Designing food safety standards in beef jerky production process with the application of hazard analysis critical control point (HACCP)

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Abstract

Purpose – This paper aims to identify the hazards in the production process and designing standard operational procedure (SOP) in producing beef jerky (dendeng Lambok). This SOP is designed with the application of hazard analysis critical control point (HACCP) that aimed to be a standard guideline for producing dendeng lambok products that are safe for consumption.

Design/methodology/approach – Problems that are generally found in the food industry are that there are many products, which do not meet food safety standards so that these products are not safe for consumption. The method can be used in dealing with these problems is to apply HACCP and design the SOP for the production of dendeng lambok. The initial data used are a flow diagram of the dendeng lambok production process. Flowchart of dendeng lambok production process is needed to identify hazards in each process. Based on the identification of hazards in each process, a process is included in the critical control point (CCP). Furthermore, SOP is designed for processes that enter CCPs.

Findings – Based on the application of HACCP, there are four processes that are included in the CCP consisting of boiling beef, beef frying, chili frying and packaging. SOP is designed for processes included in the CCP so that they can be used as standard guidelines in the dendeng lambok production process in producing products that are safe for consumption.

Research limitations/implications – HACCP is a method that is widely applied to ensure the products produced are safe for consumption. Based on previous research studies, the application of HACCP can reduce the hazard to food and the resulting product is safe for consumption. The application of HACCP can also improve the safety and quality of products, thereby causing a decrease in overall costs and increasing company revenue.

Practical implications – This research can only be useful for one of the small and medium food-industries in West Sumatra, Indonesia. It is, namely, Asal Seiya Sekata (ASESE), Ltd. This is because the SOP is designed in accordance with the conditions and problems in the dendeng lambok production process at ASESE, Ltd.

Social implications – This research is expected to help ASESE, Ltd. in maintaining the quality and safety of the produced dendeng lambok products. HACCP is applied in the production process dendeng lambok done to minimize the hazards of each production process dendeng lambok. The SOP is given as a standard guideline in the production process of dendeng lambok in producing products that are safe for consumption.

Originality/value – SOP designed can be used as a reference or guideline in the production process of dendeng lambok to reduce hazards in the process that included in the CCP. SOP designed for boiling beef, beef frying, chili frying and packaging.

Keywords Food safety, HACCP, CCP, Beef jerky, Standard operational procedure

Paper type Research paper

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Introduction

The food industry is one of the sub-sectors in the industrial structure, where its existence is the most important part of agro-industry in Indonesia. Food companies are required to guarantee that the products produced are safe for consumption. All producers must apply hazard analysis critical control point (HACCP) (Toropilova and Bystricky, 2015). It is the best system currently available for maximizing the safety of meat and meat products, and food in general, which is why it has been recommended for use in the food industry and promoted by governments and scientific groups for decades (Tomasevic and Dekic, 2017).

HACCP is a food security guarantee that can be applied to produce safe products (Gandhi, 2008); while Motarjemi (2014) revealed that HACCP is a reference method for guaranteeing food safety. HACCP is able to reduce the risks associated with food hazards to acceptable levels (Ajidarma *et al.*, 2018). HACCP is a preventive approach to controlling hazards at every stage of the food chain, from primary production, processing, storage to marketing and consumption (Chen *et al.*, 2018). Tomasevic *et al.* (2012) and Hung *et al.* (2015) also defined that HACCP is a worldwide recognized systematic and preventive approach that is applied to the food industry to identify and control certain hazards such as biological, chemical and physical hazards, which include the use of materials, final products, facilities and people involved in CCPs. Ndiaye *et al.* (2018) also stated that HACCP is a system that identifies, evaluates and controls hazards that are significant in accordance with food safety standards.

Application of HACCP as a part of good manufacturing practices (GMPs) in food production has been obligatory and sometimes implemented mainly with the objective of satisfying the requirement of authorities or is seen as a task that is mandatory (Toropilova and Bystricky, 2015). GMPs are sometimes referred to as “control points” and are defined as the correct processes and procedures to be followed in the preparation of food to prevent microbial, chemical and physical contamination of the finished product (Tomasevic *et al.*, 2012).

