COMPARATIVE STUDY BETWEEN BENCHMARKING AND SELF EVALUATION FOR IMPROVEMENT OF WORKING ENVIRONMENT

SUPAPORN SUWANPITAK

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Supaporn Suwanpitak.
.....
Miss.Supaporn Suwanpitak
Candidate

.....
Assoc.Prof.Chompusakdi Pulket,
Ph.D.(Industrial Hygiene and
Environmental Health)
Major-Advisor

Chantanakul Suttinun
.....
Lect.Suttinun Chantanakul,
M.D.
Co-Advisor

V. Singhakajen
.....
Assoc.Prof.Vajira Singhakajen
M.A.(Demography)
Co-Advisor

Somnuk Sirisoonthorn.
.....
Lect.Somnuk Sirisoonthorn,
Ph.D.(Material Science)
Co-Advisor

Ram Hoon
.....
Assoc.Prof.Rassmidara Hoonsawat,
Ph.D.
Dean
Faculty of Graduate Studies

.....
Assoc.Prof.Chompusakdi Pulket,
Ph.D.(Industrial Hygiene and
Environmental Health)
Chair
Master of Science Program
in Industrial Hygiene and Safety
Faculty of Public Health

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16 May, 2005

Supaporn Suwanpitak.
.....
Miss.Supaporn Suwanpitak
Candidate

.....
Assoc.Prof.Chompusakdi Pulket,
Ph.D.(Industrial Hygiene and
Environmental Health)
Chair

V. Singhakajen
.....
Assoc.Prof.Vajira Singhakajen,
M.A.(Demography)
Member

Chantanakul, suttinun
.....
Lect.Suttinun Chantanakul,
M.D.
Member

S. Putwanpen
.....
Lect.Somreing Putwanpen,
B.S.CE(Civil Engineer)
Member

Somnuk Sirisoonthorn.
.....
Lect.Somnuk Sirisoonthorn,
Ph.D.(Material Science)
Member

Ram Hun
.....
Assoc.Prof.Rassmidara Hoonsawat,
Ph.D.
Dean
Faculty of Graduate Studies
Mahidol University

C. Chaikittiporn
.....
Assoc.Prof.Chalermchai Chaikittiporn,
Dr.P.H.(Epidemiology)
Dean
Faculty of Public Health
Mahidol University

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Supaporn Suwanpitak

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SUPAPORN SUWANPITAK 4336605 PHIH/M

M.Sc.(INDUSTRIAL HYGIENE AND SAFETY)

THESIS ADVISORS : CHOMPUSAKDI PULKET, Ph.D.(INDUSTRIAL HYGIENE AND ENVIRONMENTAL HEALTH), SUTTINUN CHANTANAKUL, M.D., VAJIRA SINGHAKAJEN, M.A.(DEMOGRAPHY), SOMNUK SIRISOONTHORN, Ph.D.(MATERIAL SCIENCE).

ABSTRACT

Benchmarking is a searching method to find the best practice by comparison of practices, and absorbtion of the best method in order to develop organizational excellence. This research was quasi-experimental, it aimed to compare two improvements in environment and working conditions. These were the benchmarking method and self evaluation method, which is the process of using intellectual concepts to improve working conditions. The benchmarking performance had 3 steps. The planning step was to survey the working environment, and choose and prepare teams for benchmarking. The search step was to find the best practice for comparison. The observation and analyze step was to report benchmarking findings, and to conclude the results of best practices to achieve working environment improvement. The self evaluation method had 2 steps. The planning step was to survey the working environment, and choose and prepare teams for self evaluation. The observation and evaluation step was to conclude the results of best practices to achieve working environment improvement.

Results of this study showed that the benchmarking method and self evaluation method were not significantly different, after a field observation of 216 production workers. There were 88 persons in the benchmarking group and 128 persons in the self evaluation group. The statistical analysis showed that the scores of practice for improving working and environmental conditions were not different (p-value > 0.05). The comparison of recognition of knowledge for safety policy and management between the benchmarking team and self evaluation team revealed that the scores were significantly different (p-value = 0.006). It was also found that the self evaluation team had more recognition concerning the knowledge of safety policy and management than the benchmarking team.

The result of this research reveals that the application of a self evaluation method is an appropriate system useful to reduction of unnecessary steps of work and capable of bringing the best benefit to an organization. However, there should be monitoring systems for prevention of bias and discontinuation of practices.

KEY WORDS : BENCHMARKING / SELF EVALUATION / BEST PRACTICE

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การศึกษาเปรียบเทียบระหว่างวิธีเปรียบเทียบเพื่อหาวิธีปฏิบัติที่ดีที่สุด และวิธีประเมินตนเองในการปรับปรุงสภาพแวดล้อมการทำงาน (COMPARATIVE STUDY BETWEEN BENCHMARKING AND SELF EVALUATION FOR IMPROVEMENT OF WORKING ENVIRONMENT)

สุภาภรณ์ สุวรรณพิทักษ์ 4336605 PHIH/M

วท.ม. (สุขศาสตร์อุตสาหกรรมและความปลอดภัย)

คณะกรรมการควบคุมวิทยานิพนธ์ : ชมภูศักดิ์ พูลเกษ , Ph.D.(Industrial Hygiene and Environmental Health), สุทธินันท์ ฉันท์ธนกุล, M.D., วชิระ สิงหะคเชนทร์, M.A.(Demography), สมนึก ศิริสุนทร, Ph.D(Material Science).

บทคัดย่อ

เบนช์มาร์กกิ้ง เป็นกระบวนการค้นคว้าหาวิธีการปฏิบัติที่ดีที่สุดโดยการเปรียบเทียบกระบวนการหรือวิธีการปฏิบัติกับผู้ที่ทำได้ดีกว่า และนำผลของการเปรียบเทียบนั้นมาปรับปรุงและพัฒนาองค์กรให้ดีขึ้น โดยไม่ต้องเสียเวลาลองผิดลองถูก ทำให้ได้มาซึ่งวิธีปฏิบัติที่ดีที่สุด เพื่อให้องค์กรก้าวไปสู่ความเป็นเลิศ การศึกษาวิจัยนี้เป็นการศึกษาวิจัยกึ่งทดลอง มีวัตถุประสงค์เพื่อเปรียบเทียบกระบวนการปรับปรุงสภาพแวดล้อมการทำงาน 2 วิธี คือวิธีเบนช์มาร์กกิ้ง และวิธีประเมินตนเอง ซึ่งเป็นกระบวนการที่ก่อให้เกิดการใช้ปัญญาพิจารณา ใคร่ครวญตรวจหาเหตุผลเพื่อคิดค้นวิธีปรับปรุงแก้ไขสภาพแวดล้อมการทำงาน สำหรับวิธีเบนช์มาร์กกิ้งมีขั้นตอนการดำเนินงาน 3 ขั้นตอนคือ การวางแผน (สำรวจสภาพแวดล้อมการทำงาน, เลือก และเตรียมทีมงานเบนช์มาร์กกิ้ง) การค้นหาองค์กรที่จะนำมาเปรียบเทียบ จากองค์กรที่ดีที่สุดในกลุ่ม และ การเก็บและวิเคราะห์ข้อมูล (รายงานผลการวัด หรือเปรียบเทียบ, กำหนดเป็นข้อปฏิบัติการปรับปรุงสภาพแวดล้อมการทำงาน) และวิธีประเมินตนเองมีขั้นตอนการดำเนินงาน 2 ขั้นตอนคือ การวางแผน (สำรวจสภาพแวดล้อมการทำงาน, เลือก และเตรียมทีมงานประเมินตนเอง) และ การเก็บและประเมินผลข้อมูล (สรุปเป็น ข้อปฏิบัติการปรับปรุงสภาพแวดล้อมการทำงาน)

ผลการศึกษาพบว่า วิธีเบนช์มาร์กกิ้ง และวิธีประเมินตนเอง ได้ผลไม่แตกต่างกัน โดยเก็บตัวอย่างในพนักงานฝ่ายผลิต จำนวน 216 คน ในจำนวนนี้เป็น พนักงานโรงงานเบนช์มาร์กกิ้งจำนวน 88 คน และพนักงานโรงงานประเมินตนเอง จำนวน 128 คน จากการทดสอบทางสถิติพบว่า คะแนนข้อปฏิบัติการปรับปรุงสภาพแวดล้อมการทำงานของวิธีเบนช์มาร์กกิ้ง และวิธีประเมินตนเอง ไม่แตกต่างกัน ($p > 0.05$) และจากการเปรียบเทียบคะแนนความตระหนักในความรู้เกี่ยวกับนโยบายและการบริหารงานความปลอดภัย ระหว่างทีมเบนช์มาร์กกิ้ง กับทีมประเมินตนเอง พบว่ามีความแตกต่างกันอย่างมีนัยสำคัญทางสถิติ ($p=0.006$) โดยที่ทีมประเมินตนเองมีคะแนนความตระหนักในความรู้เกี่ยวกับนโยบายและการบริหารความปลอดภัยมากกว่าทีมเบนช์มาร์กกิ้ง ผลที่ได้จากการศึกษาวิจัยนี้แสดงให้เห็นว่าการนำวิธีการประเมินตนเองมาใช้อย่างมีระบบ จะช่วยลดขั้นตอนการทำงาน และทำให้เกิดผลประโยชน์ต่อหน่วยงานได้ แต่ควรที่จะมีระบบติดตามเพื่อป้องกันอคติและความไม่ต่อเนื่องในการปฏิบัติ

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LIST OF CONTENTS

LIST OF CONTENT
(Continued)

LIST OF CONTENT
(Continued)

LIST OF TABLES

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF TABLES
(Continued)

LIST OF FIGURES

CHAPTER I
INTRODUCTION

1.1 Background and rationale

In the present time, Thailand has developed a lot of industries and applied many technologies in process, after those problems arise from unsafe working conditions that may proceed from unsafe condition or hazardous condition. The hazardous conditions cause occupational injuries and diseases. Regarding to injuries information, the medical treatment expense and loss due to indirect expense that trend to enlarge because of two main courses, the first is the different manufacturing processes that define worker's habit in each process; the second is the worker's characteristics in different economics, social and culture situation in the same organization.

Therefore, the methods of information display and exchanging knowledge among several factories with different production processes for the purpose of learning best practice from each other. Then, they did not have to apply the ideas from display information to their workplace with trial and error. Consequentially, it will result in better working environment; extremely decrease the occupational injuries.

The information from workmen' s compensation fund, Social Security Office, in the year 2000, found occupational injuries, total of 189,621 persons. Approximately 55, 214 persons were injuries and minor injuries, less than 3-day off work, lost some parts of their body, disability, fatality. It is calculated as average injuries rate of 34.20 persons per 1,000 workers (1).

