

**DEVELOPMENT OF HAZARD ANALYSIS CRITICAL
CONTROL POINT (HACCP) SYSTEM FOR SAUCE
MANUFACTURERS**

By

W.G.N.D.Gunathilaka

The thesis is submitted to the University of SriJayavardenepura for the award of Master of Science in Food Science and Technology on 28th April 2006

DECLARATION

The work described in this thesis was carried out by me under the supervision of Professor Arthur Bamunuarachchi, Mr. Mendis and Mrs. Rangika Wijesuriya and a report on this has not been submitted in whole or in part to any university or any other institution for another degree.

28/11/2006

W.G.N.D. Gunathilaka

We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the university for the purpose of evaluation.

A handwritten signature in blue ink, appearing to be 'A. B.', written over a horizontal dotted line.

Prof. Arthur Bamunuarachchi

A handwritten signature in blue ink, appearing to be 'B.S.P.', written over a horizontal dotted line.

Mr. B.S.P. Mendis

A handwritten signature in blue ink, appearing to be 'Wijesuriya', written over a horizontal dotted line.

Mrs. Wijesuriya

Table of Content

	Page
Table of Content	i
List of Figures	iv
List of Tables	v
Acknowledge	vi
Abstract	vii
1. Chapter - Introduction	1
1.1 Objectives of the Study	1
2. Chapter - Literature Review	2
2.1 History of HACCP	2
2.2 Evaluation of HACCP	2
2.3 What is HACCP	4
2.4 Hazard	5
2.5 The Seven HACCP Principles	7
2.6 HACCP Support Programs	7
2.6.1 Definition	8
2.6.2 Cleaning	8
2.7 Codex Alimentations General Principle for Food Hygiene	9
2.8 Importance and benefits of HACCP	9
2.9 Basic Concept of HACCP	10
2.10 Good Manufacturing Practices	10

2.11 Codex Guidance for the Implementation of HACCP	15
2.12 Principles of HACCP System	17
2.13 Application of the principles of HACCP	19
2.13.1 General	19
2.13.2 Sequence of Application	20
2.13.3 Assembling the HACCP Team	21
2.14 Product Description	21
2.15 Process Flow Diagram	22
2.16 Plant Schematic Factory Layout	22
2.17 Hazard Analysis –Principle 1	23
2.17.1 Hazard Analysis Procedure	26
2.17.2 Hazard Assessment	31
2.17.3 Control Measures	33
2.18 Determine Critical Control Point – Principle 2	36
2.19 Establish Critical Limits – Principle 3	39
2.20 Establish a Monitoring System for Each CCP - Principle 4	41
2.21 Establish Corrective Action – Principle 5	44
2.22 Establish Verification Procedure – Principle 6	46
2.22.1 HACCP Plan Validation	46
2.22.2 HACCP System Audits	47
2.23 Establish Documentation and Record Keeping – Principle 7	48
3. Chapter -Experimental	49

3.1 Food Safety Policy	49
3.2 Scope and Purpose	50
3.3 Product Description	51
3.4 Method of Developing HACCP Plan for the Plant	74
3.5 Description of Product and Process Flow	75
3.5.1 Unit Operations	76
4. Chapter - Results	78
4.1 Critical Control of Production Line	78
4.2 Proposed Factory Layout & Process Flow and Traffic Pattern	79
4.3 Factory Working Environment & Worker Facilities	79
4.4 Record Keeping	79
4.5 Cleaning & Sanitation of Machinery	86
4.6 Method of Cleaning	86
4.7 Discussion	87
4.8 Conclusion	87
4.9 Suggestions and Recommendations	88
5. Reference	89

