

# Hazard Contamination Control Behavior Practice of Puff Industry: A Case Study of Puff Unit of Khajorico Pvt. Ltd. Chapagaun Lalitpur, Nepal

Sanjib Kumar Yadav <sup>a</sup>, Rajesh Kaji Kayastha <sup>b</sup>

<sup>a, b</sup> Department of Mechanical Engineering, Pulchowk Campus, IOE, TU, Nepal

Corresponding Email: <sup>a</sup> sanjib804062@gmail.com, <sup>b</sup> mmtnepal@hotmail.com,

## Abstract

Hazards in a food manufacturing process are generally physical, chemical and biological. Foreign objects are the most obvious evidence of a contaminated product and are therefore most likely to be reported by production or by consumer complaints. Strong Relationship between hazards contamination control behavior practice and hazard contamination which is thoroughly studied in the case of Khajorico Pvt. Ltd. (puff plant) Chapagaun Lalitpur Nepal.

## Keywords

Hazard – contamination – behavior – Significance – production – industry – time temperature

## 1. INTRODUCTION

Physical hazards are either foreign materials unintentionally introduced to food products (ex: metal fragments in ground meat) or naturally occurring objects (ex: bones in fish) that are hazardous to the consumer. A physical hazard contaminates a food product at any stage of production. Food processors should take adequate measures to avoid physical hazards in food. Today's consumers are much more aware about food safety and quality than past. Due to food borne illness outbreak and product recall also suffered millions of pounds economic losses in food industry. Major reasons for these failures are mishandling, changes in the equipment, addition of incorrect ingredients, formulation process, recipe or preparation practice, problems in packaging, lack of attention to detail as well as malicious contamination [1].

## 2. LITERATURE REVIEW

As a result of development and improvements in food industry and international trade, customers are demanding safe and wholesome food products. As a result, food processing companies are implementing food safety management systems to ensure the

production and distribution of safe foods. The present study designed a HACCP plan for a puff plant to improve the safety and quality of products. The reduction of identified CCPs number is necessary since it will lead to a decrease of the overall cost hence increase the net outcome of the company. Further research is needed to design HACCP plans for other bakery industries in Sudan [2]. Even though result of development and improvement in food industry and international trade customers are demanding safe and wholesome food products. It is great challenge to make food totally hazard free but in previous research it has shown that significance of Food handler behavior before and after food safety training program. The purpose of this work is to find out of the effect of training program in puff production unit of khajorico Pvt. Ltd. and to study the relationship between hazards contamination control behavior practice and its outcome or evaluating the effectiveness of food safety training program on employee of puff industry.

## 3. METHODOLOGY

### Research Method

This section will address the research design for the study. After providing training of food safety of one

group what kind of behavioral changes takes place. The pre-test in this study was the observation of different categories of food safety behaviors before safety training program. The post-test in this study was the observation of the same different categories of food safety behaviors after food safety training program was administered. The difference in the observed behavioral changes pre-test and post-test were evaluated by comparing the frequency of each behavior. The pre-test was used as baseline for comparing behaviors observed by researcher. This baseline was used as the control for the study to compare the post-test data to the independent variable. The food safety training program administered between the pretest and the posttest. The dependent variables were the different categories of food safety behavioral occurrences observed by the researcher during the posttest. The different categories of food safety were hand hygiene, visual inspection, and time- temperature control. Different specific behaviors in each category were selected for observation.

### **Instrumentation**

A behavior observation checklist was developed by the researcher as the means for collecting data. The behavior observation checklist was comprised of eighteen categories which each category contained different specific food safety behaviors for a total of twenty nine food safety behaviors to be observed in this study as shown in Table 1.

Each specific food safety behavior had boxes for the observer to check “yes” or “no.” If one of the food safety behaviors on the checklist was witnessed being correctly performed, then the observer would mark “yes” on the checklist. If one of the food safety behaviors on the checklist was witnessed being performed incorrectly or not completely performed, the observer would mark “no” on the checklist.

An example of the usage of the behavioral checklist that occurred in the study was the researcher observed employee of food industry who was handling raw flour with bare hands. The employee walked to the hand washing station, used soap and strongly scrubbed and rinsed hands all for a total of thirty seconds. The researcher checked “no” under the hand washing behavior on the observation checklist instrument since

the employee did not follow correct hand washing procedure. The purpose of marking “yes” or “no” was to record the frequency of correctly or incorrectly performed food safety behaviors since this study examined changes in the number of correctly performed food safety instances that occur between the pre-training and post-training observations.

