

The Implementation of Hazard Analysis Critical Control Points in the Amplang Production Process at UMKM X, Balikpapan

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Article information

Article history

Submitted : March 19, 2024

Revised : March 31, 2024

Accepted : April 07, 2024

Keywords:

amplang, critical control points, food safety, HACCP

Kata Kunci:

amplang; titik kendali kritis; keamanan pangan; HACCP

ABSTRACT

Amplang is a snack made primarily from fish. It is usually given as souvenirs, especially in Balikpapan. The process of making amplang involves a long process, that might lead to bacterial growth if not handled correctly. Hazard Analysis and Critical Control Point (HACCP) is one of the methods that can be used to prevent food contamination. The purpose of this research is to assess the HACCP implementation in the production process of amplang by Micro, Small, and Medium Enterprises (MSME) of X in Balikpapan. This research is qualitative research with a case study approach. The informants in this study were the owners and employees of MSME of X. The formulation of the HACCP stages indicates that the critical point is in the fish meat grinding process. Based on the bacterial testing results at each stage of amplang production in MSME of X, it meets the requirements of SNI 7763:2013.

ABSTRAK

Amplang merupakan makanan ringan yang berbahan baku utama dari ikan dan biasanya dijadikan sebagai buah tangan para wisatawan khususnya di Kota Balikpapan. Tahap pembuatan amplang melalui proses yang cukup panjang, sehingga dalam proses tersebut dapat memicu pertumbuhan bakteri jika tidak ditangani secara benar. Maka dari itu, *Hazard Analysis and Critical Control Point* (HACCP) merupakan salah satu cara yang dapat digunakan untuk mencegah kontaminasi pada makanan. Penelitian ini bertujuan untuk mengetahui gambaran HACCP pada proses produksi amplang UMKM X di Kota Balikpapan. Penelitian ini merupakan penelitian kualitatif dengan pendekatan studi kasus. Informan pada penelitian ini adalah pemilik dan karyawan dari UMKM X yang bertugas menangani proses produksi amplang dari tahap penyimpanan daging ikan sampai pengemasan. Hasil perumusan tahapan HACCP menunjukkan bahwa yang menjadi titik kritis yaitu pada proses penggilingan daging ikan. Berdasarkan hasil pengujian bakteri pada setiap proses produksi amplang ikan di UMKM X sudah memenuhi syarat SNI 7763:2013.

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INTRODUCTION

Indonesia is known as a maritime country, which means that a significant portion of its vast territory consists of water. The extensive waters of Indonesia indicate abundant natural resources, especially in fisheries. Therefore, various food industries are established throughout Indonesia. The food industry comprises a variety of sectors that produce food products, one of which is amplang. Amplang is a food product made primarily from Spanish Mackerel fish, mixed with flour, and seasoned with unique spices from each region (Qosthari, 2016). This food product is often chosen as a must-try souvenir, especially in the East Kalimantan region, specifically in Balikpapan. Balikpapan is expected to serve as a supporting city around the national capital, and as a result, there is a possibility of increased demand for local delicacies like amplang. With the growing interest in purchasing regional specialties such as amplang, the number of producers making amplang is also increasing. This is the foundation for Micro, Small, and Medium Enterprises (*Usaha Mikro Kecil dan Menengah* or UMKM) X to become one of the amplang producers, using Spanish mackerel and flatfish (*Belida fish*) as their main raw materials. According to Prameswari (2018), fish have high nutritional content that is believed to enhance intelligence and energy in those who consume it.

Spanish mackerel fish is commonly used as the raw material for amplang. However, according to Maisur et al., (2019), this fish can be substituted with other types of fish, although the taste may vary slightly. One alternative fish that can be used for amplang crackers is milkfish, which, as stated by Hafiludin (2015), is rich in protein (20-24%), amino acids, fatty acids, and vitamins (Yustini, 2021). Nevertheless, due to the raw material for amplang is fish, as noted by Kusumayanti (2011), it is considered prone to spoilage and can undergo decomposition more quickly compared to other food products. Therefore, quality control for amplang is needed from the beginning of the process to when the product is marketed.

