

Analysis of the Application of Sanitation Standard Operating Procedures (SSOP) in the Process of Freezing Yellowtail Fish Fillet (*Caesio Cuning*) in PT. Arti Buana Lautan Indonesia

Syahrul^a, Mutemainna Karim^{a*}, Awaluddin^a, Muh. Ayusal Salam^a

^aBalik Diwa Institute of Maritime Technology and Business

Correspondent Author*: mutemainnakarim@gmail.com

Abstract

PT. Arti Buana Lautan Indonesia is a fishery processing company producing frozen yellowtail fish fillets (*Caesio cuning*) for export markets. This study aimed to analyze the implementation of *Sanitation Standard Operating Procedures* (SSOP) in the fish fillet freezing process. A descriptive method with a case study approach was used. Data were collected through observations, interviews, and documentation, then analyzed using a checklist based on the Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia No. 17/PERMEN-KP/2019. The results showed that SSOP implementation was categorized as very good, with an overall average score of 94.71%. The highest score was found in employee health control (96.53%), while the lowest was in water and ice safety (93.94%). Other assessed aspects included cleanliness of food contact surfaces, prevention of cross-contamination, sanitation facilities, chemical handling, and pest control. Overall, SSOP implementation effectively supported product quality assurance and food safety standards for export products.

Keywords: cold chain, food hygiene, food safety, quality assurance, seafood processing

INTRODUCTION

Indonesia is a maritime country that has a huge potential for fishery resources with an area of waters that exceeds the mainland. Indonesia's marine resources include various types of economically important fish that have the potential to support food security, increase the country's foreign exchange, and develop the fishery product processing industry, (Madduppa et al., 2012). One of the fishery commodities that has high economic value and export opportunities is yellowtail fish (*Caesio cuning*). This fish belongs to the group of reef fish that is widely found in Indonesia's tropical coral reef areas and has a fairly high market demand, both in fresh form and frozen processed products. The existence of economically important reef fish in Indonesia shows that coral reef areas have a great contribution to the capture fisheries sector and the marine product processing industry so that they require sustainable management and are supported by a good processing system to maintain the quality of fishery products (Marwayana et al., 2022).

The fishery product processing industry has a strategic role in increasing product added value and expanding international market access. However, the main challenge in this industry is maintaining food quality and safety during the handling, processing, storage, and distribution processes. Fishery products are a food group that is prone to degradation because they have high water and protein content so they are susceptible to microorganism activity, oxidation, and enzymatic damage (Masniyom, 2011). In frozen fish fillet products, the quality of sanitation and hygiene is an important factor because contamination can occur at every stage of production, from the receipt of raw materials to the freezing and storage process. Microbiological contamination such as *Escherichia coli*, *Salmonella*, and *Listeria monocytogenes* can cause products to not meet food safety standards and potentially be rejected by export destination countries (Sheng & Wang, 2021). In addition, chemical and physical contamination is also a serious concern in international trade in fishery products.

To ensure the quality and safety of fishery products, the processing industry is required to implement a good sanitation system through *Sanitation Standard Operating Procedures* (SSOP). SSOP is a standard sanitation procedure that is a basic requirement in the implementation of quality assurance and food safety systems such as *Hazard Analysis and Critical Control Points* (HACCP). The implementation of SSOP aims to ensure that the entire production process is carried out in hygienic conditions so that it is able to minimize the risk of product contamination (Ericson, 2015; Wallace et al., 2014). According to the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia through (Regulation of the Minister of Maritime Affairs and Fisheries Number 17/PERMEN-KP/2019 Concerning Requirements and Procedures for Issuing Certificates of Processing Eligibility, 2019), There are eight main aspects in the implementation of SSOP, namely water and ice safety, cleanliness of surfaces in contact with products, prevention of cross-contamination, worker sanitation facilities, product protection from contaminants, chemical labeling, employee health control, and pest control. These eight aspects are important indicators in determining the basic feasibility of a fish processing unit.