### **Development of Observational Study**

The structure of the study was a pre- and post-test method where a series of pre-training observations were conducted, followed by the administration of a food safety training program, and then a conduction of post-training observations. This study used quantitative observations as the means of collecting behavioral data. Quantitative observations use checklists and behavior observation tools developed prior to the observation to record or document observed behaviors. A checklist of twenty nine food safety behaviors was developed and used by the researcher to collect the food safety instances observed in the mixing section of Khajorico Pvt. Ltd. The purpose of the pre-training observations was to develop a baseline of behavioral data to establish a point of reference for comparing to post-training observations. The purpose of post-training observations was to identify if there was a change in food safety behaviors by comparing the post-training data to the pre-training data.

This study was based on observational research. Direct observation is the determination of the extent to which a particular behavior(s) is present by watching. The participants who volunteered in the direct observation study were aware they were being watched by the researcher. Direct observation was used during every data collection observation session. The researcher also applied a time allocation to the method of data collection. A time allocation involved the researcher randomly selecting a time to conduct an observation and recorded what the participants were doing when participants were first seen and before participants realized the researcher was watching. The observer role the research undertook during the data collection period of the study was as a naturalistic observer. A naturalistic observer simply observe and record events as instances naturally occur as no attempt is made to alter the situation in any way. The purpose of developing the