Quality control is not solely limited to the final product; hence, it is advisable to monitor food safety from the early stages of amplang production. One measure that can be taken to ensure product quality and food safety is the implementation of Hazard Analysis and Critical Control Point (HACCP). HACCP is a quality management system that emphasizes safety, particularly for food. It is based on a systemic approach to anticipate potential hazards during the production process and determine critical control points that require strict supervision. Implementing HACCP in the amplang production process aims to prevent contaminated food, ensuring the quality and safety of the product that reaches consumers through a series of identification, monitoring, and control processes for potential hazards, from raw materials to processing, packaging, and consumption. This is supported by research conducted by Kharisma (2019), which states that the HACCP method is a relevant system capable of ensuring food safety and preventing potential risks during the production stages by identifying critical points in each process, thus ensuring the safety of the product until it reaches consumers. Knowing the importance of HACCP, this research is aimed to assess the HACCP implementation in a production process, which on this occasion is the amplang production process at UMKM X Balikpapan.

RESEARCH METHODS

This research study employed a qualitative study with a case study approach. The research setting is the Small-Scale Industrial Center of Teritip, Balikpapan, conducted from March to September 2023. The informants in this research were the owners and employees of UMKM X responsible for handling the amplang production process from fish meat storage to packaging. The selection of informants was done using purposive sampling.

The research started with a field survey at UMKM X. During the survey, the researchers identified the stages of the amplang production process at UMKM X. In broad terms, there are eight main stages in the amplang production process at UMKM X: receiving raw fish material (in the form of fish fillets), fish grinding, mixing of amplang raw materials (fish, flour, and seasonings), amplang molding, amplang frying, amplang sorting, amplang packaging, and amplang product

distribution. Subsequently, direct observations were made at each stage or process of production, and interviews were conducted with four employees and the owner of UMKM X.

Regarding HACCP development, there are 7 fundamental principles to be considered based on the research (Kurniawan, 2016): hazard analysis or hazard identification (hazardous materials/conditions) and risk assessment; determining critical control points (CCP); establishing critical limits for each identified CCP; setting up monitoring procedures for each CCP and critical limit, determining corrective actions to be taken in case of deviations from CCP and critical limit monitoring results; establishing effective record-keeping procedures as documentation of the HACCP plan, and establishing verification procedures to ensure that the HACCP system has been effectively implemented. Data analysis was conducted by comparing the implementation of HACCP in the field with these seven principles. This was done to assess the implementation of HACCP at UMKM X.

RESULTS AND DISCUSSION

Amplang is a light snack primarily made from fish meat. The characteristic of amplang is its savory taste with a brownish color. The raw materials for amplang include fish-meat, flour, chicken eggs, clean water, cooking oil, and seasonings such as salt, sugar, pepper, flavor enhancers, baking soda, and garlic. The production process of this product begins with the grinding of fish meat, mixing all the raw materials into a dough, shaping it on a special stainless-steel table with a flat surface that doesn't easily peel off, and cooking the amplang by frying it in a large frying pan, followed by draining. After cooling and draining, the products are sorted, packaged, and distributed.

The raw materials for amplang use carefully selected ingredients that have been inspected to meet the standards applicable at UMKM X. Ingredients such as fresh fish meat are stored in refrigerated areas. The same goes for other raw materials, including fresh chicken eggs, flour, cooking oil, and other seasonings, which are all kept fresh in their packaging.

Process Flowchart

The production process flowchart for amplang at UMKM X starts with fresh fish, which is then beheaded, filleted, and frozen. UMKM X produces 15 kg per day and prepares 10 kg of dough at a time. Before production, the frozen fish is diced, then ground three times. After grinding, the seasoning and flour mixing process begins, with manual stirring (using hands). Once the desired texture is achieved, the dough is shaped and undergoes the frying process. After frying, the amplang is drained, sorted, packaged, and distributed to sales points. The production process flowchart at UMKM X is depicted in figure 1 as follows:

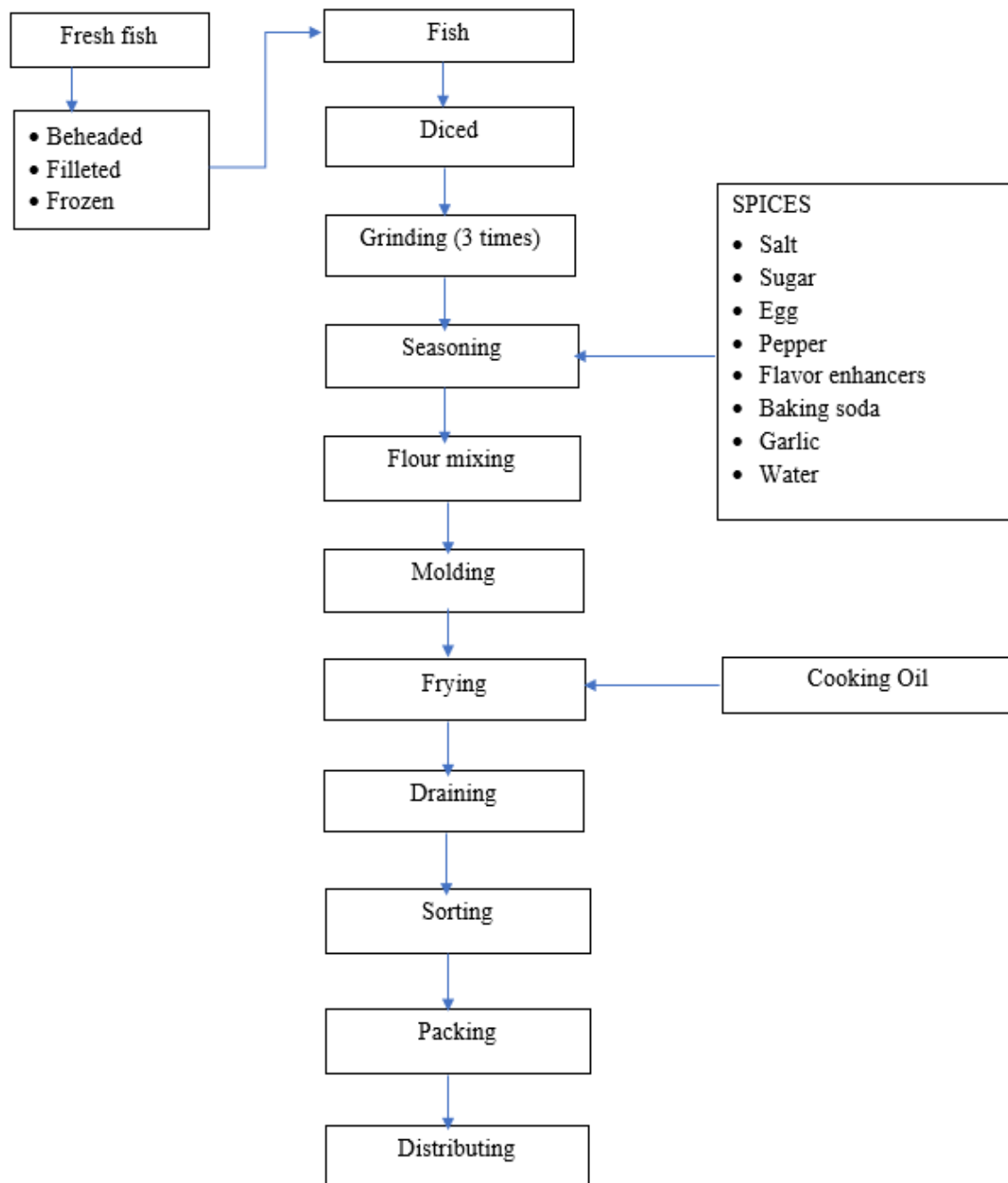


Figure 1. The Flowchart of Amplang Production

Hazard Identification

In the amplang production process, there are various types of hazards, including physical, chemical, biological, and ergonomic hazards.