According to statistics of Social Security Office in the year 2001, the workers had got occupational injuries of 6,598 cases or 24.20 cases / 1,000 persons / year in Pathumthani. (2)

According to these statistics, the Labour Minister found that it is important problem to reduce the occupational injuries, therefore in the year 2003 the is injuries and occupational diseases must be reduce for 10 percent and the next year, 2004, the policy to minimize injuries and occupational disease for 10 percent still be continued. The cooperation between government and private sectors should be set up to watch and improve working environments in industries to be the safest workplaces as specified by the International Labour Organization. There are four items of the aims of Occupational Health Performance in the International Labour Organization. First, it aims to minimizing injuries rate and severity and occupational diseases. Second, it is to improve working environment equipment, physical and mental process to be appropriate to the workers. Third, it is to enhance body mind and social for all careers and Fourth is to promote the national policies and provide aids to members as appropriate. (3)

Chaiyut chawalitnitigul(4) has had his opinion that Occupational Health Performance is composed of three aspects, first is the environmental problem threaten worker's life and health, or cause illness and decrease working efficiency. Second, the environmental problem assessment which threatens life and health in workplace need knowledge and experience in monitoring and analysis. Third, the environmental problem control which is the preventive and corrective method is the most important method in decreasing health hazard for workers.

The employers have to perform all activities to cover occupational Health Service Performance such as physical check-up before, during and after working, health promotion program, disease prevention, treatment and surveillance of occupational diseases, environmental surveillance, working condition arrangement and environmental prevention.

This research is to perform the Occupational Health Performance using principle strategy in solving environmental problem for decreasing the health hazard of workers to the minimum by supporting the industries to solve their problems. The industries have to evaluate themselves to improve their working environment and to find guideline about the best practice in working environment improvement that is suitable for prevention or decrease injuries from work.

1.2 Objective of this study

1.2.1 General objective

The general objective is to compare the benchmarking method and self evaluation method for working environment improvement.

1.2.2 Specific objectives

1.2.2.1 To study the working environment and safety management policy in a food processing factory.

1.2.2.2 To evaluate effectiveness and factors influencing working environment improvement by using both the benchmarking method and the self evaluation method.

1.3 Hypothesis of this study

The benchmarking method and self evaluation method are not different for the improvement of work and environmental condition.

1.4 Variable of this study

1.4.1 Independent variable

1.4.1.1 Benchmarking method.

1.4.1.2 Self evaluation method

1.4.1.3 Educational level

1.4.1.4 Working duration

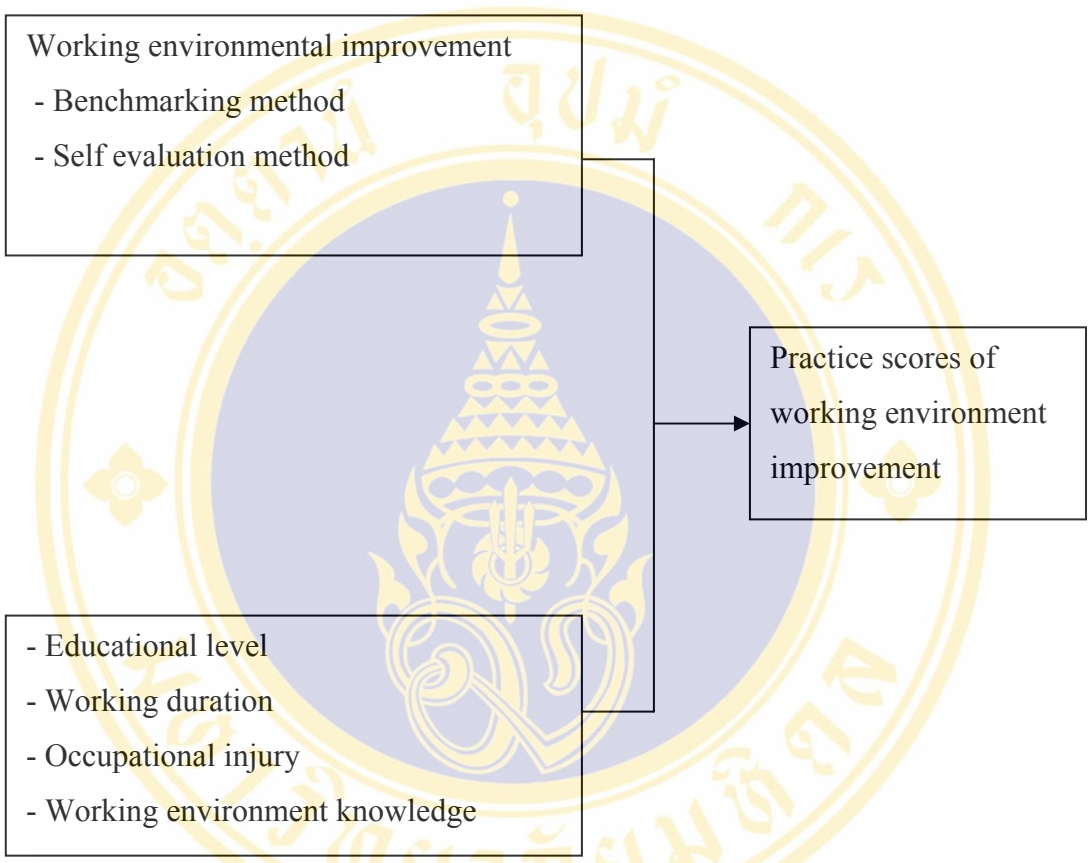
1.4.1. Occupational injury

1.4.1.6 Working environment knowledge

1.4.2 Dependent variable

Practice scores of working environment improvement.

1.5 Conceptual framework



1.6 Scope of this study

1.6.1 This study has the target for comparison of working environmental improvement between benchmarking and self evaluation methods for workers in food factory.

1.6.2 Working environment of this study choose the main factors which affect directly to work. The main factors are divided into 6 groups such as hazardous control form working environment and chemical, safety in material handling, working area / working condition or working point, accident control from equipment / machine and electricity, personal protective equipment including social welfare and worker's health.

1.6.3 Population in this study is the production employees of manufacturing process, sweet categories in Pathumthani using two methods:

1.6.3.1 Benchmarking method.

1.6.3.2 Self evaluation method.

1.7 The expected outcome

The best practice of working environment improvement of these two methods, benchmarking and self evaluation method could be applied both in the factory. The self evaluation method could be easier used and low cost.

1.8 Definition

1.8.1 Working environmental improvement means searching for easier and better method which will result in safer working condition and appropriate for working without causing injuries, occupational diseases or disturbing others.

1.8.2 Benchmarking is the searching method to find the continual best practice by comparative method with the better practice and bring the best method for improving their own organization to reduce time and lead to organizational excellence.

1.8.3 Self evaluation is the process of brain storming, planning, prosecuting and performance practicing. It is the process of critical thinking to improve working environment and develop organization to be the most effective organization using principle, education recognition, self development, validity and goodness.

CHAPTER II
LITERATURE REVIEW

2.1 Working environment

Case study of working or condition and behavior that the employment characteristics or the workplace have not identify the working behavior but they concern the behavior effectiveness to response working such as the workers in factory do not care the working environment (as high or low temperature) while they are working. They still to work because these are their responsibilities. The effect of too high temperature could had to less effective due to their body temperature has to regulate follow the environment, sweating loss could had to exhaustion and became serious result effectiveness in working and reflect the accident problem in working or mind follow as case study of working environment to improve their working environment for the most production, satisfy and do not effect mind (5)

The important principle of working environment

2.1.1 Noise

That is well know noise could be to make them can not concentrate, from studying found that the too high and low level of noise could disturb them more than the normal level of noise. Sanders and McCormick refer to Seal and Knight (5) that the noise will disturb the general workers, conclude the effect noise as;

2.1.1.1 The level of noise exceed 95 dB(A) will effect working .

2.1.1.2 The noise will not be the problem of the easy and routine job.

2.1.1.3 The high level of noise is effectiveness the general feelings.

2.1.1.4 The nerve process will reflect to be effectiveness from loud noise.

2.1.1.5 The noise dose not effect the time period during stimulation and reaction if possible time provide.

However the level of noise in proportion with man – hour as well. If the workers work long time in the area with high level of noise could make them effectiveness in working and loss hearing result hard of hearing or deaf. The regulation of noise controlling of Thailand describe in the Notification of the Ministry of Interior and the Notification of the Ministry of Industry emphasize the level of noise must not exceed 91 decibels (A), working not more than 7 hours a day but in case of working 7 – 8 hours a day, the level of noise must not exceed 90 decibels (A). In cases of working more than 8 hours 8 a day, the level of noise must not exceed 80 decibels (A) and the highest level of noise shall not exceed 140 decibels (A). If the level of noise do not pass standard must have Personal Protective Equipment from noise (6).

To use music or soft music in the industrial factory from assumption of the music reflect the good attitude for morale and increasing the production. This case study between result of music using and workers working in a carpet textile factory in the process of pattern providing and put the ropes which need the employee with high mind and body skills and take long time for working. The result found that music is not reflect the production but questionnaire of music using found that they believe they can increase the production. Landy and Trumbo Refer to Aree Petchpud. (7)

Beside case study of Uhrbrock (8) found that music is not benefit to all organization and is not corrective method of the worst result of organization. Music is good for some jobs, found that the employee morale will be better and good for using in the easy and routine job than the multiple jobs.

2.1.2 Illumination

The level of illumination in the factories or offices are the important condition in workplace which study by psychologists, engineers and the other experts. They revealed that if the illumination is not enough could make the workers tired due to the fatigue of vision and the effect the production could be lost.

The effects on body and mind;

2.1.2.1 The body effect

The main organ from the light effect is eye. The light danger could make eye effectiveness although there are mechanism in eyes to adjust the sight

in the area with high or low lighting but everything in the world are limited so the inappropriate lighting, not enough or too much could make eye dangerous. The most symptoms such as the eyes, muscle and nerve exhaustion, indistinct, feel vomit, feel dizzy, pain eyes, membrane and cornea inflammation, eyes vibration and others, Besides these symptoms could make workers effectiveness and cause the severities result any loss.

2.1.2.2 The mind and emotion effect

The light danger to body effect the mind and emotion could make workers became serious that is the emotion status to concentrate the eyes for long times result nervous, headache and may cause agreement in workplace. The reflect of mind and emotion effect the body as blood pressure, pepticulcer and etc. and the circle effect to be continued.

Lighting intensity is a fact of light provides in the workplace that too high and low intensity is not good for working and health. We have to consider the type of working in light provide that each type need the different lighting intensity. The Notification of the Ministry of Interior describes for the lighting intensity as shown in table 2.1. (9)

Table 2.1 The lighting intensity.