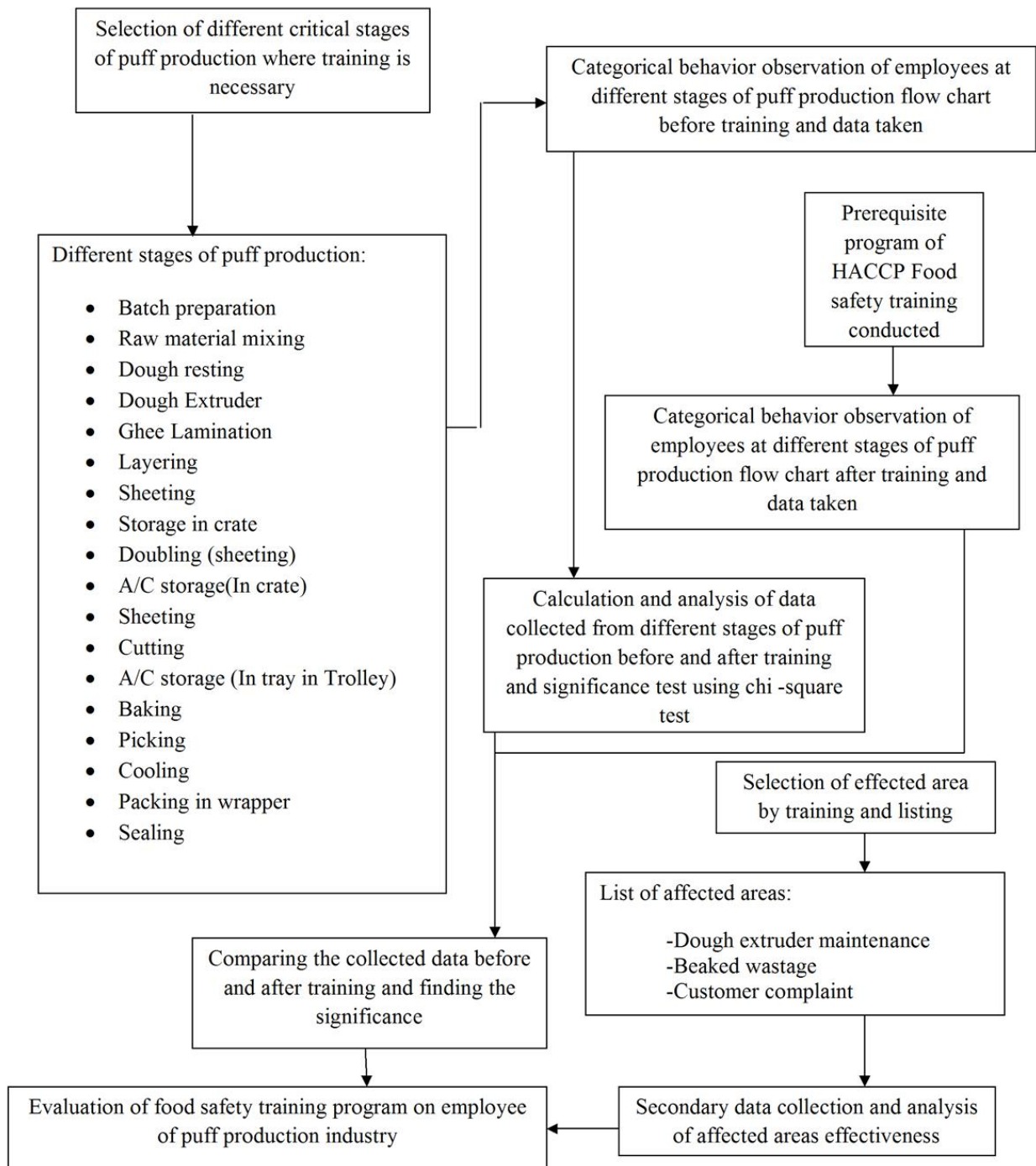


Figure 1 Theoretical Framework for research design

study with the elements of a direct observation coupled with time allocation and taking on a naturalistic observer role was even though the subjects are aware they are being watched, time allocation assisted in alleviating the participants' knowledge of when the researcher would be watching their actions and being a naturalistic observer allowed the researcher to watch the participants in their environment without upsetting their daily routines or job duties.

Naturalistic observations were an advantage to the study since the participants were being watched in surroundings they were comfortable in and they performed their food safety behaviors in real-life situations; it aided the researcher in collecting the food safety behavioral data needed. The collection of data clearly reflects the constraints of the participants' normal environment. The disadvantages of conducting an observational study were reactivity and observation bias. Reactivity is the influence that an observer has on the behavior under observation even though the behavior influenced by an observer may not be representative of the behavior when an observer is not present. This section must take note that the study evaluated the instances of correctly practiced behaviors which occurred collectively in the food service environment, not individual instance performance. The focus on direct observation is important to mention because direct observation protected the privacy of the participants and that conduction of naturalistic observations was crucial to the design of the study since participants were already accustomed and comfortable in their work environment; however the study observed behavioral instances that occurred in general, not behavioral instances which occurred by each individual.

### **Procedure**

The researcher conducted the observations in the different section of puff unit of Khajorico Pvt. Ltd. and spent a maximum of two hours at each observation session. The data was recorded on a behavioral observation checklist developed by the researcher, which listed the twenty nine behaviors that were selected for observation. Each time one of the behaviors on the checklist was observed by the researcher, whether it was correctly performed, incorrectly performed, or was not completely followed through, the