In the process of processing frozen yellowtail fish fillets, the application of SSOP is very important because the characteristics of perishable fish meat require fast, hygienic, and controlled handling. The filleting, washing, freezing, and storage processes must be carried out at the appropriate temperature to prevent the growth of decaying microorganisms as well as pathogens. In addition, the cleanliness of equipment, workers, and the production environment must be maintained consistently so that product quality is guaranteed. The implementation of non-optimal SSOP can lead to a decrease in product quality, an increase in the number of microbial contamination, and rejection of export products by the destination country (FAO, 2018). This condition can certainly harm the company economically and reduce the competitiveness of Indonesian fishery products in the global market.

PT. Arti Buana Lautan Indonesia is one of the fishery product processing companies in Makassar City that produces frozen yellowtail fish fillets (*Caesio cuning*) for the export market. As a company engaged in the export of fishery products, the implementation of sanitation and food safety systems is very important to maintain product quality and meet international standards. This company has implemented SSOP at all stages of production in accordance with applicable regulations. However, the effectiveness of SSOP implementation needs to be evaluated periodically to ensure that all procedures are carried out consistently and to standards. Previous research has shown that there are still several obstacles in the implementation of SSOP in fish processing units, such as lack of sanitation supervision, low awareness of hygiene among workers, and suboptimal sanitation documentation (Candrianto et al., 2024; Munief et al., 2022). Therefore, evaluation of the implementation of SSOP is an important step in supporting the company's quality assurance and food safety system.

In addition to maintaining product quality, the implementation of SSOP also has an important role in increasing consumer confidence and strengthening the competitiveness of Indonesia's fishery product processing industry. Today's export market demands food products that are not only of high quality, but also safe to consume and produced through a system that meets international standards. Export destination countries such as the United States, Japan, and European Union countries apply very strict sanitary and food safety requirements to imported fishery products. Therefore, fishery products processing companies must be able to implement effective and well-documented sanitation systems in order to maintain international market access (Samarajeewa, 2023).



Based on these conditions, the research on the analysis of the application of *Sanitation Standard Operating Procedures (SSOP)* in the freezing process of yellowtail fish fillets at PT. The meaning of the Indonesian Ocean Basin needs to be done. This study aims to analyze the application of eight key SSOP at each stage of the production process and evaluate their suitability with applicable sanitation standards. The results of the study are expected to provide information on the level of effectiveness of the implementation of SSOP, identify aspects that still need improvement, and become recommendations for companies in improving the quality and safety of fishery products. In addition, this research is expected to be a reference in the development of sanitation and food safety systems in the fishery product processing industry in Indonesia.

METHODS

This research was carried out at PT. The meaning of Buana Lautan Indonesia which is located on Jalan Sabutung No. 3, Paotere, Makassar, South Sulawesi. The study aims to assess the level of compliance with the implementation of eight aspects of *Sanitation Standard Operating Procedures (SSOP)* in the freezing process of yellowtail fish fillets (*Caesio cuning*). The research method used is a *mixed method* with a *case study approach* to obtain an in-depth picture of the application of SSOP in fish processing units (Creswell & Creswell, 2018). The determination of the research subject was carried out by *purposive sampling* based on suitability with the research objectives (Etikan et al., 2016).

Data collection was carried out through direct observation, interviews, and documentation studies. Observations are carried out at all stages of the production process from the receipt of raw materials to the storage of the final product to assess the implementation of sanitation, equipment cleanliness, clean water use, and worker hygiene. Interviews were conducted with the *quality control (QC)* team, production head, and processing operator, while documentation studies were conducted on SSOP manuals, monitoring forms, and internal audit reports of the company. The research sample consisted of 18 respondents from marketing, QC, and production employees through filling out a research questionnaire.

