ISBN : 978-602-14917-9-9

IMPLEMENTATION AND ASSESSMENT OF FOOD SAFETY SYSTEM IN A SMALL DAIRY PLANT AT KALIGONDO AREA, BANYUWANGI, EAST JAVA, INDONESIA

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Abstract. This article aims to present the results of implementation and assessment of food safety system in a small dairy plant located in Kaligondo Area, Banyuwangi, East Java, Indonesia. A small dairy plant has developed by two groups of dairy cow farmers, Sumber Lumintu and Sido Makmur, and produces pasteurized fresh milk and its derivatives. There are some steps to implement food safety system including a diagnosis of prerequisites based on BPOM requirements, implementation of good manufacturing practices (GMPs), sanitation standard operating procedures (SSOPs), and hazard analysis and critical control point (HACCP). Assessment results of initial diagnosis showed that conformity of 59 items observed achieved 76,1%. GMP, SSOP, and HACCP had met requirements for Kaligondo dairy plant. However, the main difficulties encountered for the implementation of food safety system were related to the implementation of actions established in the flow chart and to the need for constant training/adherence of the workers to the system. Despite this, the implementation of the food safety system was shown to be challenging, but feasible to be reached by small-scale food industries in Kaligondo area.

Keywords-GMP, SSOP, HACCP, CCP, BPOM

1. Introduction

The implementation of three components including GMPs (Good Manufacturing Practices), SSOPs (Sanitation Standard Operating Procedures), and HACCP (Hazard Anaylisis and Critical Control Point) are important keys to be fulfilled in a food safety system [1]. The term of GMP is a system for making sure that products are consistently produced and controlled according to quality standards. It is implemented to ensure safety of food and compliance with agencies that control the authorization and sale of food and beverages [2]. In Indonesia, the authority to control food safety for protecting public health is The National Agency of Drug and Food Control of Republic of Indonesia or NADFC (Indonesian: Badan Pengawas Obat dan Makanan) or BPOM. Moreover, HACCP system is a systematic preventive approach to food safety from unwanted disruption (biological, chemical, and physical hazards) in production process that can cause the finished product to be unsafe and designs measures to reduce these risks to a safe level [3]. HACCP system will identify all critical control points (CCPs) in production process to guarantee food safety. A key to success in implementing HACCP is depend on implementation of GMPs and SSOPs as basic requirements in food processing mechanism [4].

In Kaligondo area, Banyuwangi, East Java, Indonesia, the implementation of HACCP system in a small diary plant is fundamental importance to public health, since this segment is mainly composed of a variety of small to medium sized industries that supply a large proportion of the population. The

ISBN : 978-602-14917-9-9

objective of the present study was to report the implementation of a food safety system in a small dairy processing plant at Kaligondo area, to examine the challenges encountered, and to assess the role of food handlers' training in the implementation of the system.

2. Materials and Methods

2.1. Dairy processing plant characteristics at Kaligondo area

The observation location for this study was in small diary plant at Kaligondo area, Banyuwangi, East Java, Indonesia that produced approximately 1800 L of milk per week. Implementation of HACCP system was applied for line production of pasteurized fresh milk.

2.2. Food safety systems implementation

The first step for implementation of food safety systems is to recognize the initial prerequisite programs of the GMPs and SSOPs and its implementation. To diagnose initial prerequisite was carried out a meeting with Kaligondo staff in charge of the diary in order to provide objectives, responsibilities according to the costs involved, profit gained, and obstacles in the implementation of the system.

Based on those conditions, a team that was responsible for making coordination and making corrections in GMPs and HACCP implementation was formed. Then, to be responsible for food handler was created a HACCP team. A HACCP team coordinated with dairy processing plant manager.

The second step was to evaluate dairy status in relation to prerequisite programs (programs diagnosis) implementation. Diagnosis was conducted by visiting areas of dairy at Kaligondo, including both internal and external areas, using a check list consisted of 80 questions covering building layout, equipments, furniture list and utensils, food handlers, food production, transport, and documentation. There was three items in the check list to classify field conditions namely 1) conforming when the requisite was fully adhered to; 2) not conforming when the requisite was partially or not adhered to; and 3) not applicable. Furthermore, we classified the percent of conformity from processing plant with calculating the percentage both of conformities per section and nonconformities per section.