behavior was recorded on the checklist under the appropriate behavior. If the behavior was correctly performed, it was marked "yes" under the appropriate behavior on the checklist. If the behavior was incorrectly performed or not completely followed through, it was marked "no" under the appropriate behavior on the checklist. The researcher did not inform the participants when the next observation session would be conducted; the researcher would select different times and days during the week to conduct observation sessions in avoidance of a pattern that could alert the participants when the researcher would perform the next observation. The researcher completed many observation sessions within the pre-training observation period. As part of the research design, there were 250 participants during the pre-training observation sessions.

The completion of pre-training observations induced the second stage of the study of food safety training where all 250 participants completed a 60-90 minute online interactive program. The food safety training program encompassed material on personal hygiene, cross-contamination, time-temperature control, basic food safety, allergens, and cleaning and sanitation. The online program used workforce language, visual cues to help learners instantly recognized right and wrong practices, provided real-world scenarios, and was available in Nepal. The food safety training and examination took three month on every Friday. The post-training observations were initiated and were conducted in the same manner as the pre-training observations. Behavioral instances were recorded on the behavioral observation checklist each time any of the nine behaviors were witnessed being correctly or incorrectly performed. As part of the research design, the same 250 participants who volunteered in pre-training and food safety training were present during the post-training observation sessions.

### **Statistical Analysis Method**

The study utilized three types of descriptive statistics. The Cumulative frequencies were computed on the pre-and post-training individual and categorical behavioral data. Cumulative frequency of individual and categorical data of pre- and post training was divided by the total frequency. Total frequency was the



data from both pre- and post training. The row by column chi square statistic was performed on the individual behavioral instances observed pre- and post-training data. Row by column chi square is employed to find a significance of differences between proportions of subjects, objects, events, and so forth by comparing observed frequencies and frequencies expected. Least means square is the group means after having controlled for a covariate. Odds ratio is a comparison whether the probability of a certain event is the same for two groups cite3.