Based on the results of the study by Kokkinakis *et al.* (2011), the implementation of HACCP has a positive impact on company functions, employee performance and quality standards for raw materials, which effectively reduce the average number of microorganisms. The result of the Ackah *et al.* (2018) showed that HACCP is effective in controlling and eliminating biological hazards, especially microbes in shito vegetable. The results of Jany *et al.* (2016) also shows that the application of HACCP in improving product safety and quality can cause a decrease in overall costs and increase company revenues. Gandhi’s (2008) research shows that the developed HACCP procedure can produce good quality products and is safe for consumption. This results in considerable possibilities in terms of exports and international standards.

There are limited studies that address the application of HACCP in designing a food safety management system in the meat processing companies. Yang *et al.* (2016) conducted a survey of food-borne pathogens in ready-to-eat (RTE) meat products in China. They analyzed the prevalence of food-borne pathogens in different product categories, market distribution, packaged forms, seasonal variation and regions. Samples were collected from catering, retail and wholesale sources in different seasons throughout the course of the year. They found that the packaging method played a consistent role in the prevalence of all four food-borne pathogens in packaged RTE meat products. Four food-borne pathogens are the microbial prevalence of *Listeria monocytogenes*, *Salmonella* spp., *Staphylococcus aureus* and diarrheagenic Escherichia coli. Maldonado-Siman *et al.* (2014) stated that HACCP is increasingly relied on to ensure food safety in both meat producing and meat-processing enterprises. They conducted a survey, which aimed to compare incentives costs, difficulties and benefits of Chinese and Mexican meat-exporting enterprises related to food safety management system implementation. While Luning *et al.* (2011) conducted a study to evaluate the food safety management system performance for three meat-processing companies by using the microbial assessment scheme diagnosis. *Listeria monocytogenes*, *Salmonella* spp., *Campylobacter* spp. (food safety indicators); *Escherichia coli* entero bacteriaceae (hygiene indicators) and total viable counts (overall performance) were analyzed at ten critical sampling locations covering both product and environmental samples.

Asal Seiya Sekata, Ltd. (ASESE, Ltd.) is one of the medium-sized companies that sell typical west sumatra food. ASESE, Ltd. sells a variety of food products, one of which is dendeng or jerky. Dendeng is a typical west Sumatra food made from beef. Beef is a food with high health risks (Muhandri *et al.*, 2015). This is because beef has an excellent nutrient content for the growth of pathogens (infectious agents) if supported by appropriate food or environmental conditions such as temperature, pH and water content (Sparringa, 2007).

ASESE, Ltd. produces two types of dendeng, namely, dried jerky (dendeng kering) and wet jerky (dendeng lambok). Dendeng lambok is a distinctive west sumatran food whose processing is different from beef jerky in general. Dendeng lambok is processed through boiling. Unlike other types of jerky that are generally processed through a drying process. Based on the method of processing, dendeng lambok has a high risk of food security. This is due to the boiling process in which the beef is tenderized with water at a certain temperature and time (Taufik, 2015). Lestari *et al.* (2017) revealed that the boiling process can produce high water content; high water content is a very good medium for the development of pathogenic microorganisms. Currently, ASESE, Ltd. does not have food safety standards for its dendeng lambok products. Therefore, food safety standards are needed so that the resulting dendeng lambok products are safe for consumption.

This study aims to identify hazards in the dendeng lambok production process and design the standard operating procedure (SOP) in producing dendeng lambok. The SOP is designed with the HACCP implementation, which later aims to be a standard guideline for producing dendeng lambok products that are safe for consumption.