Data analysis was carried out in a quantitative descriptive manner using a *checklist audit* based on the Regulation of the Minister of Maritime Affairs and Fisheries of the Republic of Indonesia Number 17/PERMEN-KP/2019. The assessment was carried out on eight aspects of SSOP with a scoring system, namely a score of 4 for the very good category, a score of 3 for the good category, a score of 2 for the inconsistent category, and a score of 1 for the category not applied (Marriott et al., 2018; Schirone et al., 2018). The percentage of SSOP adoption is calculated using the formula:

$$\% \text{ Implementation} = \frac{\sum \text{Score of Each Parameter}}{\sum \text{Maximum Score}} \times 100\%$$

The assessment results are categorized into three levels, namely 75–100% (meeting standards and effective), 50–74% (requiring improvement), and 1–49% (requiring serious improvement). The data from the research is tabulated using Microsoft Excel and presented in the form of tables and percentage graphs to illustrate the level of compliance of companies with the implementation of SSOP.

RESULTS AND DISCUSSION

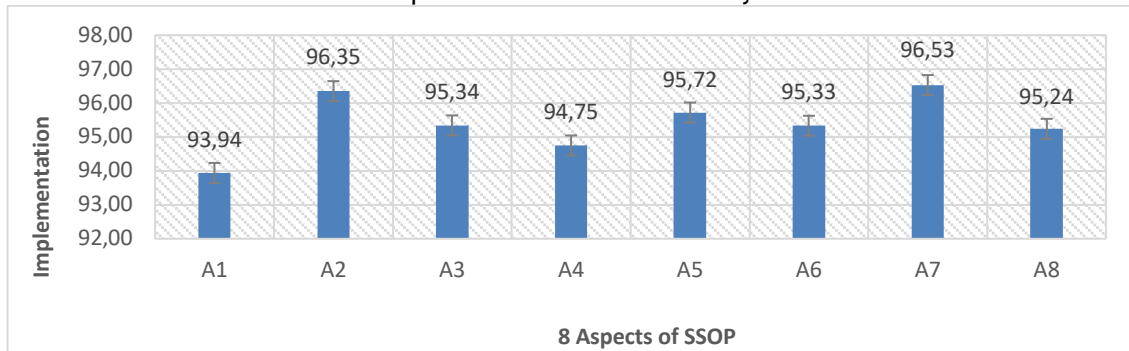


The processing process includes 16 stages: (1) receipt of raw materials from suppliers with a temperature of $\leq 4^{\circ}\text{C}$, (2) sorting based on size and quality, (3) weighing I (an average of 40 kg per basket), (4) washing I to remove impurities, (5) removal of the head and stomach contents, (6) washing II, (7) fillings using a sharp knife, (8) skin removal, (9) sorting to remove brown and fat parts, (10) washing III, (11) weighing II (2.5 kg per package), (12) stacking in vacuum plastic, (13) freezing in Air Blast Freezer (ABF) at -35°C to -20°C , (14) packing in protective plastic-coated cartons, (15) frozen storage at -25°C or lower, and (16) stuffing into reefer containers for export.

Based on the analysis of the processing of yellowtail fish fillets at PT. The meaning of Buana Lautan Indonesia obtained an average overall implementation score of 94.71% in the eight key Sanitation Standard Operating Procedures (SSOP). The results of the score analysis on the application of each SSOP key are presented in Figure 1.

Figure 1.

Implementation of 8 SSOP keys



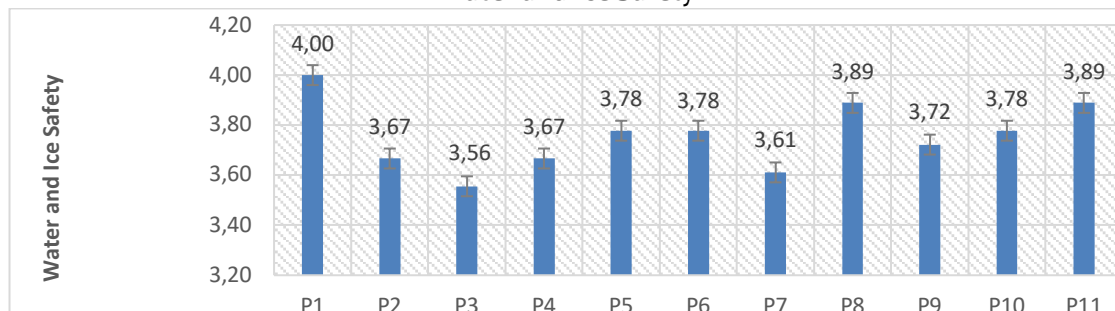
Source: research data processing results

Water and ice safety

PT. The meaning of Buana Lautan Indonesia has an average implementation of 93.94% in water and ice security. The results of the assessment for each of these parameters are presented in Figure 2.