An odds ratio of one implies that event is equally likely to happen in both groups. An odds ratio greater than one implies the event is more likely to occur in Group A than Group B. An odds ratio of less than one implies the event is less likely to occur in Group A than Group B. Chi square, least means square, and odds ratio were computed by using the Statistical Analysis System (SAS) to generate results from collected observational data. Specifically for odds ratio, the generalized linear model program in SAS was utilized to compute the categorical data to compare pre- and post-training observations. The generalize linear model program is applicable to a wider range of data analysis problems; it was appropriate in the analysis of date in this particular study since statistical inference about parameters estimates could be made.

#### 4. RESULT AND DISCUSSION

Summary of Descriptive Statistics The variables showed frequencies for every instance in which they were observed being correctly practiced. These frequencies were derived from the number of correctly practiced behaviors being divided by the total number of instances that the particular behavior was observed being correctly and incorrectly practiced.

##### Effectiveness of Food Safety training

1.Maintenance problems occurred in Dough Extruder Dough extruder or Fat pump is a major machine use to laminate appropriate and accurate amount of margarine on the dough sheet. Generally due to vulnerable activity of food handler's different kind of metallic or non metallic hazard find in the internal part of machine which cause break down in production.As shown in figure 2 there is significant changes in the maintenance

problem before and after training or we can say occurrence of maintenance problem reduced after training.Maintenance problem reduced by more than 50 percent with comparing to before and after training.Before training with in 21 month period of time 37 times maintenance problem recorded and after training it is reduced to 16 times in 21 month.

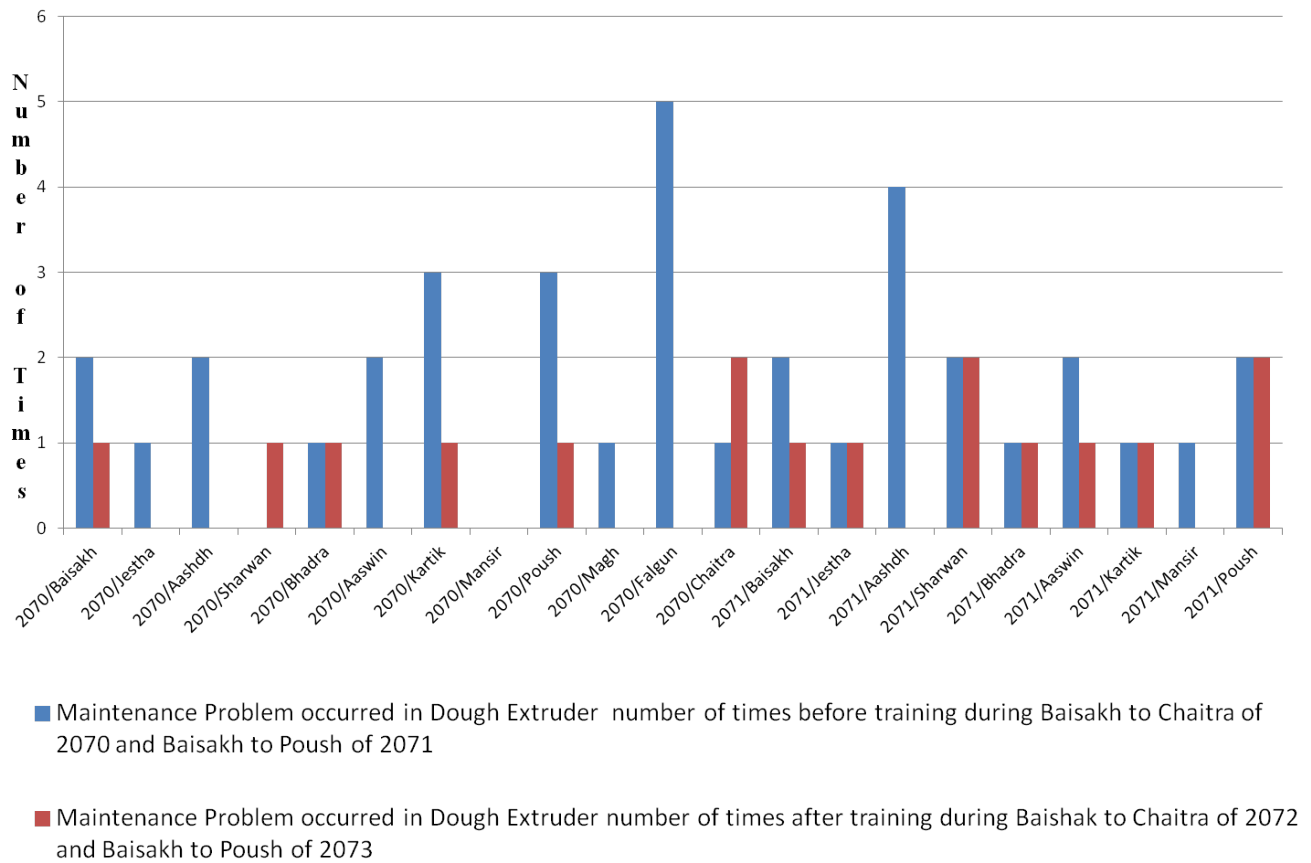
2.Baked puff wastage Record As shown in Figure 3 Percentage of Baked puff wastage before training during Baisakh to Chaitra of 2070 and Baisakh to Poush of 2071 before training is comparatively more than after training in each of the month except 2070 jestha,2071 Baishak and Ashad.According to the experience of Khajorico Pvt. Ltd.Chapagaun Nepal it is due to uncertain break down of machine for example Oven problem,A.C. storage problem etc.