List of Figures

Figure No:	Page
1 Type of Hazards	6
2 CCP Decision Tree	36
3 Present Factory Layout	53
4 Proposed Factory Lay out	54
5 Present Process Flow and Traffic Pattern	55
6 Proposed Process Flow and Traffic Pattern	56
7 Flow Diagram of Red Chili Sauce	57
8 Flow Diagram of Green Chili Sauce	58
9 Flow Diagram of Tropi Fruit Chili Sauce	59
10 Weekly Finished Product Results – TPC (cfu/g)	80
11 Weekly Finished Product Results – Yeast & Mould Count (per g)	81
10 Shelf Life Study – TPC (cfu/g)	82
11 Shelf Life Study – Yeast & Mould (per g)	83
12 Weekly Analysis of pH	84
13 Shelf Life Study – pH	85

List of Tables

Table No:	Page
1 Critical Limit	40
2 Critical Limits & Operating Limits	41
3 Amendment Record Sheet	49
4 HACCP Team and Leader	50
5 Hazard Analysis and CCP Determination	60
6 HACCP Plan	72
7 Weekly Finished Product Results – TPC (cfu/g)	80
8 Weekly Finished Product Results – Yeast & Mould Count (per g)	81
9 Shelf Life Study – TPC (cfu/g)	82
10 Shelf Life Study – Yeast & Mould (per g)	83
11 Weekly Analysis of pH	84
12 Shelf Life Study – pH	85

ACKNOWLEDGEMENT

I would like to offer my heartfelt gratitude to my internal supervisors, Prof.Arthur Bamunuarachchi, Course Coordinator and Head of the Department of Food Science & Technology, Sri Jayewardenepura University, Gangodawila, Nugegode, for his excellent guidance encouragement and advice for completion of my study and Mr.B.S.P. Mendis, Director General, SLSI for his guidance and encouragement during my project.

I also would like to offer my sincere gratitude to my external supervisor, Mrs.Wijesuriya, Quality Assurance Manager, Coco Lanka Ltd.Ekala, Ja-ela, for her invaluable guidance and encouragement to carry out this project. And I would further like to offer my thanks to the rest of the staff and workers of Coco Lanka Ltd, for their support during my study. Finally I would like to offer my sincere thanks to all my colleagues who helped immensely during this project.

Development of Hazard Analysis Critical Control Point (HACCP) system for Sauces Manufacturers

By

W.G.N.D.Gunathilaka

ABSTRACT

Like any other basic requirements, food is one of the basic needs for mankind. With the development of the technology, consumer always considers quality standard and safety measures for their food .Hence; any food manufacturer should pay much attention to the quality systems

Hazard Analysis Critical Control Point (HACCP) system is one of the very effective and widely used food safety assurance system at present. This study was to help to implement the concept for Coco Lanka Ltd that produces a range of sauces for export purpose.

A comprehensive literature survey was carried out on the HACCP as well as food quality and safety aspect to support the study.

The methodology of the project was based on information gathered from observations and investigation of procedure adapted at the factory.

The result of the study show the management of the factory has positive reaction towards HACCP concept .Some important suggestions for the factory such as improving hygienic condition, process control, internal auditing was introduced by this project.

It could be concluded that at present there are weaknesses with respect to process flow, process, and hygienic quality testing and record maintenance. This study enables the preparation corrective measures and if attended company could easily achieve HACCP System for the production of sauces.

CHAPTER 1 – INTRODUCTION

Day by day world population is increasing drastically. Food is the major requirement above all other basic necessities. Although the quality of food plays a major role in any of the food production process, it is very essential for a food manufacturing organization to take measures for food safety. Due to prevailing perfect competitive marketing channels in the open economy, many consumers will demand product of high quality standard and safety.

Hazard Analysis Critical Control Point system is one of the very effective and widely used concepts for safety assurance measures at present.

Sauce is a new product of Coco Lanka Ltd. competing with global market and safety assurance system will be an additional advantage for these products. Many international bodies like International Commission on Microbiology Specification of Food have recommended the HACCP system for food safety.

If other parallel products of the company use HACCP, by introducing the quality assurance system to the new products, it is obvious that it also can dominate in the international market.

1.1 Objectives of the Study

- Observation of present process to HACCP adherence
- Implementation of HACCP System for sauces manufacture at Coco Lanka Ltd,
- Monitoring the established system.
- Analysis of finished products to ensure adherence.