The type of working	**The lighting intensity (Lux)**
Work not requiring meticulous attention to details such as transferring, pecking, grinding, spreading out evenly the rough material	Not less than 50
Work requiring attention to details not much such as production.	Not less than 50
Work requiring moderate attention to details.	Not less than 200
Work requiring greater attention to details.	Not less than 300
Work requiring special attention to details.	Not less than 1,000

2.1.3 The weather

The weather is a fact effect behavior in working that is a weather condition. The reason of using word 'The weather condition' instead of 'temperature' because of the result of heat and cold to the body depend on the other fact such as moisture and ventilation.

2.1.3.1 Heat

We found that heat relation negative with operation. Case study of Fine and Korbrick refer to Seal and Knight (5) found that for long working time in the heat area result effectiveness working.

2.1.3.2 Cold

According to Fox 's(10) study the coldness effect to the worker for physical cold make the hand and foot pain before the other hand. If the temperature for hand is lower than 46° F, working result will be quickly effectiveness, working, from case study of Clark (11) found that the critical temperature effect to the surface temperature during 55 – 60° F.

2.1.3.3 Moisture

Percentage of moisture mean percentage of vapor is the highest proportion of possible under a temperature (12) if stable temperature it well be relax at moisture between 30 – 70 percentage.

2.1.3.4 Ventilation

Ventilation make to be more relax. If there is the ventilation in case of hot weather could make the workers feel better and increasing the ventilation could help to minimize the body temperature of the workers (12).

Beside the temperature in working environment provide we have to care about ventilation as well. Air flow help the workers fell more relax and prevent the disease from air pollution.

2.1.4 Ergonomics

Working environment does not consider the different fact and limits of workers that could make them uncomfortable, inefficiency then could make injuries risk and health problem of the workers.

Back pain is the most important symptom of workers to see the doctor (13) cause of back pain could separate four types such as;

2.1.4.1 Injuries

2.1.4.2 Lifting and transferring the heavy material

2.1.4.3 Wrong ergonomics

2.1.4.4 Working with vibration

Back pain could separate two type as immediately back pain form injuries such as the back bone broken, the back bone move and etc and chronic pain found eighty percentages from lifting in the wrong way or heavy material, wrong ergonomics, serious job and etc. (14)

The result of case of study of back pain form working of Korean workers 7,685 persons average age 40 years found that 15.4 percentage of workers pain at low back form lifting heavy material. (15)

The normal workers could have a problem about muscle as well. The result of workers in the department store of Maeda and parties(16) found a problem such as low back pain, neck, shoulder, eyes exhaustion, cramp, hand shiver and to be numb.

2.1.5 Man – hour

Long working time that the body could not do anymore could make inefficient in working, decrease production and sometimes cause to be sick. Case study of Kossori(17) study in thirty – four factories and study the man – hour result and absent, working time to hour a week and 8 hours a day could make the best result of working efficiency, absent rate. If increasing man – hour it could decrease be satisfy in working. Man – hour more than 8 hours / day 48 hours / week found that increasing working hour although the increasing production but have to take time to correct the mistake from working and could increase the injuries rate. Beside case study of Sparks, Cooper, and Shirom (18), found that working more than 48 hours relation health including heart disease, In century 90 European Council set the member country to set the most working hour is 13 hours day and 48 hours a week (Spector ; 2000 : 256) (19)

2.1.6 Safety condition and accident cause

Working industrial factory is the human and machine system. The workers sometime can not accommodate to factory condition and machine. Sometimes the machines have got some problem result injuries. The injuries will be serious or not that all cloud be a problem of working or abilities of factories.

Worksafe is an important fact from the theory of requirement of Maslow ; requirement, stability, safety is the second requirement that the first one is the physical requirement that is the basic requirement that important to all industrial organizations.

There are two cause of accident as the personal and organization fact. Accident may occur from some cause or other or both causes that is the major cause of accident.

Table 2.2 showed the concern both personal and organization fact to working.

Table 2.2 The concern both personal and organization fact to working.

The personal fact	The organization fact
- Alcohol and drugs using in working - Serious status (such as death in family) - Character (such as aggression) - Smoking	- Recruitment - Machine design - Low rate of resign and absent - Safety Management - Safety Training

Reference: (19) Spector 2000:266

Case study of Savery and Wooden (20) that study the Australian worker numbers of sixty – one organizations found that the relation fact to occupational injuries are the frequency of serious status, the organization fact from the requirement, training including the workplace design. Case study of (21) Iverson and Erwin study the negative emotion persons for occupational injuries prediction found that they have more experience in occupational injuries. These case studies is the good initiation of the strategy to minimize the occupational injuries such as the strategy in

requirement, training, behavior controlling for example; drinking in workplace or the suitable working environment and equipment providing.

2.1.7 The researches concern the working

2.1.7.1 Environment

Peter H.,et al. (22) surveyed the working environment of the small workplace in Thailand by sampling the small workplace. (The number of workers 10 - 49 persons) in Bangkok 107 workplaces, that emphasize five industries such as food, textile, wood, mineral and metal. To survey the workplace and interview the owner including using safety audit form and found that the small workplaces have got a lot of problem need to improve in the right for leaving such as sick leaving, childbirth leaving, vacation leaving and holiday leaving, low wage rate, sub – standard welfare for example; the toilet, basins. seriousness from working because of the workplace design and organization structure are not appropriate, risk of severities as machine injuries, loud noise, silica dust, wood dust cause of potential occupational disease, lack of PPE so should improve the problem above such as;

- The cooperation between the government and the concern organization as Social Welfare and Labour Protective Department, Employer and Employee Organization with promotion of Ministry in program of the small workplace improvement.
- Training providing for the method of product improvement and increasing with low cost.
- The information distribution to the small workplaces as brochure, poster and any information documents, broadcast, radio to give the knowledge about the possible practice.
- The governmental authorities should be trained in the appropriate recommendation to workplace.
- Should provide the product and safety training program for employers and workers of the workplace.
- To set the Nation Safety Week.
- Money to pay back for workers.

Francisco J.(23) surveyed the health service and health harm in industries by sampling 1,198 workplaces in seven cities around Manila including the production, structure, sales, service, finance, transportation, product stock and communication industries by workplace survey and answer the questionnaire by interviewing, found that the medical officers in the workplace have worked full time in the big workplace but have worked part - time in the medium and small workplace so the workers in the medium and small workplace will loss the benefit in health service which check up before and after work. Health and hygiene training will be set in the big workplace and not much in the small workplace. Health harm that were found such as noise, heat, organic dust, metal dust, chemical vapor, solution and lighting and lack of the good control method could make the health problem of workers so should improve by hiring the medical officers to work full time and force to check up workers before and after work, should provide the health training course for workers, to provide the specific ventilation to control the dust, chemical vapor, solution dangerous, force to record sick or injuries statistics in workplace for the right information in health status evaluation of workers in workplace.

Chutapanit Klinferng (24) studied the research compare the safety management in six types of workplaces by sampling workplace with 100 workers up that are located in Bangkok and five provinces around Bangkok 111 workplaces. Using interview form about safety administration in the workplace found that the workplace emphasize the requirement, job changing test and working joining for the first one and for the second such as safety rules, the third such as emergency and damage plan, the fourth such as safety policy and assignment, the fifth such as safety committee and the lost one such as concerning and promotion of executive. All safety management does not pass standard, researcher give guideline for safety administration in the manufacture and aim them recognizable and attitude to be right by safety training in clouding controlling following safety rules and all workers give cooperation in safety administration in their workplace.

Chutatawat Intarasuksri (25) and parties researched the evaluation of working result follow as the Notification of Ministry of Labour and Welfare subject Safety Committee in working by sending the questionnaires to

employers and workers concern this law and use 431 questionnaires found that workplace performance in safety committee is high (average 3.67 – 5.00) and working efficiency of safety committee in safety officer providing promotion from executive of workplace for safety committee performance is high.

Working efficiency safety committee is fair (average 2.34 – 3.66) and most workplaces require the governmental promotion in safety recognizable all workers that is high and second is requiring the promotion of safety standard training from the government to safety committee.

Warren and Rheingold (26) studies the research found for technical / concrete skills and information, This encompasses such areas as rescue skills, knowledge of equipment, the ability to answer specific very little mention of technical ability for women instructors when they worked with a man. In the co-ed pairings, the males received almost all of the feedback praising technical skills and knowledge. This demonstrates that there is a difference between perceptions of male and female co-instructors. Because believe the women co-leading with men have less of a voice in specific areas, technical skills being one such area.

2.1.7.2 Safety management and promotion activity in work safe

Phusit Keittikhun (27) said that the person who has more work age will have the knowledge in worksafe less than who has less work age.

Nittaya Pensirinapha and Sarawut Suthammasa (28) studied the opinion on the cause of occupational health and safety in person who worked on safety found that safety officer has less experience and skill for management and operation and the main cause of employee are less interesting, less understanding. The executives is less important in this topic, and do not support the budget in working management and do not have the exactly policy.

Patthama Pummapun (29) found that the fact knowledge in safety management relate to the direct cause and working behavior.

Kritsada Chaikul(30) said that effective and complete safety system have to get the suitable basics on good working condition which the person should understand in safety and health as in 3 topics;

1. Elements
2. Plans
3. Project and Techniques or Tools

Ganjana natapintue and parties(31) found that in safety training in work place. Workers will be more interesting than supervisor that refer to production lost time.

Suputtra Towarapa(32) found that result from safety activities test found that workers' safety behavior are better, have the good knowledge, attitude about safety.

2.2 Benchmarking: Working environment improvement

Because in the present time, the domestic industries have got the promotion and development, there are trainers and high technology for production to apply in working to get the high product and best benefits that is the importance of businesses and may cause of accident problem, occupational disease and environment impact could make injuries and properties in high rate.

Both government and private need to develop and improve themselves for safety in industries with the working principle that 'Occupational Health and Safety of workers are appropriate and Production Loss Controlling is least could make the high product and best benefits to industries system' commit to word – class standard.

Benchmarking is a method for workplace in safety performance by comparison the better process and best practice and take the result of comparison to improve themselves and not spend more time to improve the organizations benchmarking could make best practices is an important basic data for benchmarking (33)

2.2.1 Benchmarking: Meaning and characteristic

The important words are benchmark, benchmarking and best practices

What is benchmark? The meaning of benchmark is the effective comparison criteria that mean the comparison, abilities. The meaning of benchmark concern the organization improvement follows as quality improvement. benchmark mean Best – in – Class is the most excellent or the world class that the most excellent or the best in the original for the other person compare their abilities.

What is benchmarking? (34) Benchmarking mean the product service and the best practices comparison and measure method to get the comparison result for their organization improvement to be the best practices in each types of organizations.