3.Customer Complaint for Hazard found in Product From Market As shown in figure 4 there is significant changes recorded in customer complaint before and after training or we can say frequency of customer complaint reduced after training.Frequency of occurrence of maintenance problem reduced from 11 times to 4 with comparing in 21 month of before and after training.

#### 5. CONCLUSION

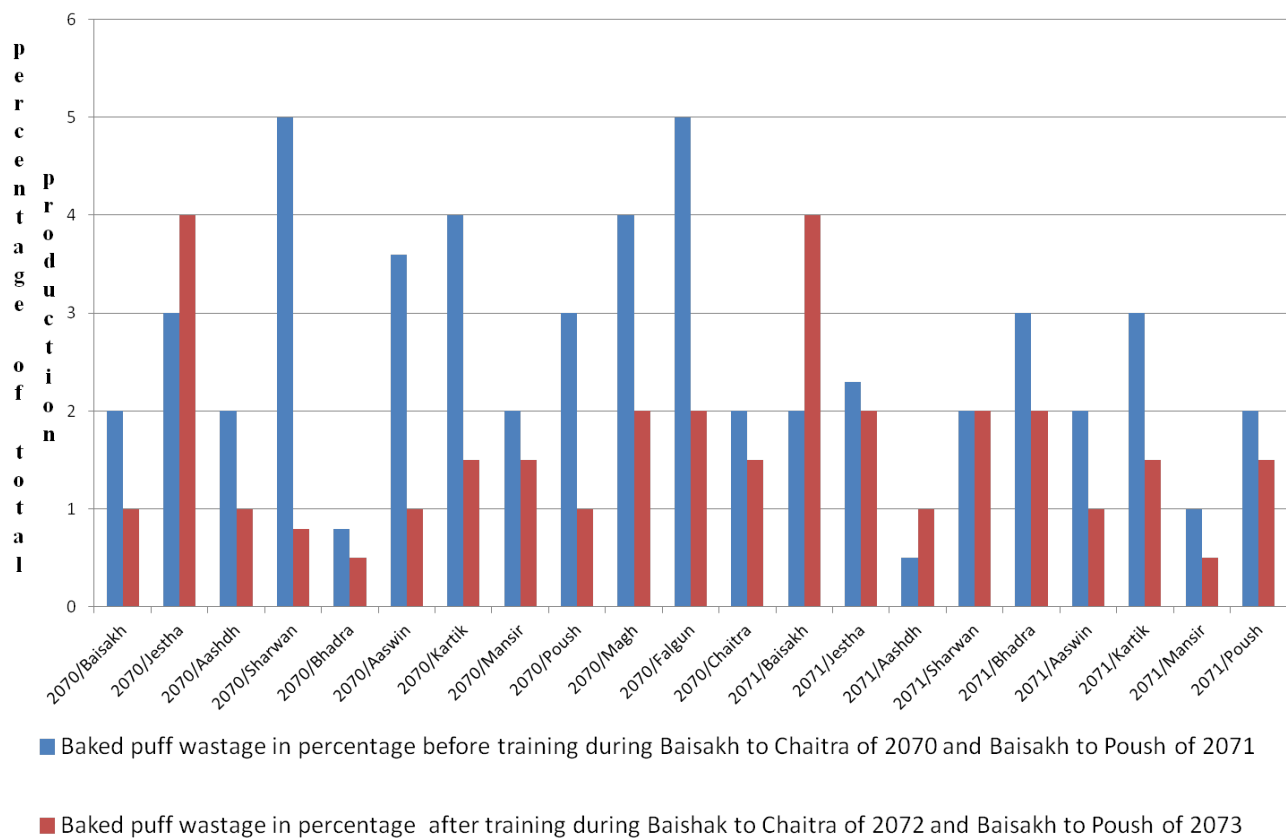
There is significant changes in the maintenance problem before and after training recorded or we can say occurrence of maintenance problem reduced after training.Maintenance problem reduced by more than 50 percent with comparing to before and after training.Before training with in 21 month period of time 37 times maintenance problem recorded and after training it is reduced to 16 times in 21 month. Baked puff wastage before training during Baisakh to Chaitra of 2070 and Baisakh to Poush of 2071 before training is comparatively more than after training in each of the month except 2070 jestha,2071 Baishak and Ashad.According to the experience of Khajorico Pvt. Ltd.Chapagaun Nepal it is due to uncertain break down of machine for example Oven problem,A.C. storage problem etc. As shown in figure 4 there is significant changes recorded in customer complaint before and after training or we can say frequency of customer complaint reduced after training.Frequency of