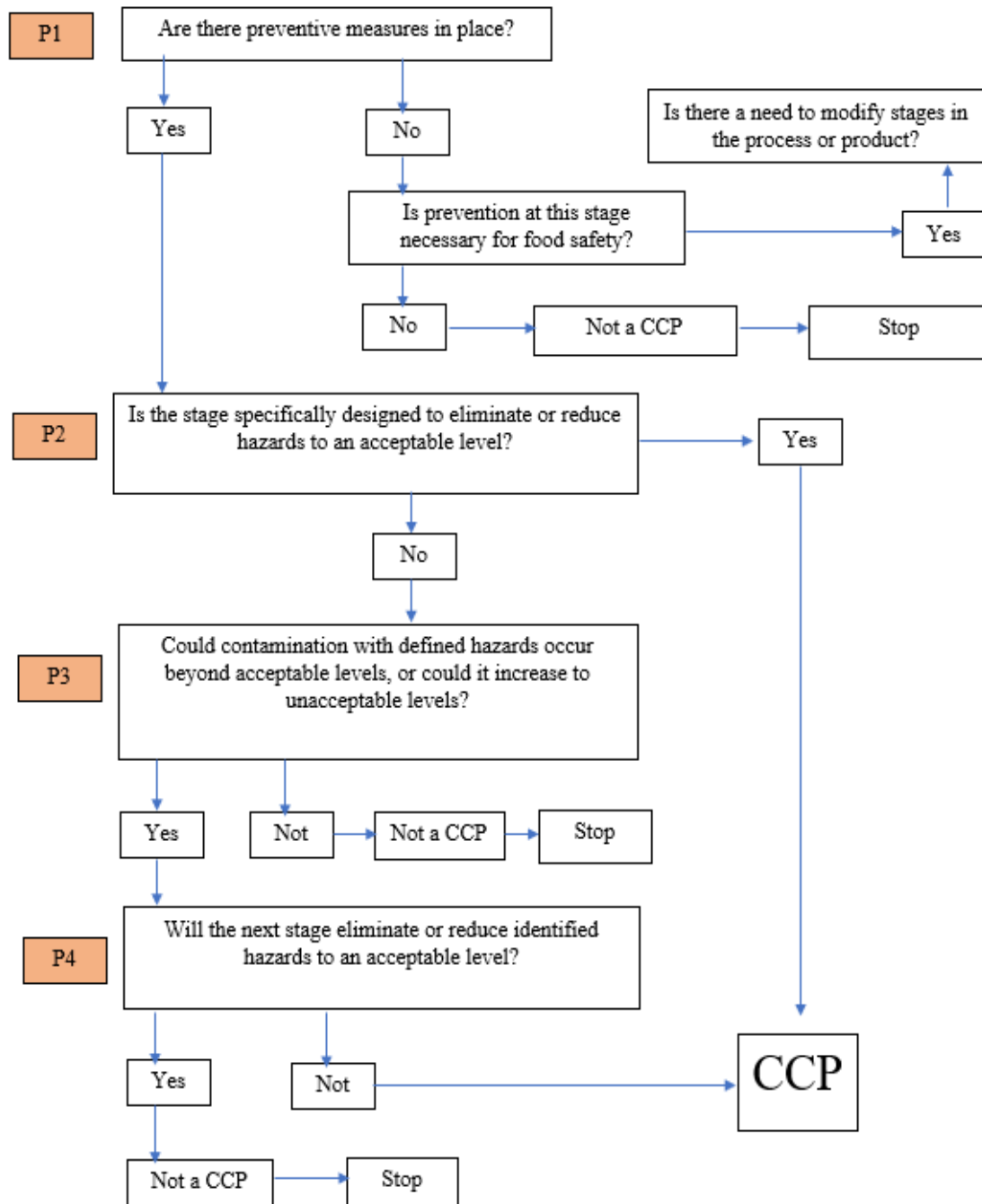
Determination of Critical Control Point (CCP)**Figure 1. Flowchart of Critical Control Point (CCP) Determination**