Method

Conter *et al.* (2007) revealed that before implementing a HACCP system, a food (meat) business should already have in place various practices that may be collectively termed "prerequisite programs" (PRPs) (e.g. raw material specifications, staff training, hygienically designed facilities and good hygienic practices. This research is descriptive with a method of observation or field observation regarding the production process of dendeng lambok. Data processing consists of descriptions of dendeng lambok products, identification of consumer targets and product use plans, preparation of flow charts, hazard analysis, determination of CCPs, and CCP limits, monitoring, corrective actions, verification procedures and SOP design. The design of the food safety management system for dendeng lambok begins by implementing the HACCP principles or the sixth HACCP step. After the entire process flow diagram is verified on-site, this study proceeds to hazard analysis identification. The hazard identification refers to several standards and food regulations, three of which are KBPOM No. HK. 00.06. 1. 52. 4011; SNI 7387:2009; and SNI 3932:2008. Further, the significance of each potential hazard is based on data from CODEX (Indonesian Ministry of Health, 2003; Indonesian Ministry of Industry, 2010); and Indonesian National Standard (SNI).

The CCPs are determined based on the process flow diagram and hazard analysis. Moreover, the critical limit and monitoring system are designed for each CCP, accordingly.

To minimize potential hazards, the monitoring system defines three specific components for each point, namely, procedure, frequency and person in charge. Finally, documents and the record-keeping procedure is defined properly. Appropriate documentation benefits the company when it requires a data-driven root cause analysis, CCP monitoring or performance appraisal for certification.

Results and discussion

Product description

The product description is done to identify the type, ingredient, method of serving and storing of the food. The descriptions of *dendeng lambok* products can be seen in Table I.

Identify consumer goals and product use plans

The target of consumers for beef jerky products is intended for all groups. Dendeng lambok products are RTE products and are recommended to be preheated before they are consumed.

The organization of flow charts

The flow chart of the *dendeng lambok* production process is prepared by listing all the ingredients used in full along with the processing process to become finished products. The flow chart of the *dendeng lambok* production process can be seen in Figure 1.

Hazard analysis

Hazard analysis is carried out at each stage of the *dendeng lambok* production process. The hazards consist of chemical, biological and physical hazards. Hazard analysis can be seen in Table II.

Supporting or additional ingredients consist of shallot, garlic and ginger. Details of hazard identification can be seen in Table III.

Determination of critical control points and critical limits

Tomasevic and Dekic (2017), who conducted a survey in the Serbian meat industry found that the most widely followed PRPs in the surveyed companies were cleaning and sanitation, temperature control, pest control and the control of the health and hygiene of the employees, all above 90 per cent among the surveyed meat producers. Based on SNI 01-4852-1998, the CCP is a step in which control must be applied and carried out as an effort to prevent or eliminate or reduce the food safety hazards to an acceptable level. The determination of CCPs is done based

Name of the product	Dendeng lambok
Ingredients	Beef, red chili, garlic, shallot, ginger, salt and monosodium glutamate
Primary packaging	Vacuum nylon bag
Secondary packaging	Cardboard box
Preservation method	–
Storing temperature	Room temperature and −5°C
Distribution method	Room temperature
Expiration date	one month at −5°C, five days at room temperature
Consumer requirement	–
Consumer target	General
Preparation before consumption	Preheated before consumption