Figure 2.

Water and Ice Safety



Source: research data processing results

The aspect of water and ice safety at PT. The meaning of Buana Lautan Indonesia has been running well with an achievement of 93.94%, as evidenced by the use of filtered PDAM water, closed reservoirs that are routinely cleaned, and ice from official suppliers that are microbiology tested twice a year. However, water quality monitoring is still less than optimal because it is only done visually without internal chemical or microbiological tests, while the person in charge of water safety is only one person so that the supervision is not at risk of being maximized. In addition, water and ice monitoring documentation has not been



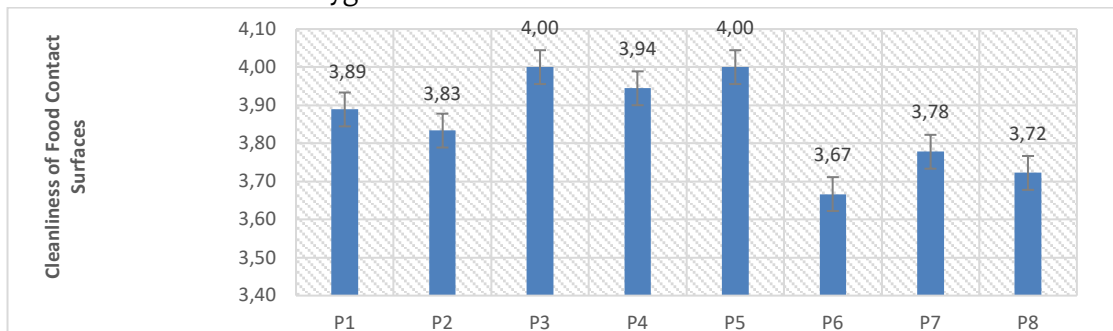
consistent. In general, SSOP standards have been met, but improvements to testing facilities, additional officers, and documentation improvements are needed to ensure water and ice quality is more guaranteed. Water used in the food processing process must meet hygiene standards, meaning it must not contain chemicals and must be bacteriologically acceptable to prevent product spoilage and disease for consumers (Novianti *et al.*, 2017).

Hygiene of surfaces in contact with food

The aspect of surface cleanliness of contact with food at PT. The meaning of Buana Lautan Indonesia has an average application of 96.35% which is presented in Figure 3.

Figure 3.

Hygiene of Surfaces in Contact with Food



Source: research data processing results

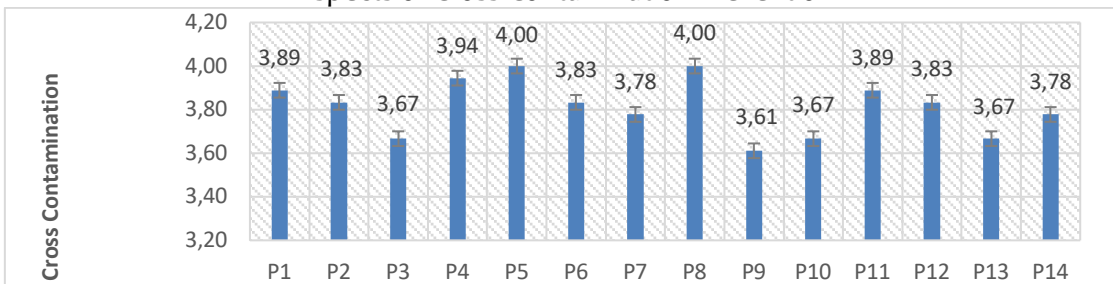
The hygiene aspect of surface contact with food showed excellent implementation with an achievement of 96.35%, supported by routine cleaning before and after production and the use of cleaning agents according to standards. All equipment that comes into direct contact with food is cleaned by trained workers and directly supervised by the QC team. However, monitoring and recording of surface hygiene conditions is not fully optimal because daily documentation is still incomplete. Overall, surface cleanliness is SSOP compliant, but improved recording systems are needed to ensure sanitation consistency. Surface sanitization procedures in contact with food are used in the food processing industry to remove food residues that bacteria can utilize to multiply and minimize microbial populations (Ban *et al.*, 2023; Zhou *et al.*, 2022).