Table 1. Determination of Critical Control Point at UMKM X

No	Production Process	Hazard Source	Prevention	P1	P2	P3	P4	CCP/ Not a CCP
1	Receiving raw fish material (fish fillet)	Biological Factor (Bacteria <i>E. Coli</i> , <i>Salmonella sp</i>)	Pack the raw fish material properly and promptly place it in the refrigerator to avoid contamination.	Yes	No	No	-	Not a CCP
2	Fish Grinding	Physical Factor (Noise, Vibration); Biological Factor (Insects, Bacteria <i>E. Coli</i> , <i>Salmonella sp</i>); Ergonomic Factor (Repetitive motions, standing work posture)	Regularly clean the grinder after each use and maintain it to prevent corrosion, thereby avoiding physical and biological hazards.	Yes	No	Yes	No	CCP
3	Amplang Raw Materials Mixing (fish, flour, and seasonings)	Chemical Factor (Dust); Ergonomic Factor (Repetitive motions, Standing work posture)	Make sure that hands and feet are washed before entering the production area, and use gloves and head covers.	Yes	Yes	No	-	Not a CCP
4	Amplang Molding	Ergonomic Factor: Repetitive motions, Work posture	Make sure that hands and feet are washed before entering the production area, and use gloves and head covers.	Yes	Yes	No	-	Not a CCP
5	Amplang Frying	Physical Factor (Hot climate); Biological Factor (Bacteria <i>E. Coli</i> , <i>Salmonella sp</i>); Chemical Factor (Lead content in cooking oil); Ergonomic Factor (Work posture, cleanliness of the frying area)	Use non-slip footwear or install floor mats to prevent slipping.	Yes	Yes	No	-	Not a CCP
6	Amplang Sorting	Ergonomic Factor (Work posture, standing)	Ensure that the sorting area is covered to prevent contamination.	Yes	Yes	No	-	Not a CCP
7	Amplang Packaging	Physical Factor (Heat from packaging equipment); Biological Factor (Bacteria <i>E. Coli</i> , <i>Salmonella sp</i>)	Amplang products are promptly packaged, and workers use full PPE.	Yes	Yes	No	-	Not a CCP
8	Amplang Product Distribution	Ergonomic Factor (Manual Handling)	Products are securely packaged.	Yes	Yes	No	-	Not a CCP

Based on Table 1, the data shows that the Critical Control Point (CCP) is in the grinding process. Laboratory results indicate that the fish samples that have undergone the grinding process are not contaminated with bacteria. However, as a preventive measure, it is necessary to clean the grinding equipment after the grinding process to avoid bacterial, physical, or chemical contamination. This is because the equipment is made of iron, and there is a possibility of corrosion if it is not properly maintained or cleaned.

Determination of Critical Limits, Monitoring, Corrective Actions, and Verification

The establishment of critical limits at each CCP is done to prevent physical, chemical, and biological contamination in the amplang production process. The critical limits for each CCP in the amplang production process can be seen in Table 2.

Table 2. Critical Limit for CCP in the Amplang Production Process

CCP	Bahaya	Critical Limit	Monitoring	Corrective Action	Verification
Fish Grinding (CCP)	Growth of microbes (<i>E. Coli</i> , <i>Salmonella sp</i>)	Equipment is in good and clean condition, no dirt	Owner directly supervises the fish grinding process	If the grinding equipment is not clean or experiences damage, the owner will issue warnings or make repairs	Warnings or repairs by the owner

Raw materials are basic materials that can consist of fresh and processed foods that can be used to produce food (Guidelines for the Assessment of Food Raw Materials - BPOM RI 2020:4). Referring to the theory from this theory, the raw materials used in food production include amplang, which consists of fresh and processed foods such as fish meat, flour, chicken eggs, clean water, cooking oil, and seasonings such as salt, granulated sugar, pepper, flavor enhancers, baking soda, and garlic.

According to Hui, Cornillon, Lim, Murrel, and Nip (2004) in Widiyastuti, Sri, 2018:124), a flowchart process will identify the steps used in a specific production being reviewed. The flowchart usually illustrates the production process, in this case, the process of making amplang. The flowchart of the amplang production process at UMKM X starts with fresh fish, which is then beheaded, filleted, and frozen. UMKM X produces 15 kg per day and 10 kg per batch. Before production, the frozen fish is chopped, then ground three times, after grinding, the seasoning and flour mixing process is carried out, manually stirred using hands, and once the desired texture is achieved, it is molded and enters the frying process. After frying, it is drained, sorted, packaged, and distributed to the sales location. The amplang production process starts with grinding fish meat, mixing all raw materials into dough, molding on a special stainless steel table with a flat and non-peeling surface, and frying in a large frying pan, followed by draining. After draining and cooling, the products are sorted, packaged, and distributed.

According to Booklet Module for Food Production for Household Industries: Amplang Crackers - BPOM RI, 2017:5, in the flow or diagram of the amplang production process, grinding is only done once. Based on the description above, the number of fish meat grinding varies, with three times conducted in the research, and once according to the reference. The identification of hazards in food is essential to ensure food safety. Biological, chemical, or physical substances or conditions that can pose an undesirable health risk to consumers. According to NACMCF (1992), a hazard is defined as a biological/microbiological, chemical, physical property that can render food unsafe for consumption (Daulay, Sere Saghranie). In this study, there are several potential biological hazards, for example, the common ones are *E. Coli* and *Salmonella sp* bacteria in raw fish meat and other raw materials. In addition to biological hazards, there are also potential hazards

from physical factors such as noise, heat, ergonomic factors like repetitive motions, and chemical factors from dust.