CHAPTER 2 - LITERATURE REVIEW

2.1 History of HACCP

HACCP has become synonymous with food safety .It is a worldwide recognized systematic and preventive approach that addresses biological ,chemical and physical hazards through anticipation and prevention rather than through end product inspection and testing.

HACCP system grew from two major breakthroughs. The first was associated with W.E Deming who deals with the total Quality Management System. (TQM), which emphasis a total system approach to manufacturing that could improve quality while lowering cost. The second was by Pillsbury Company. NASA introduced and adopted HACCP as the system that could provide greatest safety while reducing the dependence on end point inspection and testing.

HACCP epimerizes control of the process as far upstream in the processing system as possible by utilizing operator control and /or continuous monitoring techniques at Critical Control Points. Now more international groups like international Commission on microbiological specification of food have recommended the broad application of HACCP to food safety.

2.2 Evaluation of HACCP

The HACCP system of food safety was pioneered in the 1960s by The Pillsbury Co, the US Army Natick Research and development Laboratories, and the National Aeronautics and Space Administration in the Collaborative development of food for the space programme.Stringent pathogen free criteria could not be verified slowly by

finished product testing. Therefore, it is necessary to design the production process so that the elimination of potential hazards could be assured.

Pillsbury presented the HACCP concept publicly at the first conference for Food Protection in 1971 and in the following year conducted a three week workshop for Food and Drugs Administration inspectors which culminated in the use of HACCP principles in the promulgation of the Law Acid Canned Foods regulation in 1974. This remains the only instance in which HACCP principles have been written into a federal regulation for food production, although National Marine Fisheries Service uses voluntary HACCP programs and the U.S Dept. of Agriculture has begun its own HACCP effort.

In the 1970 and early 80's the HACCP approach was adopted by other major food companies and begun to receive attention from segments of the food industry other than manufacturing. Report by the International Commission on Microbiological Specifications for Foods, ICMSF (Simonsenet al., 1987) revealed a growing international awareness of the HACCP concept and its usefulness in dealing with food safety.

In its assessment of the effectiveness of food regulation in the U.S.A national Academy of Sciences subcommittee recommended in 1985 that the HACCP Approach be adopted by regulatory agencies (NAS, 1985). This recommendation led to the formation in 1987 of the National Advisory Committee On Microbiological Criteria for Foods (NACMCF). The committee expended the HACCP protocol from its original three principles to seven principles. In 1990, USDA's Food Safety and Inspection Service (FSIS) initiated a two year HACCP implementation study in which it will

evaluate the effectiveness of HACCP programs in providing a greater assurance of the safety of meat and poultry products.

2.3 What is HACCP?

- HACCP is an Acronym for: Hazard Analysis Critical Control Point.
- Preventive system for food safety.
- Not a zero risk system, it is design to minimize the risk of food safety hazards.

Management tool used to protect the food supply chain and production process against Microbiology, chemical and other physical hazard contamination.

HACCP is a system which identified specific hazards and preventive measures for their control to minimize the risk of producing defective goods or service product unsafe to any potential consumer. HACCP was originally developed to address food safety hazards, but it can, and often is used to address all facets of food quality.

Basic Requirement for HACCP System

HACCP is originally developed to address food safety hazards through systematical examination of every step in the food operation from raw material to the end consumer.

❖ HACCP Techniques involve:

- Hazard and risk analysis
- Identification of potential product defects with relation to production factors (Critical Control Points)
- Preventive control rather than reactive control.
- Accountability.

2.4 Hazard

A hazard is a biological, chemical or physical agent or factor with the potential to cause an adverse effect or hazard means the unacceptable contamination. Unacceptable growth and /or unacceptable survival by microorganism of concern to safety or spoilage and/or the unacceptable production or persistence in foods of products of microbial metabolism.

There are three types of hazards, namely biological, chemical and physical hazards.

The primary objective is HACCP program is to produce reliably safe product that is free of biological, chemical or physical hazards.

HACCP identified hazards;

- Biological
- Chemical
- Physical