Prevention of cross-contamination

PT. The meaning of Buana Lautan Indonesia has an average implementation score of 95.34% in the prevention of cross-contamination presented in Figure 4.

Figure 4.

Aspects of Cross-Contamination Prevention



Source: research data processing results

The implementation of cross-contamination prevention reached 95.34% and has gone well through proper handwashing practices, the use of clean and complete work clothes, and



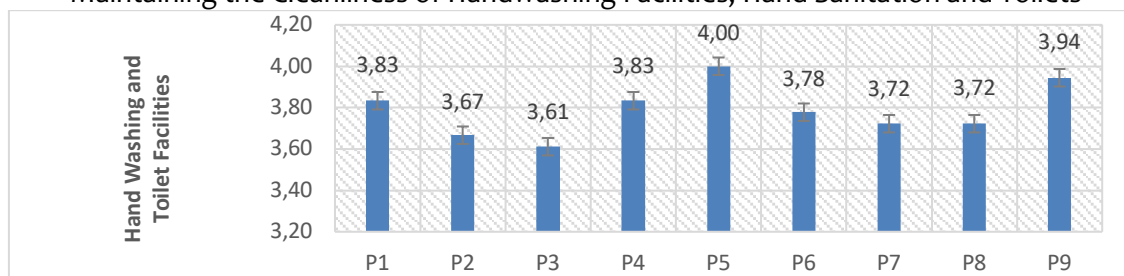
the restriction of employee movement between process areas. Cleaning of areas and tools is carried out regularly so that the risk of contamination from the environment and workers can be minimized. However, the compliance of some workers with certain procedures still needs to be strengthened, especially in terms of work behavior to maintain hygiene during the production process (Insfran-Rivarola et al., 2020; Kamboj et al., 2020). In general, this aspect meets the standard, but regular monitoring of worker behavior and training is still required.

Maintain the cleanliness of hand washing facilities, hand sanitation and toilets

Maintaining the cleanliness of hand washing facilities, hand sanitation and toilets at PT. The meaning of Buana Lautan Indonesia has an average application score of 94.75% which is presented in Figure 5.

Figure 5.

Maintaining the Cleanliness of Handwashing Facilities, Hand Sanitation and Toilets



Source: research data processing results

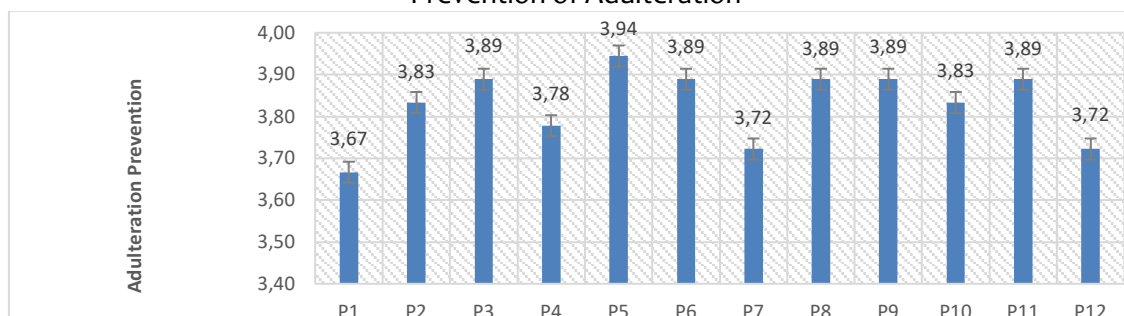
This aspect shows an implementation rate of 94.75% with handwashing facilities available at strategic points, clean toilet conditions, and adequate availability of soap and sanitizer. The cleanliness of the facility is maintained through a regular cleaning schedule by appointed officers. However, some facilities still require more frequent checks to ensure the availability of soap and the condition of the equipment remain optimal. Overall, the personal hygiene aspect is good, but daily inspections need to be improved to make hygiene standards more consistent. Hand washing, hand sanitization and toilets (Zhou et al., 2022) is a very important factor in preventing contamination of products.