The quality of raw materials, processing technology or methods, food contamination, and the determination of critical control points are characteristics to be considered and observed in producing safe processed food products. Food processing facilities that apply Good Manufacturing Practice (GMP) are expected to ensure not only the quality of the products but also the safety of the food from the production process to the hands of consumers. The implementation of GMP can be done by planning and preparing Hazard Analysis Critical Control Point (HACCP) documents, which function to analyze hazards and critical control points to ensure the safety of a food product (Putri, 2022). UMKM X, an informal sector engaged in the production of typical souvenirs from Balikpapan, including amplang, has implemented HACCP. This is evidenced by the presence of HACCP documentation and routine quality inspections of the products. Based on the examination results of bacteria from seven samples, including flour, fresh fish, ground fish, mixed dough, ready-to-mold dough, new frying oil, used frying oil, raw water used in dough mixing, and amplang products ready for packaging, it shows negative results or the absence of *E. coli* and *Salmonella* sp, and it does not contain Total Coliform MPN in tap water used in dough mixing.

In the development of HACCP, there are seven basic principles that need to be considered based on research (Kurniawan, 2016), namely hazard identification, determination of CCP, determination of critical limits for each CCP, monitoring CCP, establishment of corrective actions, establishment of verification procedures, and documentation and recording.

The determination of CCP is a stage to eliminate identified hazards, where CCP is determined based on the decision tree in preventing or eliminating potential hazards to an acceptable level (Sari, 2023). Based on Table 2, it is shown that 1 production process categorized as CCP is the fish grinding process.

The determination of critical limits at each CCP is carried out to prevent physical, chemical, or biological contamination in the amplang production process. Analyzing critical control points (CCP) aims to determine which part of the production process has the potential to cause hazards and the severity of the hazards in food processing (Widyastuti, 2017). Table 2 shows that the grinding process is categorized as a CCP. Based on Table 3, the fish grinding process, which is categorized as a CCP, has the hazard of microbial growth (*E. coli*, *Salmonella* sp) if the workers do not clean the equipment after use, causing the equipment to become moist and allowing the growth and development of bacteria that can affect the quality of food production. The monitoring is done by the owner directly supervising the fish grinding process, and for corrective action, if the grinding equipment is not clean or is damaged, the owner will issue a warning or make repairs. Laboratory results show that there is no bacterial contamination in the fish samples that have gone through the grinding process. However, as a preventive measure, equipment used for grinding should be cleaned after the grinding process to avoid bacterial, physical, or chemical contamination. This is due to the equipment is made of iron and is susceptible to corrosion if not properly maintained or cleaned.

CONCLUSION

The production process of UMKM X contains four types of potential hazards, namely, physical, chemical, biological, and ergonomic hazards. Hazard control and prevention are carried out by UMKM X Balikpapan by implementing the HACCP food safety system. Based on the production process of the field, from the receipt of fish raw materials to the distribution stage and delivery to the ship, there is one step that is defined as a critical point, or CCP, namely the process of grinding fish meat. At its implementation, UMKM X has implemented the HACCP system well and in accordance with the plan and has qualified for SNI 7763:2013. Furthermore, recommendations are given to prevent potential contamination later on, namely that owners are advised to choose suppliers of fresh fish raw materials that also implement food safety and personal

hygiene systems. Layout of the production site to be more organized by considering 5R/5S, so that it can prevent contamination of the raw materials of the product and the safety of UMKM X workers.

ACKNOWLEDGEMENTS

This article was written by Anis Rohmana Malik, Novita Lizza Anggraini, Mayati Issabella, Adiek Astika Clara Sudarni, Andre Saputra Pata'dungan, Mochammad Irfan, and Riany Eunike from Engineering Safety Study Program of the Department of Industrial Technology and Process based on the results of a research study entitled The Implementation of Hazard Analysis Critical Control Points in the Amplang Production Process at UMKM X, Balikpapan. This study is funded by the internal funding grant of the Institut Teknologi Kalimantan Institute through the PDM Scheme Research Grant Program in 2023. The content is entirely the responsibility of the authors

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