In the other hand, benchmarking is result, method, plan, practice step evaluation process including the product and service evaluation process of organization that could make the difference of the same practice in each type and benchmarking witch indicate safety is the comparison for more standard safety practice.

Benchmarking is not system auditing, Benchmarking is finding best practice could make the best working (35, 36, 37, 38). Benchmarking is the adaptation tools and increasing the organization abilities by using research and comparison between the business process and the best practices in each type. The information could be applied for organization adaptation in short time and benchmarking concern all human resource managements in organization including cooperation for working process adaptation.

Especially benchmarking in safety could minimize Lost Time Injury Frequency Rate (LITFR).

Blewett (39) said that safety working is best important mean controlling Lost Time Injury Frequency Rate: LTIFR

Reason (40) found that the basic of safety management to be successful, have to be continuously for system monitoring follow the scope of failure indicator of process in injuries system as below;

- Lack of the target for analyze the critical work and process.

- Lack of the organization completion (organization cooperation).

- Lack of communication (Internal and External).

- The mistakes for work design.

- Lack of prevention.

- The mistakes for hard were (Anything not human such as material, equipment machine, raw material.

Barenklau(41), Chnokar and Wallin(42), Komaki(43), Sulzer - Azaroff and Feliner(44), Sulzer – Azaroff (45)

To study benchmarking in safety conclude the safety working measure is an importance depend on employee behavior, should evaluate the behavior follow as standard by notice or questionnaire, can get the unsafe behavior information of workers that are the injury causes. The result of Barenklau and Parties emphasized the injury behavior, from that case studied return one step for following up the second problem due to the second problem is the cause to make the unusual major cause after that correct the problem.

The result is the unsafe working behavior could be protected from sick and occupational disease.

National Safety Council (NSC) (46) that is the Nation Safety Consult in Chicago, the United States member more than 45,000 businesses such as Labour Organization, schools, the public representative and private group by cooperation to provide the policy, plan, research on safety aim the accident and loss protection
efficiency.

Including the best practices from the number in group by using benchmarking and exchange the safety information from the expert. Beside the member of group can get the prizes from minimizing accident, from the committee of council, the result of all members group found that much lower accident rate. The comparison between the member and not be the members found that the members in Nation Safety Council have the accident rate lower than not being the member and the

member of group can arrange the critical risk assessment or life safety and properties in workplace could make the lower accident and loss.

In the present Thailand is found the workplace of box category that is located in Nawanakorn Industrial Estate in Pathumthani has 196 workers work 8 hour a day from Monday – Saturday get awards from National Safety Council because of the workplace has suitable safety and working environment without occupational injury or illness involving days away from work as shown in table.

Table show the accident rate from working in 1998 -2003

Year	Accident rate Case/percentage
1998	1/0.38
1999	2/0.76
2000	1/0.38
2001	0/0
2002	0/0
2003	0/0

According to the table found that in 2001 the accident rate is zero because of the workplace has used benchmarking process for working environment improvement cooperate with the same network total eight workplaces such as Samutprakarn, Ratchaburi, Songkhla, Cholburi, Saraburi, Pracheenburi and two workplace in Pathumthani. May not mean the real best of all organization but may be especially some organization and other because each organization has the different vision culture, business type and the fact within organization, so best practices is not limit an only process or some process and other but depend on the best practices of organization.

Nation Product Increasing Institute(47) to do the project ‘to increase efficiency in the competition by using benchmarking was in process by Center of Excellent Department of research (R&D) and information technology system (Nation product Increasing Institute) is the one project in project of Thailand Industries Enhance that has made rapid strides with benchmarking process and best practices.

To get the budget from government for the project that aim to make a strong management for Thai manufacturer could make more efficiency in competition.

Because of benchmarking is the process comparison method or the Best practices and take benchmarking result to improve own working.

The point of benchmarking in this time is food safety. The project details emphasized food safety and trained the principle and the method of benchmarking and best practice of any processes in the food industrial group for applying in own organization improvement and have provided the data base of best practices of the canned food industrial group.

This project finished at the end of 2002 the performance period six months but the performance and result information of project did not display and know that only in benchmarking team.

Best practices what is

American productivity & Quality Center (APQC) has defined best practice mean all practice could make the best result that conclude as best practice is the practice to make the organization successful all can say that is the practice to make the best practice.

The word 'best' of best practice is the comparison meaning words that depend on the situation and the main target. The word 'best'

May not mean the real best of all organizations but may be especially some organization and others because each organization has the different vision best practices is not limited an only process or some process and others but depend on the best practices of organization.

Benchmarking is the process for finding the best practices.

Best Practice on Occupational Health and Safety and working Environment Improvement in 2003 (48).

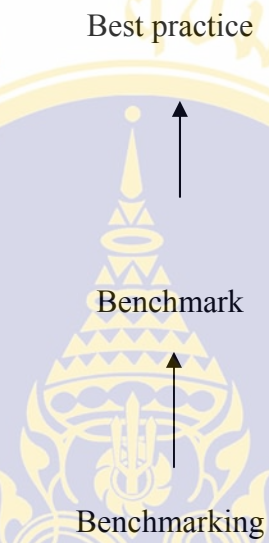
There are four best practice as below;

- Best practice on "The Heavy Machine Filter Cleaner Creation." By Cimen Thailand (Kangkoi) Co. , Ltd., Sasraburi
- Best practice on "Solder Ball Washer Creation" By Akia Systems Microelectronic (Thailand) Co. , Ltd., Pathumtani

- Best practice on “Aluminium Structure Frame Cutter Machine” By Sony Siam Industries Co. , Ltd. , Ayuthaya

- Best practice on “In pollution Rust Protective Injector Tank.” By unity Industrial CO. , Ltd. , Rayong

The relation of benchmark, benchmarking & best practice(34) as below;



Beside benchmarking also mean (49)

- The tool for improvement, setting and finding the standard of Best Practice.
- Benchmarking is the process for search the best practice continuously and select the best practices to use or improve for best of the best.
- The target setting method in practice and project for best practice of industries.
- Best practice search and imitation to stimulate working of the concern person and has made rapid strides.
- The positive ideas to the search and adaptation process to be best practice for organization effective improvement.
- Learning the method to be best practice and adaptation anything to be appropriated own organization.

2.2.2 Characteristic of benchmarking

2.2.2.1 Internal benchmarking is the performance process comparison within their organization.

2.2.2.2 Competitive benchmarking is the comparison in working or practice process by comparison with the direct competitive organization.

2.2.2.3 Functional benchmarking is the comparison between the same process and same or nearly industries.

2.2.2.4 Generic benchmarking is benchmarking cross industries is the comparison between practice process and the organization in the other industries that emphasize the evolution making and working changing process, not emphasize duplicate the working style from the other in the same industries.

2.2.3 Benchmarking comparison analyze

The dominant of benchmarking system.

2.2.3.1 Internal benchmarking

2.2.3.1.1 To be easy to practice.

2.2.3.1.2 Low cost.

2.2.3.1.3 To be quickly for doing.

2.2.3.1.4 Could make working changing and the better training in organization.

2.2.3.1.5 Could make using the information together.

2.2.3.1.6 To be easy for training.

2.2.3.1.7 To use the same language.

2.2.3.1.8 To concentrate and understand in their working process.

2.2.3.1.9 To have the good beginning for benchmarking process in the future.

2.2.3.2 Competitive benchmarking

2.2.3.2.1 To know the details information of the competitive organization in the same business.

2.2.3.2.2 To take the information to use in organization plans and targets.

2.2.3.2.3 To compare the same working process.

2.2.3.2.4 To have chance to become relation.

2.2.3.2.5 May get the same practices.

2.2.3.3 Functional benchmarking

2.2.3.3.1 To be found in the industries trend information.

2.2.3.3.2 To be quantity comparison.

2.2.3.3.3 To be finding the same thing.

2.2.3.3.4 To have the better organization improvement.

2.2.3.3.5 The organization could adapt to the varieties practices.

2.2.3.3.6 Requiring to show clearly their aim.

2.2.3.3.7 Recover new occurrence or any activity in organization.

2.2.3.3.8 The improvement helps the organization to have best practice for the working instruction.

2.2.3.4 Generic benchmarking

2.2.3.4.1 Not have the result from competition and danger from the same industries.

2.2.3.4.2 To open mind to have more vision.

2.2.3.4.3 To be the evolution.

2.2.3.4.4 To be effective for discovery new things.

2.2.3.4.5 To be checking the information compare with the varieties industries.

2.2.3.5 If there is no the internal benchmarking the following event will be occured:

2.2.3.5.1 The limit of growing up of organization.

2.2.3.5.2 Low efficiency for organization.

2.2.3.5.3 To make the competition between each person in organization to increases the personal abilities.

2.2.3.5.4 To make working in organization more flexible.

2.2.3.6 If there is no the competitive benchmarking the following event will be occured:

2.2.3.6.1 To be difficult for finding the organization improvement method.

2.2.3.6.2 Can not compare with the best practice.

2.2.3.6.3 Low abilities in organization effective improvement.

2.2.3.7 If there is no the functional benchmarking the following event will be occured:

2.2.3.7.1 Can not adapt to best practice.

2.2.3.8 If there is no the generic benchmarking the following event will be occured:

2.2.3.8.1 Not open mind and no vision.

2.2.3.8.2 Not have the efficiency in discovery new thinks.

2.2.3.8.3 Not have checking the information compare with the varieties industries.

2.2.4 Benchmarking limit

2.2.4.1 Internal benchmarking

2.2.4.1.1 Comparison with each section could make some problem to workers.

2.2.4.2 Competitive benchmarking

2.2.4.2.1 To have the limit in the trading secret.

2.2.4.2.2 To get the wrong information.

2.2.4.3 Functional benchmarking

2.2.4.3.1To get the same process rarely.

2.2.4.3.2 To be more famous than internal or competitive benchmarking.

2.2.4.1 Generic benchmarking

2.2.4.4.1 High expenses.

2.2.4.4.2 To be difficult for practices.

2.2.4.4.3 To get the best practice rarely.

2.2.4.4.4 To spend long time for planning.

2.2.4.4.5 The comparison result can not use in our organization if too different working.

2.2.5 Benchmarking process

The steps of benchmarking to improve working of workplace benchmarking process is consisted of below;

Plan

Step 1 Benchmarking process choosing
Step 2 To choose and prepare team for benchmarking

Search

Step 3 To find the best practice for comparison

Observe and Analyze

Step 4 The information collecting and analyze
Step 5 To consider the performance gaps and strengths
Step 6 To understand all system
Step 7 To report benchmark
Step 8 To set the target

Adapt

Step 9 Practice plan development, step of practice and result checking
Step 10 Adaptation

2.2.5.1 Plan step

Step1st Benchmark selection.