Table I.
The descriptions of dendeng lambok products

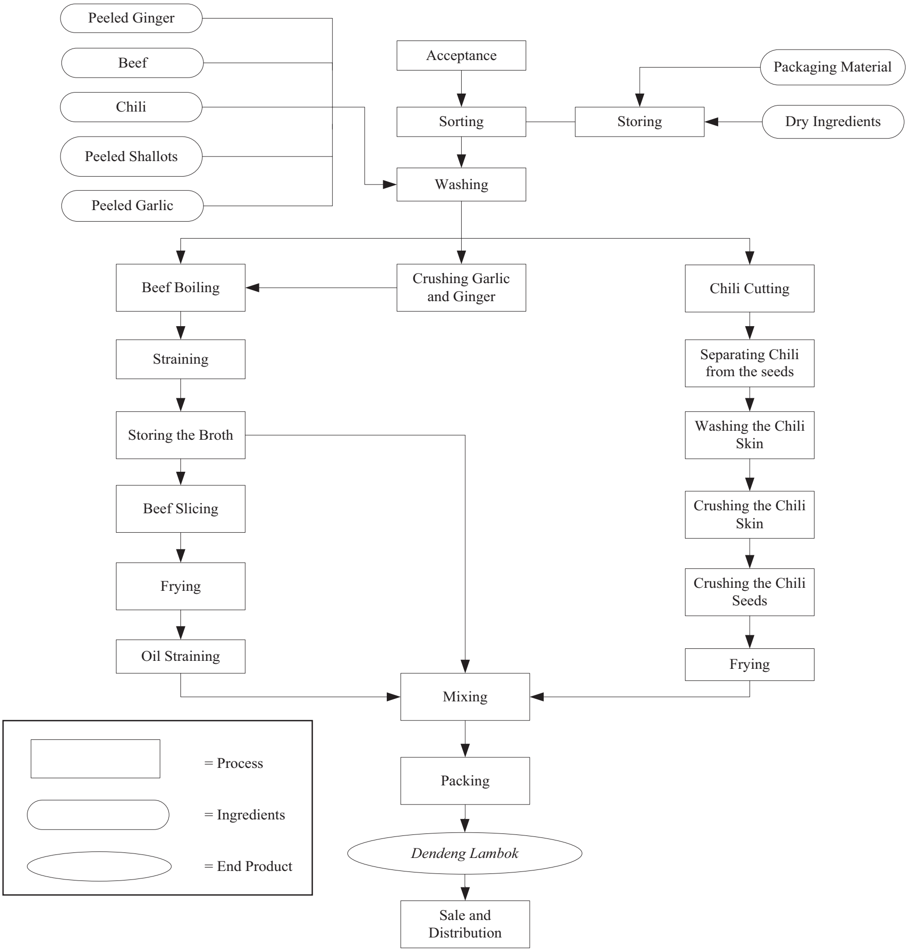

Figure 1.
The flowchart of dendeng lambok production process

on a decision. Based on SNI 01-4852-1998, the critical limit is a criterion used as a reference in separating acceptable and unacceptable conditions. In addition to SNI 01-4852-1998, other standards are used as references in the determination of the CCP and their critical limits are SNI 7313:2008 used as reference to determine maximum limit of pesticide residues on agricultural products; SNI 01-2908-1992 for beef jerky; SNI 01-3933-1994 for dried ginger as raw material for beef jerky cooking spices; SNI 7387:2009 used as reference in determining maximum limit of heavy metal contamination in food; and regulation of Indonesian Ministry of Agriculture (2011) no. 88/Permentan/PP.340/12/2011 for maximum limits on chemical contamination, biological contamination and prohibited chemicals. Determination of CCP and critical limits of CCP can be seen in Table IV.

Table description:

- Q1 = Does a control measure exist? If not then not the CCP, if yes, proceed to the next question.

Table II.
Hazard analysis
(B = biological,
C = chemical, and
P = physical)

Raw material		Packaging material		Dry ingredients	
Beef B, C, P		Vacuum bag nylon P		Salt P	
Supporting material B, C		Box P		Monosodium glutamate P	
Chili B, C, P					
Cooking oil C					
Water B, C, P					
Flow diagram					
Beef	Supporting material	Chili	Packaging material	Dry ingredients	Cooking oil
1. Acceptance B	2. Acceptance B	3. Acceptance B	4. Acceptance B	5. Acceptance B	6. Acceptance B
7. Sorting B	8. Sorting B	9. Sorting B	10. Storing P	11. Storing P	12. Storing P
13. Washing B, C, P	14. Washing B, C, P	15. Washing B, C, P			
18. Boiling B, C, P	19. Crushing garlic and Ginger P	20. Chili cutting P			
21. Straining B, P		22. Separating chili from the seeds B, P			
23. Storing the broth P		24. Washing the chili skin P			
25. Beef slicing P		26. Crushing the chili skin P			
27. Frying B, C, P		28. Crushing the chili seeds B, P			
29. Oil straining B, P		30. Frying B, C, P			
		30.Mixing			
			31. Packing B, P		
			32. Sale and distribution		