Prevention of adulteration

PT. The meaning of Buana Lautan Indonesia has an average application of 95.72% in the prevention of adulteration in Figure 6.

Figure 6.

Prevention of Adulteration



Source: research data processing results

Adultation prevention reached 95.72%, which reflects good efforts in protecting food from contaminants including chemical, physical, and other foreign materials. The company

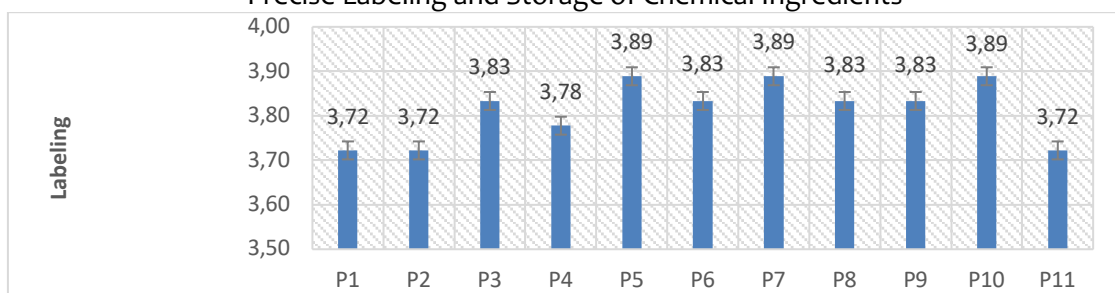


has implemented material storage properly and separated hazardous materials from the production area. However, monitoring of possible contamination from the environment and worker activities still needs to be improved so that there are no discrepancies. In general, the implementation of this aspect is very good and in accordance with SSOP. Non-food ingredients (cleaners, sanitizers, and other chemical solutions) are placed in enclosed, isolated areas to prevent product contamination, (Ban et al., 2023).

Proper labeling and storage of chemicals

PT. The meaning of Buana Lautan Indonesia has an average application score of 95.33% on labeling, storage and proper use of chemicals. The assessment results for each parameter are presented in Figure 7.

Figure 7.
Precise Labeling and Storage of Chemical Ingredients



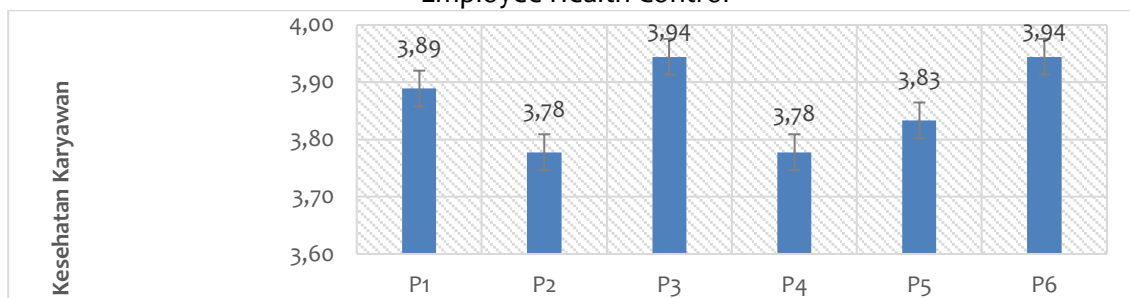
Source: research data processing results

This aspect obtained a score of 95.33% with good implementation related to chemical labeling, storage in a special area separate from foodstuffs, and use according to procedures. Each chemical already has a clear label and is stored in a safe temperature chamber. Small obstacles are still seen in the completeness of documentation of the daily use of chemicals. Overall, standards have been met, but documentation and recording of hazardous materials use need to be strengthened. The expiration date on the product acts as a quality control measure for the product and influences the decision in consumer purchases (Kamboj et al., 2020; Zhou et al., 2022).