A. To check strategies of organization (mission, vision, values, goals, strategies, objectives)

B. To check the process effect performance

- To record all steps which effect benchmarking.

- To choose the step to success plan.
- To record the expectation of organization from beginning of benchmarking.

C. To do document of responsibilities team in process

- Document development for benchmarking.
- To design the flow chart of process of case study and effect impact working of the other process.
- To identify requirement, expectation and check all efficiencies of process.
- To identify the name list of responsibilities in each process.
- To make sure about promotion of executive.
- To identify the beginning / leadership group of organizations in benchmarking process.

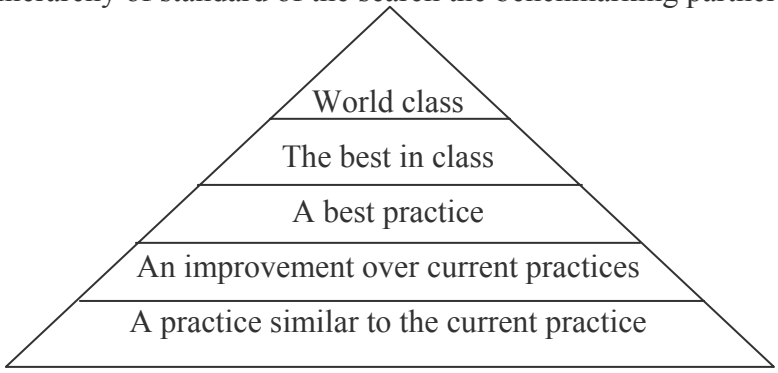
D. To identify the type of benchmarking as below;

- Internal comparison
- Competitive comparison
- Functional comparison
- Generic comparison

E. To identify aims / target and requirement in organization improvement as below;

- World class
- Good, Better, The best of class
- Continue Process Improvements: CPI

A hierarchy of standard of the search the benchmarking partner(s)



Step2nd To choose and prepare benchmarking team.

A. To introduce the principle to the benchmarking team in order to have:

- Group
- To coordinate the group of quality executive to benchmarking group.
- Benchmarking leader (Should be the same group with number 2)
- To arrange the activities.
- To set the suitable time for team to study benchmarking.
- To set variable for identification (result, efficiency, expense, time)
- To set scope of benchmarking.
- To identify the time period, human and etc. to use in benchmarking.
- To identify the type of benchmarking

B. To set the rule and responsibility.

C. To provide the flowchart of benchmarking process.

- To learn the current process.
- To provide the flowchart of benchmarking process and use the word 'is' for being in progress and should not use the word 'should be' because it could make information confuse.

2.2.5.2 Search step

Step 3rd To find the organization the compare with the best.

A. To find the name list of best accomplish organization in each type.

- To find out the data on internet, magazine, journal, research, expert in any industries on the famous organization.
- To find out the company or organization name list that is possible to do benchmark together.

B To find the organization for comparison (5 – 15 case).

- To do the table for consequence organization of groups.

- If we require to interview the organization and sending the questionnaire by post or interviewing on the phone.

- To arrange before and after of the name list of organization for benchmark depend on the case study from comparison in any organization.

C. To should the organization for benchmark in the final state.

- To emphasize the accept leadership organization .

- To evaluate the expectation benefits and possibility in exchange program for site visit factory.

- To provide the data and reason to make sure the executive to organization permit to exchange the data with the best organization.

Site visit instructions are as follows:

- To coordinate, make and appointment including the reason, objective of site visit and inform the name list of visitor to the authorities.

- To should the objective and learning between site visiting (including setting the requirement for new data).

- Benchmarking team conference.

- To contact for more information and offer the budget before visiting for setting the data and visiting area.

- To set the interesting thing / process between visiting organization.

- To draft the question for questionnaire in benchmarking process and should reserve the question.

- To prepare the interesting information for benchmarking and question for exchange information to the best organization.

- To ask for permission the visiting company every time in case of taking a camera or record equipment before going inside factory

- To have relationship with the company authority fore coordination in case of any information requirement next time.

During site visiting

- To collect the information about benchmarking follow as the agreement between the visiting company.
- To prepare question and always consider the visiting company could ask the same question to our company.
- To prepare the suggestion and information to exchange the visiting company.
- To effort for getting the exactly information but should not exceed in site the detail in the process.
- To record the information every time.
- Beside we have to record any opinion during side visiting for applying in the future.
- To find out the dominance of visiting company for the better quality to our company. Sometime we have to apply the opinion for comparison in any process due to many processes could not do in the same thing.

After site visiting

- To immediately to have a meeting to conclude the result of site visiting and provide benchmarking practice plan.
- To do systematically conclusion document.
- To compare the current practice and the conclusion
- To take the recommendation.
- To try the practice and evaluate the result.
- To provide the development plan and improvement including correcting.

D. To know exactly benchmarking method and manual in keeping convention of manufacturer.

- To understand in code of conduct of benchmarking.

- To check the right of any states with law department if necessary.

Code of conduct

a) The principle of law performance.

To avoid any negotiations or actions that could make misunderstood in trading such as the price or bid data that should not ask direct the cost, price with the competitive company.

b) The principle of information exchange.

Should have agreement of the exchange information level that is the same level of information and have to be permit to use especially benchmarking .

c) The principle of secret.

Mostly the point is the most problem of benchmarking process due to it necessary to control the secret level both organization and personal level that all have to keep the secret and can not display except permission from the concerned person.

d) The principle of information using.

To use the information for objective especially practice improvement within group of company to join in benchmarking. The consult or client take this information outside before permission.

e) The principle of internal coordination.

To effort to contact for any information direct to the assignment person of each company only and should contact the responsibilities in benchmarking if it is possible should have agreement.

f) The principle of external coordination.

In case of visitor to ask for information about benchmarking have to be permitted every time from responsibility person who will give information about benchmarking.

g) The principle of preparation.

To identify the rule and responsibility and control efficiency in benchmarking to meet the target with preparing in each step especially process preparation that need corporation.

2.2.5.3 Observe and analysis step

Step 4 Information collecting and analyze.

A. To consider the information plan and method.

- To consider the measure for process comparison such as the result of working environment improvement performance, quickly decreasing accident statistics, lower cost.
- To consider the information collecting.
- To set rule and responsibility of collector.

B. To collect and arrange consequently the important.

- Information to collect information and arrange the information analyzes process.
- To conclude the information analyze resource in report.

C. To train benchmarking team.

Step 5th To consider performance gaps and strengths.

A. To analyze performance gaps and strengths.

- To analyze performance gaps from the detail for comparison.
- To consider the result of gaps with comparison.
- To plan gaps in the future.
- To do new flowchart follow the possible process.

B. to do report of benchmarking result.

- To conclude the analyze result in report.
- To recommend the best practice from benchmarking.

Step 6th To conclude all system.

A. To study all system of benchmarking report.

- To study benchmarking report and recommendation .
- To make sure the team follow as the theory and the right practice.
- To analyze performance gaps.
- To consider the effect of change management and process in organization.

B. The final recommendation conclusion.

- To study the result and recommendation from benchmarking.
- To find out the result from all system of organization improvement.
- To change vision to be appropriate the process, follows as recommendation for adaptation efficiency of organization in the future if it is necessary.
- To evaluation the effect of policy / regulation exchange of organization.
- To decide the final step to get the recommendation from benchmarking to apply in organization.

Step 7th Report of benchmark.

A. Report

- To report to be appropriate the workers in organization.
- To consider the difference of group, presentation method, to report such as graph, statistic data, flowchart and etc.
- To acknowledge the employee ideas of all level in organization.

B. Idea collecting and Analyze.

Step 8th To set the target.

A. To write down the performance to the target follow as best practice.

- To correct / adapt the target if necessary.
- To collect the result from benchmarking for setting the target, plan and aim of plan.
- The executive consider for plan adaptation.
- To use the normal language and easy to understand.

B. To use standard for practice reflect the new target.

2.2.5.3 Adapt step

Step 9th To develop the practice, practice step and measure.

A. To prepare the working improvement follow as the recommendation below;

- Working step adaptation (if necessary).
- To measure the result from benchmarking.
- To measure feed back.

B. To present the practice plan to the executive for improvement.

- To explain the draft of practice plan for benchmarking team.
- To present the practice plan to the executive of organization for improvement.
- After improvement have to follow as the plan the best practice, follow the progress and feed back from workers.

C. Celebration

Step 10th Adaptation

Benchmarked process following

- To confirm the result of strategies adaptation.
- To be continuous for following satisfaction of workers.
- Organization improvement that improve to become good or better in the country.

2.2.6 The famous tools in benchmarking

2.2.6.1 Criteria testing matrix

Criteria testing matrix is the selection for process. Many time we found that any process.

Selection train to anything that interesting, the considerer will emphasize that thing with out consideration the other main point and to decreases the bias of selection by taking criteria testing matrix to put the score. The process selection will be more reasonable score, choose depend on that process. If it is necessary in environment improvements that mean little score.

The criteria testing matrix table shown as figure 2.1

Criteria / Process	Section 1st Dangerous controlling from working environment	Section2nd Safety in material handling	Section3rd Workplace, Working condition or working area	Section4th Dangerous control from tools, machine and electrical	Section5th Personal Protective Equipment (PPE)	Section6th Welfare and occupational health providing	Total Score

Figure 2.1 Criteria testing matrix table

2.2.6.2 Fishbone diagram

Fishbone diagram is the diagram to show the cause of problem with consideration all factor effect the process.