	Possible biological hazard	Possible chemical hazard	Possible physical hazard
Ingredients/materials			
Beef	Salmonella sp, escherichia coli, staphylococcus aureus, ALT, coliform, bacteria from the raw materials that can rot and decay the beef	Pesticide residues and heavy metal contamination from raw materials and slaughterhouses	Bone and feather fragments, soil dirt, and gravel contamination originating from the slaughtering process
Supporting materials	Fungi and bacteria that cause rotting may appear due to the moist condition	Pesticide residues and heavy metal contamination from raw materials	
Chili	Fungus due to improper handling can accelerate the decaying process	Pesticide residues and heavy metal contamination from raw materials	Twigs, leaves carried by chili suppliers
Packaging materials			Pieces of plastic from suppliers and dust from the storage room.
Dry ingredients			Dirt coming from the supplier or physical damage to the packaging material that allows dirt to enter the plastic package
Frying oil		Contamination of heavy metals from these raw materials	
Air	Coliform and feces coli from the contaminated well	As, Fe, F, Cd, CaCO3, Cl, Cr, Mn, No3-N, No2-N, PH, Zn, Cn, SO4, Pb, detergent as MBAS, KMnO4, NH3-N, selenium, Cu, aluminum from the contaminated neighborhood	The smell, dissolved solids, turbidity, taste, temperature and color of contaminated well water
The cookware		Cookware washing soap residue	Dirt from unclean residual usage and washing. Dust from open storage
Processing steps	*Possible Biological Hazard*	*Possible Chemical Hazard*	*Possible Physical Hazard*
Acceptance	*Escherichia coli*, *Staphylococcus* aureus, *salmonella*, and flies from the unhygienic environment		
Sorting	*Staphylococcus* aureus and decomposing bacteria		

(*continued*)

Table III.
Hazard identification in ingredients and the overall process

	Possible biological hazard	Possible chemical hazard	Possible physical hazard
	originating from the workers' hands		
Storing			Dirt and dust from the storage room
Washing	Pathogenic bacteria due to unclean washing. Coliform and coli feces from contaminated well water used	As, Fe, F, Cd, CaCO3, Cl, Cr, Mn, No3-N, No2-N, PH, Zn, Cn, SO4, Pb, detergent as MBAS, KMnO4, NH3-N, selenium, Cu, aluminum from the well water	Dirt, bone and blood due to unclean washing. Odor, dissolved solids, turbidity, taste, temperature and color of well water
Boiling	Pathogenic bacteria if the standard boiling temperature is not reached	As, Fe, F, Cd, CaCO3, Cl, Cr, Mn, No3-N, No2-N, PH, Zn, Cn, SO4, Pb, detergent sebagai MBAS, KMnO4, NH3-N, selenium, Cu, aluminum from the well water	Odor, dissolved solids, turbidity, taste, temperature and color of well water used
Spice crushing and grinding			Odor, dissolved solids, turbidity, taste, temperature and color of well water used
Chili cutting			Dirt from the knives used
Water sieving	Pathogenic bacteria if the water content is high as a result of improper draining		Dirt from the sieve used
Broth storing			Dust from air contamination due to open storage
Separating the chili from the seeds	Pathogenic bacteria from the workers' hands		Dirt from the knives used
Washing the chili			Odor, dissolved solids, turbidity, taste, temperature and color of well water used
Slicing the beef			Dirt and metal debris from the equipment used
Chili crushing			Dirt from the equipment used
Frying	Pathogenic bacteria will retain if the frying temperature is not reached	Free fatty acids and benzene compounds due to repeated use	Dirt from the cookware used and from the previous frying

Table III.