Employee health control

Employee health control at PT. The meaning of Buana Lautan Indonesia has an average implementation score of 96.53%. The assessment results for each parameter are presented in Figure 8.

Figure 8.
Employee Health Control



Source: research data processing results

The aspect of employee health control was the highest with an achievement of 96.53%, indicating that the company has implemented routine health checks, ensured that

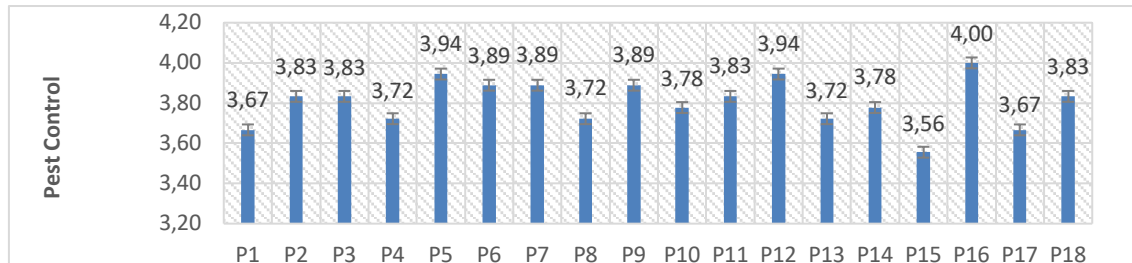


employees are free of infectious diseases, and provided regular hygiene training. Employees are also required to use complete PPE during the production process. The obstacles found are mainly related to the lack of periodic evaluation of certain workers' hygiene habits. In general, this aspect has been very good and supports food safety. Good application in (Ban et al., 2023; Insfran-Rivarola et al., 2020; Kamboj et al., 2020; Zhou et al., 2022) The production process does not always guarantee good production implementation; therefore it needs to be accompanied by good implementation through the control process.

Pest eradication

Pest eradication in PT. The meaning of Buana Lautan Indonesia has an average application score of 95.19% The assessment results for each parameter are presented in Figure 9.

Figure 9.
Pest Eradication



Source: research data processing results

Pest eradication showed an achievement of 95.19% and has been supported by cooperation with pest control, installation of traps, and periodic area inspections. Although pest control is going well, the documentation system still needs to be improved because some records of control activities have not been recorded thoroughly. Overall, the pest control program is up to standard, but the recording and reporting of activities must be strengthened to make supervision more effective. Pest prevention in food processing is influenced by several sanitation programs and their implementation as well as sanitation application training for employees, (FAO, 2018; Kamboj et al., 2020; Munief et al., 2022; Zhou et al., 2022).

CONCLUSION

Based on the results of the study, the application of Sanitation Standard Operating Procedures (SSOP) in the freezing process of yellowtail fish fillets (*Caesio cuning*) at PT. The meaning of Buana Lautan Indonesia shows excellent results with an average implementation rate of 94.71%. The results show that the company has met the basic requirements for processing feasibility in accordance with the Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia Number 17/PERMEN-KP/2019. Of the eight aspects of SSOP analyzed, the employee health control aspect obtained the highest score of 96.53%, followed by the cleanliness of surfaces in contact with food at 96.35%, which shows that the company has a high commitment to maintaining worker hygiene and sanitation of production equipment. However, there are still several aspects that need improvement, especially in water safety with a value of 93.94% and pest eradication of 95.19%, especially related to water quality monitoring after the filtration process and documentation of pest control activities. Overall, the implementation of SSOP in the company has been effective in supporting the quality and safety of frozen fish fillet products for the export market.



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