We sometime all fishbone diagram that 'Ishikawa Diagram' The structure of fishbone diagram as shown in figure 2.2

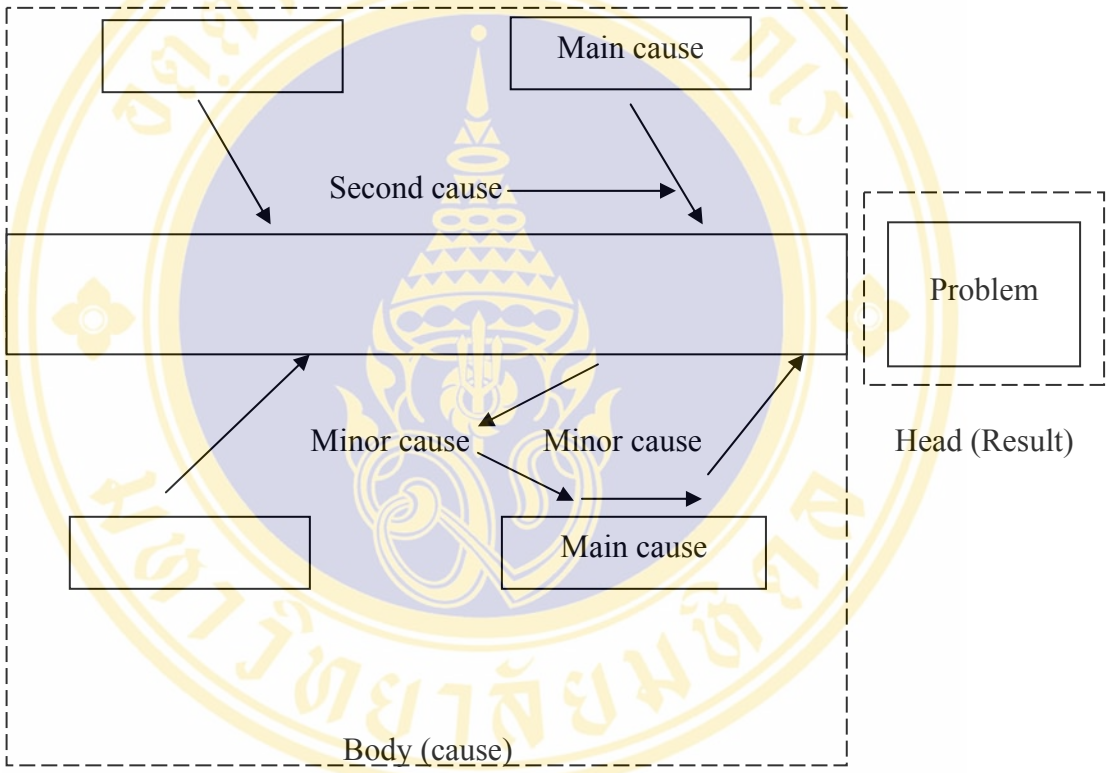


Figure 2.2 The structure of fishbone diagram

2.2.6.2.1 Body including all factor effect the main problem in head by taking the cause inside the body of fish and have to separate the level to follow as the second problem till the real cause.

- Main cause from the main element in working that expect to be the problem cause such as workers, machine, environment. The main cause include the minor cause.

- The second cause could make the problem to main cause.

- Minor cause could make the problem to the second cause.
- Minor cause is the root cause of any problem.

2.2.6.2.2 Head is the identification problem.

The recommendation for fishbone diagram

- In case of fishbone diagram in group only the leader should write the fishbone diagram in the meeting.
- Main cause, second cause, minor cause should do from brainstorm in case of solving in group
- To select the cause from brainstorming in group.
- To set the problem in head of fish have to write clearly.
- To avoid the feeling in fishbone diagram.
- Before conclusion the problem should give consequently the score to any factor.

2.2.6.3 Z Chart

Z Chart is the information analyze to find out Gaps between our company and the competition company in the present and predict the different in the future. Mostly prediction Gap in the future will show in graph call Z Chart to be easy.

Calculation to find out the different of gap.

Calculation the different of gap is

$$\text{Gap} = \frac{\text{Benchmark company - Our company} \times 100}{\text{Benchmark company}}$$

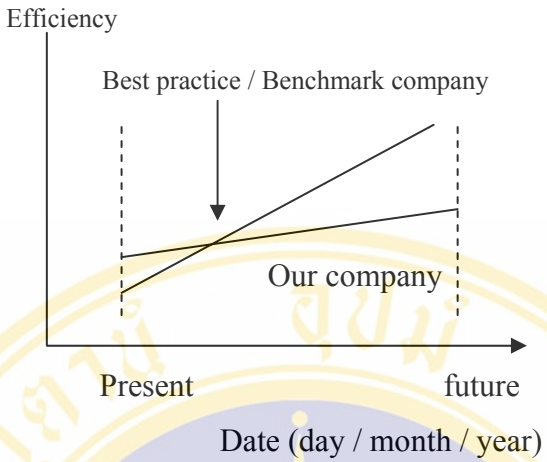


Figure 2.3 Z chart

According to the figure show our efficiency and benchmark company's efficiency. At the same time the different between our company and benchmark company is gap and after that if we always use benchmarking for comparison and improve ourselves we could approximate the time to do as well as the benchmark company and when we can do as well as that it means we could close completely gap between our company and benchmark company so we call 'Close Gap' and if we improve continuously we cloud do better than benchmark company.

2.2.7 The benefit of benchmarking

2.2.7.1 To know the best performance.

2.2.7.2 To know the leadership organization in each process.

2.2.7.3 To make the standard of efficiency in organization from the analyze of best organization.

2.2.7.4 To take the result from comparison to use efficiently the benefits.

2.2.7.5 To measure our efficiency of production process and strategies compare the best production process.

2.2.7.6 To measure the performance of each business.

2.2.7.7 Should check efficiency of organization.

2.2.7.8 To stimulate continuously the organization improvement.

2.2.7.9 To set the possible aim.

2.2.7.10 To have new vision of organization.

2.2.7.11 To make the working standard organization.

2.2.7.12 To develop quickly organization.

2.2.7.13 To be clearly and quickly exchange in organization.

2.2.7.14 This will be the creative working.

2.2.8 The problem of benchmarking

Table 2.3 showed the problem of benchmarking.

Table 2.3 Showed problem in benchmarking.

Problem	The most cause from
- To choose the appropriate benchmark company.	- To take little time to studying and search information for organization.
- To choose the wrong measure for comparison.	- Ourselves have the knowledge and process in organization not enough.
- Failure in convince the executive to believe the comparison result.	- The information is not enough. - The presentation is not interesting.
- Lack of promotion.	- Lack of promotion form executive. - Lack of the progress report in team.
- The data is collected without benefit.	- The data collecting is not right. - Our do not emphasize the identification of efficiency. - To collect roughly and delicate data
- Mostly benchmark company will not exchange benefit data.	- Benchmark company have the same process with our company. - The comparisons are narrow and the too secret.
- The information is not right.	- Not recheck the answer. - Not explain the question. - To use the question have two meaning. -To ask the wrong person.

Table 2.3 Showed problem in benchmarking.(continued)

Problem	The most cause from
- Too many measure.	- Not arrange the sequence of measure.
- After learning the practice could not apply for using.	- To set the data for learning. - Not clear in the target could make the mistakes for comparison.

2.3 Self evaluation

According to the concerned research, the researcher agree safety and working environment improvement in workplace. The self evaluation increase the workers awareness and cooperation in safety and working environment improvement management in their factory.

That follow as philosophy in evaluation to develop working human, and social. The developer should be the person who have responsibility. If we would like to develop our working we have to evaluate our working to know the point of development improvement and can take immediately evaluation result to improve themselves and their working. If everybody do like this social and our nation will be immediately developed.

Self evaluation(50) is the process to use mind for consideration, result and check the mistakes for correction method and appreciate for success than can do the new thing.

Self evaluation should not bias by using the principle of three items as below:

- Education awareness for development ourselves.
- Aim to find out the truth, the right and goodness.
- All experience is learning.

Aim of self evaluation for development themselves working, administration of organization to be effective.

2.3.1 Self evaluation: The concern research

Charat Suwanwela(51) said that the main point of evaluation is self evaluation. The other person could not evaluate ourselves we have to evaluate ourselves, is major should evaluate ourselves, is institute evaluate themselves.

Prathamridok (Prayuth Payuth Toe) (52) said that self evaluation is the practice and development ourselves that believe human being an animal can practice and efficiency to achieve. Then could always make them recognize development themselves.

Beside their principles of remind themselves as poem “to remind ourselves” could help us be careful. Self evaluation will be right we and the other have to check ourselves.

Somkid Promjui(53) has developed self evaluation for extracurricular Center of three Amphur six month we found that the practice result of this center pass standard after self evaluation, the practice pass standard better than before using self evaluation in all function and the practice result it more than 15% . The coordination of Amphur think self evaluation can develop the knowledge and skill of human. Self evaluation help to develop working and the center of Amphur. The research of Somkid Promjui confirm clearly self evaluation develop human and working including development organization.

2.3.2 Advantage and limit of self evaluation (50)

The advantage of self evaluation could take the result to improve and develop human, working including development organization systematically.

The limit of self evaluation is difficult to get rid of attitude of self evaluation.

However if we aim for self evaluation to develop working evaluator need to make a system for self evaluation of such as the research of Somkid Promjui especially the development of criteria and quality identification.

2.3.3 The analyze with comparison self evaluation (54)

2.3.3.1 The objective of evaluation

To get information technology to develop working to be successful.

2.3.3.2 The dominance

The dominance is systemly practice of working. The evaluator and evaluatee is the same person and use the evaluation result for development both internal and external information.

2.3.3.3 The experience for using

Self evaluation is the process for development our working and organization.

2.3.3.4 The rule of art in evaluation

It is the model of evaluation for develop by using the principle in the world and Dharma in evaluation that is the evaluation follow strategies could make human correct the problem and develop themselves and become to make sure to help themselves.

2.3.3.5 The criteria in quality the decision of evaluation

To use the criteria for consideration without bias and using internal and external information including using self evaluation in ourselves, working or organization improvement.

2.3.4 Advantage and benefit

Self evaluation believe human could practice and be effective to achieve their objective, after that could help them recognizable and they can help themselves that is well know to practice.

Self evaluation is the process to make the information technology for decision to improve and develop working with efficiency that the workers have to evaluate themselves and use the knowledge for decision.

Limit of self evaluation is to difficult in evaluation due the person usually have bias and lack of the knowledge so the evaluator usually evaluate wrong because attitude, to evaluate by protection themselves, afraid of lose face so the evaluator should decrease attitude and not bias including using drama for evaluation.

CHAPTER III
MATERIAL AND METHOD

3.1 Study design

The study was a quasi experimental study to compare practice of working environment improvement in workplace between Benchmarking and Self evaluation method in food factories producing bean, chocolate and etc.

3.2 Population and sample group

Population: Workers of two food factories producing bean, chocolate and etc. in Pathumthani.

Sample: Male and female production workers in two food factories producing bean, chocolate and etc., in Pathumthani.

Sampling Methods: The sampling method use random sampling of male and female workers in these two factories.

The sample size is calculated as follows (55)

$$n_0 = \frac{Z^2(\alpha/2)S^2_p}{d^2}$$

n = Sample Size

S = Sample Standard deviation

d = maximal error that allow to happen(0.1)

α = Type I error(0.05)

Z = Z normal Standard score from Z-table at $\alpha = 0.05$ value = 1.96

$$n_0 = \frac{(1.96)^2 x (1)^2}{(0.1)^2}$$

$= 384.16 \approx 384$ persons

Remark:

The number of workers in the work two factories.

The 1st Factory using benchmarking method

Total workers are 199 persons.

The 2nd Factory using self evaluation method

Total workers are 290 persons.