To make improvements to the GMPs and SSOPs adoption, the HACCP team had to do making coordination and implementation of the corrective measures. The HACCP team should provide follow-up to the implementation of the program diagnosis. Corrective actions and re-evaluation of nonconformities are carried out in conjunction with other activities in the implementation of food safety system.

2.3. Food handlers training

To obtain knowledge of food handlers relating with GMPs and also their hygiene habits was prepared an individual questionnaire. Based on the result of individual questionnaire answered by food handlers, a GMP course was conducted for dairy staff or workers at Kaligondo area to explore the knowledge by describing present conditions of the dairy (shown by photos and figures of current conditions of dairy).

To get accurate evaluations in accordance with the requirements indicated by law, an open debate was held between these workers regarding GMPs. Furthermore, current and new workers at Kaligondo area had to implement the result obtained from training course to make them aware of the importance of this tool in the safety of processed products. There was three training courses given to the workers namely: GMP, SSOP, and HACCP as shown in Table 1. Changes in behavior and difficulties encountered before and during food safety system implementation were inspected by the team responsible, making it easier for future action.

ISBN : 978-602-14917-9-9

Table 1. GMP, SSOP, and HACCP training given to workers from dairy industry at Kaligondo area

Training Courses	Check List
GMP	1. Production chain definition 2. Food safety and defilement definition 3. Defilement types 4. The Importance of microbiological defilement 5. Food borne diseases (definition, symtoms) 6. Microorganisms growth (suitable conditions) 7. Microorganisms defilement (elimination, inhibition, prevention) 8. GMP definition 9. Apply GMP principles 10. Worker's habits for foods correct handling 11. GMP advantages (food safety, longer shelf-life, reduced losses, better working environment, consumer satisfaction) 12. Change the behaviour and commitment of all employees
SSOP	1. SSOP instructions 2. How to prevent defilement 3. Types of surfaces to be cleaned and cleaning agents 4. Situations for an effective cleaning (water temperature, solution concentration, exposure time, mechanical action) 5. The hygiene process phases (pre-rinsing, detergent solution, rinsing, sanitizing) 6. Work instructions presentation
HACCP	1. Observation supply chain, food safety, defilement types 2. How to keep defilement away 3. HACCP definition 4. HACCP principles 5. Acquire of the hazards 6. Pasteurized fresh milk production flowchart 7. CCPs identification and their critical limits 8. Monitoring methods 9. Records (importance of the correct completion) 10. HACCP benefits

In line with GMP and SSOP implementation, the HACCP system is also applied to the pasteurized fresh milk processing line. Furthermore, HACCP team worked on preparing the HACCP plan per se, following all the initial activities and applying the seven HACCP principles as denoted by [5]. In the section of analysis of hazard, in addition to the hazards and harmlessness of food (biological, chemical and physical) as denoted by [5], hazards that cause loss of product. Fresh milk, raw materials, and processing environment were needed hazards monitoring from physical, chemical, or microbiological. Based on [5], the decision tree was used to identify process CCPs. Limit determination for each CCP was depend on literature, law, and expertise of HACCP team. Safety limits could be set below critical limits in some cases. Procedures of CPP monitoring were set up, taking into account ease of measurement and speed in obtaining results and correcting deviations. A worker in dairy had responsibilities throughout the implementation of monitoring procedures including visual

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observations, measurements, laboratory analyses, and period of application. If there was CCP incident caused by out of control, the corrective action should be applied. All incidents during the monitoring procedure of CCP and corrective action were recorded in the log book. To reach the aim, control and analysis spreadsheets available in the dairy, were changed and altered, allowing space to note the corrective actions applied and the name of the worker responsible.

3. Results

3.1. GMPs and SSOPs assessment and implementation

In the initial diagnosis for implementation of the GMPs, conformity of 76.1% with legislation was observed for the items analyzed (Table 2). The item ‘‘food handlers’’ presented the highest percentage of conformity (87,5%; n = 7), whereas the item ‘‘building and facilities’’ presented the lowest value (66,7%; n = 20). Table 3 shows the main nonconformities found after carrying out the initial diagnosis in the dairy processing plant. A flow chart was prepared by the HACCP team in order to correct the nonconformities and was put into practice between July and September of 2019.