Maintenance Problem occurred in Dough Extruder



**Figure 2:** Maintenance problems occurred in Dough Extruder

**Baked puff wastage record**



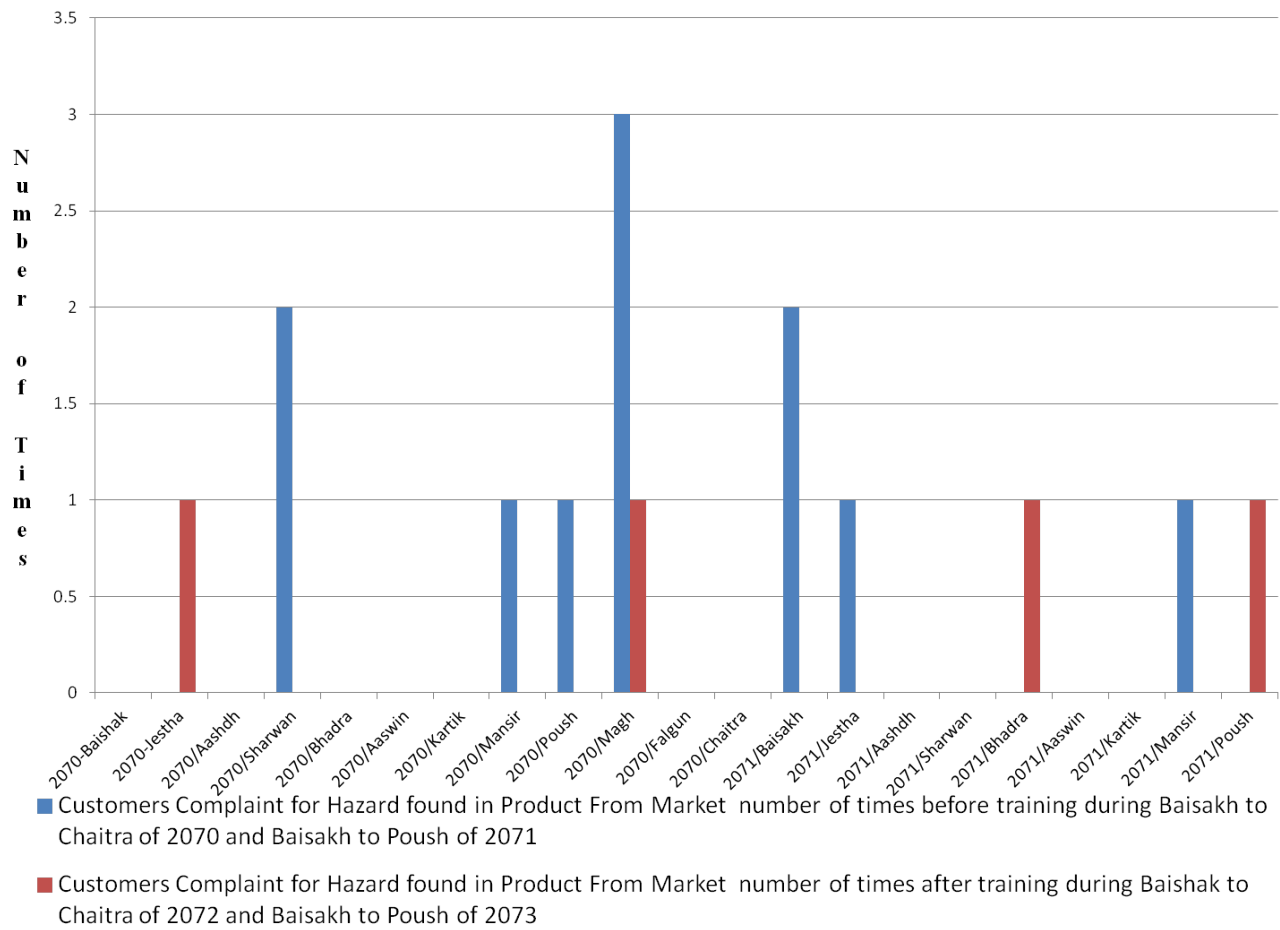
**Figure 3: Baked puff wastage Record**

occurrence of maintenance problem reduced from 11 times to 4 with comparing in 21 month of before and after training

Research has found that food service managers and employees receiving training on proper food handling practices and obtaining adequate food safety knowledge does not always translate into improved behavior cite4. Employees must have a firm understanding of food safety and more importantly, employees must be obligated to actively practice sanitation in the workplace at all times. Most agree that food safety interventions provide knowledge to food workers with the expectation that workers will translate this knowledge into practice. The lack of practiced sanitation procedures could be due to the inadequate sanitation teaching methods conveyed by the instructor. Another possibility is it could be dependent on the person and their attitudes towards

actively practicing sanitation. The discrepancy between food safety knowledge and practice could also be dependent on the environment and environmental factors where the person is suppose to practice sanitation. One environmental factor would be management itself as it is seen by researchers that the continual support and coaching of food handlers by management on the subject of food safety is a key component of the reduction of food borne illness. First, it was stated that the number of correctly practiced food safety behavior before and after training and its effect in different functional outcome of production. Training should be considered as an investment in the future and evidence is available to show that companies providing high levels of training usually have better growth and profits. Training is necessary to enable staff to fulfill their potential by understanding their responsibilities

Customers Complaint for Hazard found in Product From Market



**Figure 4:** Customer Complaint for Hazard found in Product From Market



and improving their skills cite5. The survey questioned food and drink manufacturers and processors worldwide to identify the needs, effectiveness and challenges of food safety training in the industry. The survey was sent to over 25,000 food manufacturing and processing sites worldwide. The companies surveyed represent a cross section of the industry and ranged in size from under 50 employees to over 1,000 and cover many sectors including baking, dairy, meats, fish and poultry, and packaging. The survey showed that there has been an improvement in both the quality and quantity of food safety training since last year. 42 percent of those surveyed said there had been an increase in the quantity of training and 45 percent felt the quality of training had improved cite6.

### Acknowledgments

The authors would like to thank Khajorico Pvt. Ltd. for their co-operation during data collection and grateful to Er. Anil Maharjan for his assistance. Authors also like to thanks Mr. Ramesh Sthapit for sharing his expertise on

industries during farming of this research. Furthermore, authors are grateful to everyone who has directly or indirectly helped during the shaping of this study.

### References

- [1] United States Department of Agriculture Food Safety and Inspection Service,[April-1997]. Meat and Poultry Products Hazards and Control Guide.
- [2] Abdel Moneim E. Sulieman, [2013]. The Design of Hazard Analysis sCritical Control Point (HACCP) Plan for Biscuit Plant.
- [3] Budhathoki, Tek Bahadur, 2011. Probability and statistics for engineers. In: s.l.:s.n., pp. 413-426.
- [4] United States Department of Agriculture Food Safety and Inspection Service, April-1997. Meat and Poultry Products Hazards and Control Guide.
- [5] Yousouf Gaungoo, n.d. [Online] Available at: Effectiveness of training among food handlers: A review on the Mauritian Framework.
- [6] Victoria White, n.d. Survey reveals the effectiveness and challenges of food safety training. [Online] [Accessed 2015].