Subject calculation is more than number of workers in the factories. The number of workers should be adjusted as follows:

Formula $n = \frac{n_0}{1+(n_0/N)} = \frac{384.16}{1+(384.16/(199+290))} = 215.14$

The number of workers in two workplaces is 489 persons, the first factories having 199 persons. So, the number of workers in the first factory is $\frac{199 \times 215.14}{489}$ = 87.55 = 88.

The second factory has 290 persons. So, the number of workers in the second factory is $\frac{290 \times 215.4}{489}$ = 127.58 = 128.

3.3 Instrument

3.3.1 The tools use in this research is a questionnaire with two parts:

The first part is used for workers in the production process consisting of 3 sets as follows:

The 1st set contains questions about status and general information, open-end type question.

The 2nd set contains question about opinion on working environment, consisting of 6 sections.

- Dangerous control from working environmental and chemical.
- Safety in material handling.
- Workplace, working condition or working area.

- Dangerous control from tool, machined and electricity.
- Personal Protective Equipment.
- Welfare and health care provided

The 3rd set contains questions about knowledge about working environment.

Criteria for evaluation

The 2st set : The score for each question refers to possible truth

Score 1 means available / yes.

Score 0 means not available / no.

The 3rd set: The score for each question about working environment.

Score 1 means right answer.

Score 0 means wrong answer.

The second part is used for Benchmarking team and self evaluation team. The second part contains 5 sets:

The 1st set : asking about status and general information, open–end type.

The 2nd set Questionnaire of policy and safety management.

The 3rd set Questionnaire of the knowledge about Benchmarking method.

The 4th set Questionnaire of the knowledge about Self evaluation method.

The 5th set Questionnaire of the knowledge about Working Environment.

Criteria for evaluation

The 2nd set To put the score for point of question refer to the possible truth .

Score 1 mean Available / Yes

Score 0 mean Not available / No

The 3rd set The knowledge for self evaluation.

Right answer score 1 mark

Wrong answer score 0 mark

The 4th set The knowledge of Benchmarking method.

Right answer score 1 mark

Wrong answer score 0 mark

The 5th set The knowledge of working environment

Right answer score 1 mark

Wrong answer score 0 mark

3.3.2 The principle of score for opinion about working environment.

The 1st Section; Dangerous control for working environment and chemical.

Table 3.1 Dangerous control for working environment and chemical.

Process Indicator	**Survey and analysis for working environment**
4 marks	- There are the analysis for working environment using the industrial equipment in the previous year about chemical and dust.
3 marks	- There are the analysis for Working Environment by using the industrial equipment in the previous year about noise, lighting and temperature.
2 marks	- There are working environment survey using safety audit about chemical and dust.
1 marks	- There are working environment survey using safety audit about noise, lighting and temperature.

Table 3.2 Noise control

Process Indicator	**Noise control**
4 marks	- There are the measures for noise control and use of noise control equipment on the wall and ceiling or using enclosure of noisy machine.
3 marks	- To separate the noisy machines away from working area.
2 marks	- To minimize the noise exposure of workers and moving from noisy area to the other area.
1 mark	- To use earplugs or ear muffs in noisy area.

Table 3.3 Lighting control

Process Indicator	**Lighting control**
4 marks	- To install the adjustable light appropriate for working.
3 marks	- To always clean and maintain the light in the previous year. - To check the expire date of the lamp and change it if expired in the previous year.
2 marks	- To increase lighting at the roof and windows.
1 mark	- The light is enough for working.

Table 3.4 Temperature control

Process Indicator	**Temperature control**
4 marks	- There are the insulation or the barrier between the heating material, pipe, machine and worker.
3 marks	- To install insulation to protect the heat on the roof or wall.
2 marks	- To install the air condition or fan to reduce the temperature.
1 mark	- To increase the natural ventilation by increasing the ventilation at the door, wall and roof.

Table 3.5 Dust, gas and chemical control

Process Indicator	Dust, gas and chemical control
4 marks	- To install the ventilation system to reduce dust, gas and chemical area.
3 marks	- Should have the specific chemical storage room. - The chemical container should have the label about danger, name of chemical, chemical protection and first aid for each chemical.
2 marks	- To have the label about 'do not eat or smoke' in chemical working area. - To increase the natural ventilation by increasing the windows and the doors.
1 mark	- To wash hand with soap instead of the lubricant or other chemical. - The workers who expose to chemical need to wash hands before eating or drinking.

The 2nd Section : Safety in material handling

Table 3.6 Material handling

Process Indicator	Material handling
4 marks	-To always check the equipment and system of material handing lift.
3 marks	- To have the safety rule for - Material lifting - Material handling - Material Transportation
2 mark	- To use the pallet for material handling. - To use a push – cart, tray, vehicles or the other mechanical for heavy material handling.
1 mark	- The worker have to lift the material with ergonomics awareness.

The 3rd Section : Workplace, working, condition or working area

Table 3.7 Working area

Process Indicator	Working area
4 marks	-To change from monotonous work to the other type of working.
3 marks	- To adjust the level of working control button into the appropriate position. - To adjust the level of table to be appropriate with the level of chair. - To adjust the level of chair to be appropriate and having the strong back of seat.
2 mark	- To set the shelf for material equipment and product storage.
1 mark	- To remove garbage and unnecessary things out of the working area. - The edge of table of machine have to be smooth, and can protect body injuries.

Table 3.8 Working area and pathway

Process Indicator	Working area and path way
4 marks	- The level of pathway is 1.5 meters higher from the floor, should have a strong rail. - The fork lift way should wide for at least three maters plus the fork lift wide. For two way pathway, it should wide two times of one way pathway.
3 marks	-To paint clearly and mark the pathway or using barrier to protect the danger from machine or vehicle crash.
2 marks	- To make the floor smooth without sliding. - Should have the clear mirror at the door between each room.
1 mark	- The working area should wide enough for movement of workers. - The pathway should wide and be smooth that suitable for material or goods transferring.

The 4th Section: Dangerous control for tool, machine and electricity

Table 3.9 Tools and machine

Process Indicator	Tools and machine
4 marks	- Pre – check the machine following the safety audit form. - To install the safety equipment to stop machine in case of accident.
3 marks	- To install the cover in moving part, rotating clip area of machine. - The machine cover with opening on the top should be strong enough. - To dress with suitable clothing if the workers have to work near the rotating part of machine.
2 marks	- To have the restrict line for the dangerous machine. - The pathway between machines should wide of at least 80 centimeters.
1 mark	- There are the covers of knives, sharps, scissors or strong handle. - There are boxes for tools

Table 3.10 Electrical

Process Indicator	Electricity
4 marks	- To set minor switch for electrical supply for each machine with separate control to avoid short – circuit.
3 marks	- There are the covers for electrical control panel.
2 marks	- To set the good electrical system.
1 mark	- To connect the ground for electrical machine.

The 5th section: Personal protective equipment

Table 3.11 Personal protective equipment

Process Indicator	**Personal protective equipment**
4 marks	- To control and look after the workers to wear PPE appropriate with work.
3 marks	- To always check PPE.
2 marks	- To recommend the PPE wearing method. - To recommend the PPE wearing method appropriate with working. - To recommend the cleaning and maintenance method for PPE. - Workers should participate and specify the type of PPE required for their work.
1 mark	To set PPE appropriate with working. - Safety hat - Safety glasses - Face shield - Chemical safety shield - Dust mask - Heat protective suit - Safety boots - Safety shoes - Chemical gloves - Ear plugs or ear muffs

The 6th section: Welfare and health care provided

Table 3.12 Welfare and health care provided

Process Indicator	**Health care and medical treatment**
4 marks	- There are doctors, nurse or person who has responsibility in first aid. - There are the ambulances and vehicles stand by for workplace.
3 marks	- Physical check up for employee before working and especially occupational disease protection. - Physical check up following type of working and working environment. - Yearly check up. - To inform the result of check up to workers. - To collect the information and occupational disease statistics. - There are the rooms or place for first aid to treat immediately.
2 marks	- To distribute the knowledge of occupational disease protection and help problem from doctors in the workplace. - To set the training of first aid for workers.
1 mark	- To have the activity or equipment of health promotion such as sport equipment, yearly sport game. - To separate the rest area from dangerous area.

Table 3.13 Storage room, toilet, canteen and disposal

Process Indicator	**Storage room, toilet, canteen and disposal**
4 marks	- To dispose the garbage, waste, used material following the hygienic procedure.
3 marks	- To set the personal storage. - To provide the drinking water in the workplace. - The canteen should be separated from the working area.
2 marks	- To install the washbasin in the toilet. - The number of toilets should be enough and near the working area.
1 mark	- The toilet should be separated as male – female. - The toilet is hygienic.

3.3.3 Score weighing in each item

Table 3.14 Score weighting in each item

Item	**Total score**	**Score weights**	**Scores**	**Result of score weights**
1. Dangerous control for working environment and chemical	50	39		
2. Safety in material handling	10	8		
3. Workplace, working condition on working area	20	15		
4. Dangerous control from tool, machine and electricity	20	15		
5. Personal Protective Equipment	10	8		
6. Welfare and health care provided	20	15		
Total result of score weight	130	100		

3.3.4 Data system and analysis

Table 3.15 Data system and analysis

Indictor	Question	score	remark
Survey and analysis for working environment	1.1, 1.2, 1.3, 1.4		
Noise control	1.5, 1.6, 1.7, 1.8		
Lighting control	1.9, 1.10, 1.11, 1.12,1.13		
Temperature control	1.14, 1.15, 1.16, 1.17		
Dust, gas and chemical control	1.18, 1.19, 1.20, 1.21, 1.22, 1.23, 1.24		
Safety in material handing	2.1, 2.2, 2.3, 2.4, 2.5		
Working area	3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7		
Working area and pathway	3.8, 3.9, 3.10, 3.11, 3.12, 3.13, 3.14		
Tools and machine	4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9		
Electricity	4.10, 4.11, 4.12, 4.13		
Personal Protective Equipment	5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7		
Welfare and health care provided	6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 6.11, 6.12,		
Storage room, toilet, canteen and disposal	6.13, 6.14, 6.15, 6.16, 6.17, 6.18, 6.19, 6.20		
Total indicator 13 points	Total score 130 scores	Result of score	

3.4 Questionnaire testing

The revised questionnaire is used to pretest in 40 workers in Asian micro company in Bangpa in Industrial Estate, Ayutthaya. After that the questionnaire is analyzed to find out the tool quality.

3.4.1 Reliability of questionnaire. The questionnaire is tested for reliability using, Kuder – Richardson, type, formula KR-20

Formula KR-20: $$r.. = \frac{n}{n-1}\left[\frac{[1-\Sigma pq]}{s^2}\right]$$

n = The number of points in test

p = The proportion of workers who answer right.