(*continued*)

	Possible biological hazard	Possible chemical hazard	Possible physical hazard
Frying oil draining	Pathogenic bacteria due to high oil content from improper draining		Dust and air contamination due to open process
Chili seed crushing			
Mixing			
Packaging	Pathogenic bacteria if the packing temperature is not higher than 80°C		Metal debris from the equipment that is generally made of stainless steel
Sale and distribution			

Table III.

Stages of process	Hazards	Q1	Q2	Q3	Q4	CCP	CCP limits
Beef boiling	B: pathogenic bacteria C: As, Fe, F, Cd, CaCO3, Cl, Cr, Mn, No3-N, No2-N, PH, Zn, Cn, SO4, Pb, detergent as MBAS, KMnO4, NH3-N, selenium, Cu, aluminum from the well water P: odor, dissolved solids, turbidity, taste, temperature and color from the well water used	Yes	No	Yes	No	CCP-1	The duration is 90 min at temperature 100°C-110°C
Beef frying	B: pathogenic bacteria and spore C: free fatty acid and benzene compounds P: frying residue	Yes	No	Yes	No	CCP-2	The duration is 10 min at temperature 175°C-180°C
Chili frying	B: pathogenic bacteria and spore C: free fatty acid and benzene compounds P: frying residue	Yes	No	Yes	No	CCP-3	The duration is 15 minutes at temperature 175°C-180°C
Packing	B: pathogenic bacteria if the temperature is not more than 80°C P: Metal debris from stainless steel equipment	Yes	No	Yes	No	CCP-4	The temperature of dendeng lambok is 85°C-90°C during the packing process and clear from metal debris

Table IV.
CCP and critical limit of CCP

- Q2 = Are stages specifically designed to eliminate or reduce hazards that may occur to acceptable levels? If so then CCP, If not then go on to the next question.
- Q3 = Can contamination with identified hazards occur beyond acceptable levels or can this increase to an unacceptable level? If not then CCP, if so then go on to the next question.
- Q4 = Will the next stage eliminate the identified hazards or reduce the level of probability of occurrence to an acceptable level? If so then not CCP, if not, it is CCP.

The processes that are included in the CCP consist of beef boiling, beef frying, chilli frying and packaging. Boiling beef is designated as CCP-1 because of the hazards contained in the beef, which contains invisible chemical and biological hazards and the water used. The beef is sorted to separate meat that is not physically acceptable. There is no chemical and biological hazard test done to the beef prior production. Therefore, there is a possibility that the meat used contains chemical hazards consisting of pesticide residues, heavy metal contamination and biological hazards consisting of *Salmonella* sp, *Escherichia coli*, *Staphylococcus* aureus, coliform, total plate number and microorganisms. ASESE, Ltd. also uses well water to boil the beef. Proper processing such as temperature and boiling time can reduce hazards to acceptable limits (Gustianti, 2009). The critical limit of boiling beef that must be applied is boiling for 90 min at a temperature of 100°C-110°C. Determination of temperature at the stage of boiling beef meat is based on research conducted by Sari *et al.* (2016). They stated that the initial boiling temperature of 100°C was the optimal temperature for boiling beef because it produced the best beef stew based on the chemical, physical and organoleptic analysis. In addition, Soeparno (2005) argued that boiling beef above 100°C can kill all microorganisms. Determination of boiling time is also based on interviews with cook expert on ASESE, Ltd. She said that to get the optimal meat texture, it would take 90 min of boiling time.

Beef frying is designated as CCP-2. This is because the frying pan uses cooking oil, which has the potential for chemical hazards, namely, heavy metal contamination. The use of oil should not be more than twice because it can be carcinogenic. Besides, the use of cooking oil that is too long and the temperature exceeds the normal limit (168°C-196°C) can cause faster oil degradation (decrease in the smoke point), which can cause itching in the throat. Therefore, using the right temperature and time can reduce the danger. The critical limit on meat frying is frying meat at a temperature of 175°C-180°C for 10 min. Determination of temperature at beef frying stage is based on research conducted by Sartika (2009). She suggested that the frying process should be done over medium heat (<200°C) because at this temperature the initial formation of trans fatty acids, and cooking oil used to fry meat should not exceed two repetitions. The timing of meat frying is based on the amount of fried meat, which is generally cooked after about 10 min frying with a temperature of 175°C-180°C.

