCP system are caused by the standards, regulations and audits are not in accordance with the Food and Drug Administration (Rahmawaty *et al*., 2014)

Conclusion

The process of receiving raw materials of fish and closing double seaming process is a process that is identified as CCPs (critical control points) at Blambangan Foodpackers Indonesia company limited in Muncar, Banyuwangi based map control C. Defect rate values obtained samples taken the upper control limit at 111.26 and lower control limit at 56.34, DPMO at 2.02 in the process of receiving raw materials of fish and the upper control limit at 50.38 and lower control limit at 15.86, DPMO at 3.7 on the double seaming. Based on the results of these two variables DPMO still less than 6 sigma, then it needs to be improved to reduce the number of defective products in the Blambangan Foodpackers Indonesia company limited at Muncar, Banyuwangi.

HACCP plan based on the results of the analysis were taken corporate, because result by using a fishbone diagram is to look for other fish raw material suppliers who provide good quality and improvement of the seaming machine and operator. Suggestions from this study is Blambangan Foodpackers Indonesia company limited need to make improvements in the production process by finding new fish raw material suppliers, optimizing existing labor, routine maintenance on double seaming machine, and a corresponding increase oversight of HACCP in the production process sardines, sardines so that later produced a quality product.

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