Table 2. Conformity (%) of the dairy industry at Kaligondo area in terms of implementation of good manufacturing practices

Analyzed parameters	Total of analyzed items	Number of conforming items	Conformity (%)
Buildings and facilities	30	20	66,7
Equipments and utensils	11	8	72,7
Food handlers	8	7	87,5
Production and transportation of foods	17	14	82,4
Documentation	14	10	71,4
Total	80	59	76,1

Table 3. Nonconformities Related to Good Manufacturing Practices (GMPs) Found at the Audited Dairy Industry

Item	Nonconformitities
Buildings and facilities	External door without automatic closing Absence of records from the hygiene of facilities Absence of a person that is responsible for cleaning the water tank and its documentation
Production and transportation of foods	Failure in the controlling and access of the workers in the production area Transportation of the final product in inadequate temperature, endangering the integrity of the product

3.2. Training role in food safety systems implementation

During the training sessions, it was evident that, although most of the workers knew what food contamination meant, they had never received training before. In addition, greater resistance to changes in habits and conduct with respect to hygiene could be observed with time by the longer-term workers, as compared to those recently admitted. Another difficulty encountered was the high turnover of workers, impeding the consolidation of a team with the desired work standard and resulting in improvements taking longer than expected. It was found that some workers had problems filling in the

ISBN : 978-602-14917-9-9

CCP monitoring records, either due to forgetfulness or because they failed to recognize the importance of doing it.

3.3. HACCP system implementation

The hazard analysis could affect the safety and quality of the food and determination of the CCPs, indicated a total of 11 CCPs: (1) reception of the raw milk, (2) storage of the raw milk, (3 and 4) reception of the ingredients and packaging, (5) milk pasteurization, (6) cooling, (7) addition of ingredients, (8) filling, (9) storage of the finished product, (10) dispatching of the product, and (11) sanitization of the equipment (Figure 1). During implementation of the HACCP system for the pasteurized fresh milk production line, it was observed that four of the 11 CCPs had not been maintained completely under control, whereas for the others the deviations were promptly corrected.

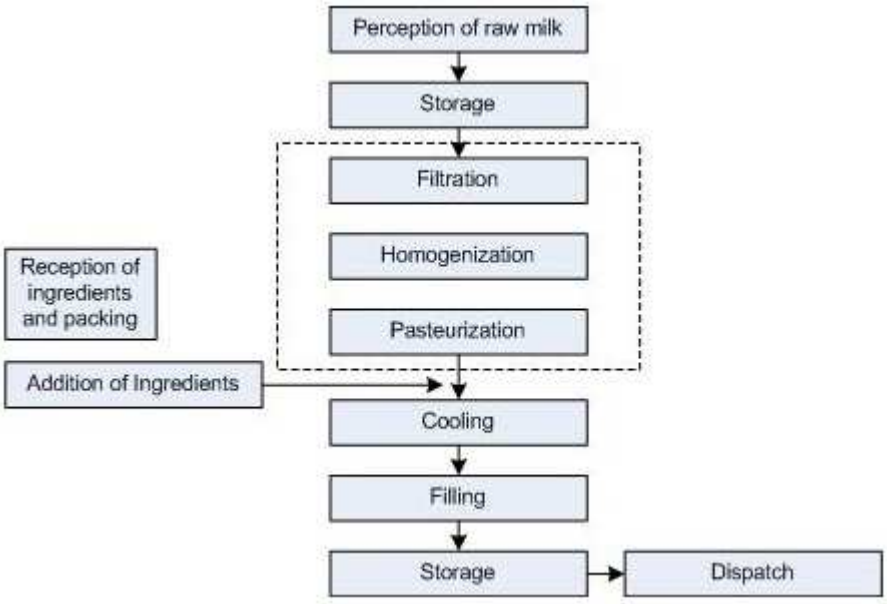

Figure 1. Flow chart of the manufacture of pasteurized fresh milk

Although no data exist on the minimum percentage of conformities with the GMPs to guarantee success of the HACCP, the fact that the company has good enough GMPs implementation based on BPOM legislation, indicated that the industry was at an intermediate level with respect to its hygiene practices (Table 2). The nonconformities encountered in the initial diagnosis of the GMPs indicated that the basic conditions for implanting HACCP had still not been established, and thus adjustments were made in order to conform to the prerequisite programs.

4. Conclusion

This activity is a part of community applied to face implementation of food safety systems in a small dairy industry at Kaligondo area, Banyuwangi, East Java. The main difficulty faced for implementing food safety system is related to the actions specified in the flowchart for adherence of workers with the system. In spite of, food safety system implementation has a good result to reduce in the populations of indicator microorganisms in small dairy.

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ISBN : 978-602-14917-9-9

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