Chili frying is designated as CCP-3. This is because chili frying using cooking oil. Cooking oil has the potential for chemical hazards such as heavy metal contamination. SNI-01-3741-2002 is a standard that is used as a reference in determining potential hazards for cooking oil. While SNI 4480:2016 used as guidance in determining potential hazards for red chili. In frying the chili, temperature and time aspects are important. This is because if the temperature used ranges from 5°C to 57°C, it can cause bacteria to grow faster and the bacteria can double its growth rate every 20 min. Time or frying duration also determines the quality of chili. If the time to fry chili does not reach a specified time, it can cause the chili to become uncooked. Uncooked Chili can pose a health risk to consumers. For this reason, you need the right control, such as the temperature and time of chili frying. The critical limit of chili frying is frying for 15 min at a temperature of 175°C-180°C. Ilmi *et al.* (2015) stated that fatty acids tend to be stable because the temperature used during frying is not too hot, ranges from 150°C to 165°C with a frying cycle that takes 30 min.

Finally, the packaging is designated as CCP-4 because the packaged dendeng lambok will be directly distributed to consumers without any further processing. The critical limit in the packaging process is to package the dendeng lambok directly after it is cooked at a temperature of 85°C-90°C to prevent the development of bacteria and air contamination. In addition, the action that can be taken is to use a metal detector to prevent metal debris inside the product. Zulfana and Sudarmaji (2008) argue that an effective and easy way to kill microorganisms is by heating at a temperature of 70°C-100°C. Thus, it can be concluded that the critical limit of packing temperature is 85°C-90°C and this can certainly destroy pathogenic bacteria.

Monitoring, corrective action and verification procedure

Based on SNI 01-4852-1998, monitoring was carried out as an effort to ensure processed foods were safe for consumption by measuring and monitoring each CCP. Corrective action must be taken if there is a deviation. Corrective actions must ensure that the CCP is under control. While verification procedures are carried out to confirm that all elements of the HACCP plan are going well. Verification procedures can be in the form of audits, procedures and tests, random sampling, and calibration of the equipment used. Monitoring, corrective actions and verification procedures can be seen in Table V.

Fulfillment analysis of prerequisite programs

The purpose of prerequisite programs is to guarantee the continuity of the production process and wellness of the environment during the implementation of HACCP. This research analyzed the fulfillment of two prerequisite programs, namely, GMPs Analysis and sanitation standard operation procedures (SSOP). The GMP is a system that ensures each product to be produced and controlled according to its required standards. The GMP analysis is based on 75/M-IND/PER/7/2010 food processing regulation of Indonesian Ministry of Industry (2010). Based on such standard, there are six aspects that are currently unfulfilled, namely, construction, laboratory, product labeling, sanitation and maintenance,

Stages of process	CCP	CCP limit	Observation procedure	Corrective action	Verification procedure
Beef boiling	CCP-1	The duration is 90 min at temperature 100°C-110°C	Thermometer and stopwatch are used for measuring the temperature and time	Time and temperature adjustment. Replacing the well water into drinking water	Calibrating the thermometer and water testing
Beef frying	CCP-2	The duration is 10 min at temperature 175°C-180°C	Thermometer and stopwatch are used for measuring the temperature and time	Time and temperature adjustment	Calibrating the thermometer and product testing
Chili frying	CCP-3	The duration is 15 min at temperature 175°C-180°C	Thermometer and stopwatch are used for measuring the temperature and time	Time and temperature adjustment	Calibrating the thermometer and product testing
Packing	CCP-4	The temperature of dendeng lambok is 85°C-90°C during the packing process and clear from metal debris	Thermometer and metal detector are used to measure the temperature and metal debris	Reheating if the desired temperature is not reached. Separating the products contaminated with metal debris	Calibrating the thermometer random sampling for product testing

Table V. Monitoring, corrective action and verification procedures documentation and human resource training. Furthermore, the analysis on SSOP is conducted to control, monitor and improve the sanitation aspect of the factory and its surrounding environments. The SSOP analysis is based on 715/MENKES/SK/V/2003 food hygiene and sanitation regulation of the Indonesian Ministry of Health (2003).

Designing the standard operational procedure

The SOP is designed as a form of food safety standards. SOPs are designed for processes that are included in the CCP based on improved work procedures. The following are SOPs for beef boiling, beef frying, chili frying and packaging:

Beef boiling. The person in charge: kitchen staff

Procedures:

- The staff wears work equipment consisting of gloves, headgear, apron and shoes.
- Make sure the water used does not smell, clean and clear, if the water does not match the qualification, the water is replaced with drinking water.
- Prepare a meat boiling pan. Add water, finely grinded garlic and ginger then boil together.
- The filtered meat is put in a pot filled with boiling water.
- Boiled meat at a temperature of 100°C-110°C for 90 min with the pan closed. During boiling, temperature and time monitoring are carried out according to the boiling meat form.
- The boiled meat is placed in a stainless steel container with a sieve and covered with a non-perforated container to hold down the water.
- The broth is separated in a closed container.

Beef frying. The person in charge: kitchen staff

Procedures:

- The staff wears work equipment consisting of gloves, headgear, apron and shoes.
- Prepare the spatulas, pans, perforated stainless steel containers, non-perforated stainless steel containers, and cooking oil. Make sure the equipment used is clean and dry. Add the cooking oil and preheat it first.
- Fry the meat according to the pan capacity.
- The meat is fried at 175°C-185°C for 10 min. Temperature and time monitoring is measured by using a thermometer and stopwatch. The staff then fills out the temperature and time monitoring form for beef frying.
- Cooking oil can only be used twice.

Chili frying. The person in charge: kitchen staff

Procedures:

- The staff wears work equipment consisting of gloves, headgear, apron and shoes.
- Prepare the spatulas, pans, stainless steel containers and cooking oil. Make sure the equipment used is clean and dry. Add the cooking oil and preheat it first.
- Add the crushed or grinded chili into the pan.
- The chili is fried at a temperature of 175°C-180°C. The staff fills out in the temperature and time monitoring form. Chili frying is done by stirring the chili for 5

min. Add the broth water (boiled water). Two min later when the chili is half cooked, add the beef jerky and stir until cooked. The total time for chili frying is 15 min.

Packaging. The person in charge: kitchen staff
Procedure:

- The staff wears work equipment consisting of thick gloves, headgear, apron, mask and shoes.
- Prepare vacuum nylon plastic bags, 250 and 500 g, cardboard boxes, sealers, stainless steel spoons, stainless steel funnels, plastic baskets and digital scales.
- Dendeng lambok is brought from the production room to the packaging room by using a trolley.
- Measure the temperature of the dendeng lambok is at 85°C-90°C during the packaging process if it is not reheated. The temperature is monitored by filling in the temperature and time monitoring form.
- Insert the bottom of the funnel into the plastic and hold the funnel. Add dendeng lambok according to the size of the plastic bags and weigh it.
- The plastic is covered with a sealer and then passed to a metal detector to prevent any metal debris. The packaged products are then stacked in a plastic basket. The products identified as having metal fragments will be placed in a special box and labeled as rejected products.

Conclusion and recommendation

The conclusion of this study is that there are four processes that are included in CCP, namely, beef boiling, beef frying, chili frying and packaging. The critical limit of each CCP is aimed to control temperature and time in preventing the growth of microorganisms and preventing damages or hazards to food.

The advice that can be given to ASESE, Ltd. is to conduct temperature monitoring routinely in the process of boiling beef, beef frying, chili frying and packaging using the temperature and time monitoring form as documentation while the recommendations that can be given is in the form of SOP design. It is recommended that the SOPs designed can be implemented and product testing to see the effectiveness of the HACCP and SOPs designed.

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