Σpq = Total of pq

s^2 = Variant of score

r = 0.82 for the knowledge of working Environment (workers questionnaire)

r = 0.74, 0.85 and 0.78 for knowledge about benchmarking, evaluation and working environment.(evaluator questionnaire)

3.4.2 Discrimination index: r is the analysis of test using formula technique 27% of all group' to find out the number by taking 0.27 multiplied by all number, the value is 27% of the sample. The subjects was divided into two groups: high score group and low score group to find out the total of each choice, H and L. It is taken the calculation as the proportion value of high group (P_H) and low group (P_L)

Formula $r = P_H - P_L$

p= The level for difficulty and being easy of test.

r = discrimination

P_H = The number of the person who answer that choice / The number of all in high group

P_L = The number of the person who answer that choice / The number of all in low group

The principle of r

If r negative means That choice should be corrected.

If r zero means That choice should be corrected.

If r positive means That choice is good.

3.4.3 Level of difficulty: P

Formula $P = \frac{P_H + P_L}{2}$

P = Level of difficulty

P_H = The number of the person who answer the choice / The number of all in high group

P_L = The number of the person who answer the choice / The number of all in low group

The principle of p

P less than 0.2 mean the difficult test.

P more than 0.8 mean the easy test.

3.4.4 The questionnaire of opinion on working Environment.

Question, close – end emphasizes on question that agrees with Working Environment; safety officer sets the criteria for emphasis the score of question as below;

The best important score is 4

The better important score is 3

The fair important score is 2

The less important score is 1

3.4.5 The evaluation output of safety audit system (56)

Criteria for evaluation output of safety audit score percentage

< 40 %	=	Poor
40 – 69 %	=	Fair
70 – 89 %	=	Good
90 – 100 %	=	Excellent

Reference : developed from PETEERSEN D: TECHNIQUES OF SAFETY MANAGEMENT COLORADO STATE UNIV.

Remark: 70 percentages is criteria of the evaluation of working environment score

3.5 Sampling technique

3.5.1 Benchmarking

-To survey and collect the information for acknowledgement of Working Environment situation in workplace.

- To select benchmarking team

- To present the details and steps of Benchmarking on Working Environment Improvement in workplace.

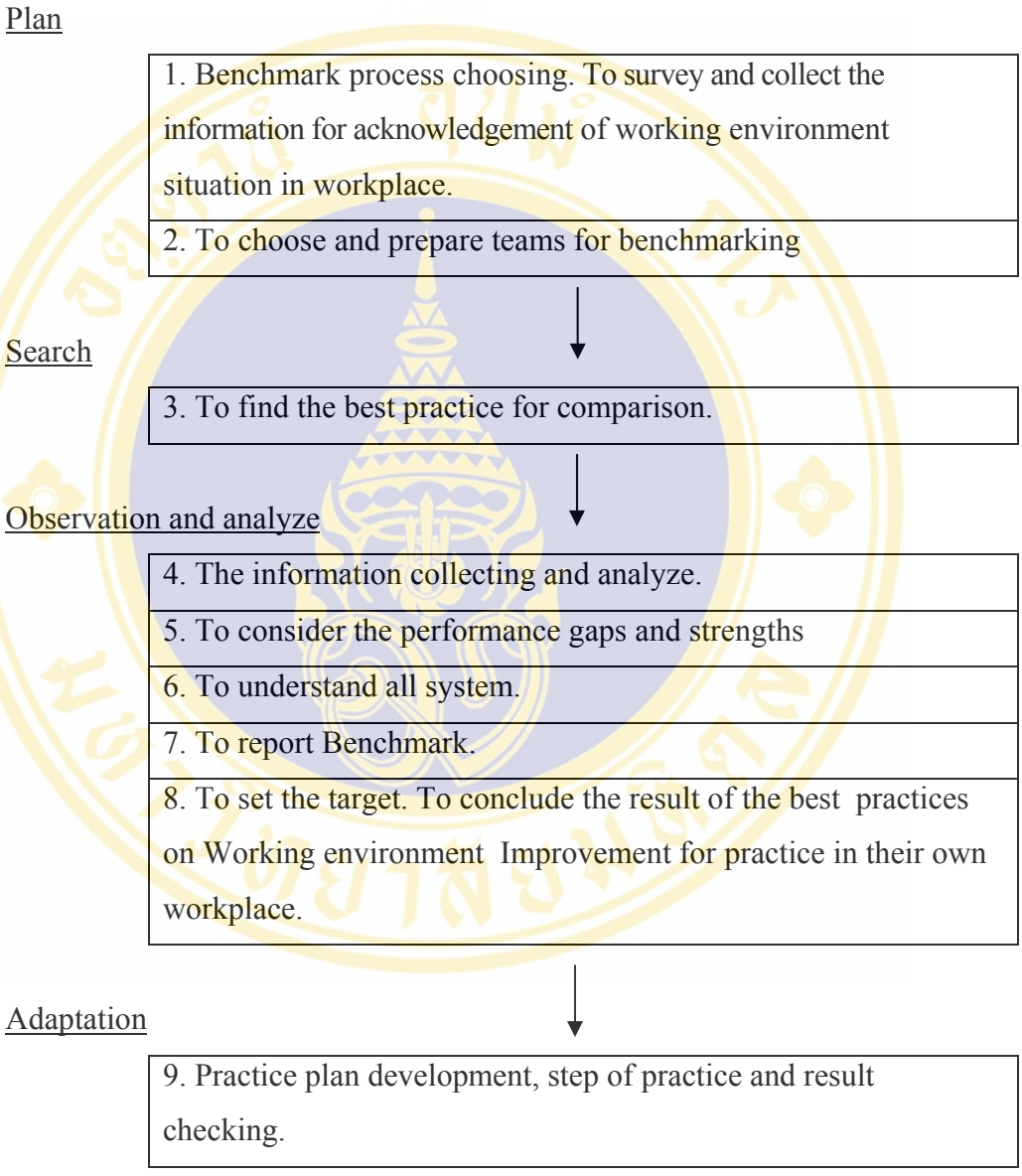
- To visit the other factory with Best Practices on Safety and Working Environment.

- To conclude the result of the best practices on Working Environment Improvement for practice in their own workplace.

- To follow up the performance result.

3.5.2 Benchmarking process

The step of benchmarking to improve working of workplace benchmarking process is consisted of below;



3.5.3 Self evaluation

-To survey and collect the information for acknowledgement of Working Environment situation in workplace.

- To select self evaluation team

- To present the details and steps of self evaluation on Working Environment Improvement in workplace.

- To conclude the result of the best practices on Working Environment Improvement for practice in their own workplace.

- To follow up the performance result.

3.5.4 Self evaluation

Self evaluation is consisted of the main steps below;

1. Plan

1. Planning for evaluation by survey and collect the information for acknowledgement of working environment situation in workplace.

2. Selection of evaluation team

2. Observation and evaluation

3. Information evaluation and collection

No problem

Problem

Recording of result

Correct the problem

3. Adaptation

4. Practices development, practice step and result checking.

5. Adjustment and follow up of self evaluation

3.6 Statistic

Statistic analysis has 2 phases:

3.7.1 Phase 1: Production workers of benchmarking factory and self evaluation factory.

3.7.1.1 Descriptive analysis: Mean, standard deviation, frequency and percent distribution were used to describe demographic characteristics of the study population for food factories.

- General information: Sex, education level, age, working duration, position, statistic of occupational injury since they start working and in the previous year and about job.
- Working environment knowledge.
- Opinion on working environment.

3.7.1.2 Analytical analysis:

- The homogeneity of sex, education level, age, working duration, position, statistic of occupational injury since they start working and in the previous year and about job by Chi-Square test.
- Independent samples t-test: Comparison of working environment knowledge score, opinion on working environment score and sex, and statistic of occupational injury since they start working and in the previous year.
- F-test two–way ANOVA: Comparison of working environment knowledge score, opinion on working environment score and education level, age, working duration, and about job.
- Correlation Analysis: Test was used to correlation of opinion on working environment score consisted of 6 sections.
- Independent samples t-test: Comparison of working environment knowledge score and compare opinion on working environment score and benchmarking group, and self evaluation group.

3.7.2 Phase 2: Benchmarking team and self evaluation team.

3.7.2.1 Descriptive analysis: Mean, standard deviation, frequency and percent distribution were used to describe demographic characteristics of the study population for food factories.

- General information: Sex, education level, age, working duration, position, statistic of occupational injury since they start working and in the previous year and about job.
- The recognition of knowledge of safety policy and management.
- Benchmarking knowledge.
- Self evaluation knowledge.
- Working environment knowledge.
- Practice of working environment improvement.

3.7.2.2 Analytical analysis:

- The homogeneity of sex, education level, age, working duration, position, statistic of occupational injury since they start working and in the previous year and about job by Chi-Square test.
- Independent samples t-test: Comparison of policy and safety management recognition score, benchmarking knowledge score, self evaluation knowledge score, working environment knowledge, regulation of working environment improvement score and sex, education level, and working duration.
- Correlation Analysis: Test was used to correlation of policy and safety management recognition score, benchmarking knowledge score, self evaluation knowledge score, working environment knowledge, and regulation of working environment improvement score.

- Independent samples t-test: Comparison of policy and safety management recognition score, benchmarking knowledge score, self evaluation knowledge score, working environment knowledge, regulation of working environment improvement score and benchmarking team, and self evaluation team.

- $\alpha = 0.05$

CHAPTER IV
RESULTS

The results of this study were presented in two parts as the following:

Part 1: Production workers of benchmarking group and self evaluation group.

Part 2: Benchmarking team and self evaluation team.

Part 1: Production workers of benchmarking group and self evaluation group.

4.1 Descriptive analysis of general information (Production workers)

4.1.1 General characteristic of workers

The survey from production workers in the manufacture, food factory between benchmarking and self evaluation. The benchmarking group found that most of them were female (68.18%) graduated primary school (61.36%), age during 31 – 40 years (37.50%), working duration during 1 - 3 years (28.41%), worker position (100%), all never developed occupational injury since they start working (87.50%). They never had occupational injury in the previous year for 88.64%. The average of age, working duration were 32.44 years and 4.29 years, respectively .

For the self evaluation group it was found that most of them were female (60.94%) graduated primary school (60.94%), age during 31 – 40 years (50%), working duration during 7 - 10 years (30.47%), worker position (100%), all never developed occupational injury since they start working (94.53%). They never had occupational injury in the previous year for 96.09%.

The average of age, working duration were 31.43 years and 7.15 years, respectively as shown in table 4-1.

Chi-square was applied to test homogeneity of the variable of workers between the two factories found that variable of sex, education level and occupational injury since they start work were not different but the variable of age, working duration and occupational injury in the previous year among the two factories were different statistically significant at education level (χ^2=8.55, p=0.05), age (χ^2=21.03, p=0.001), working duration (χ^2=21.97, p=0.001) and occupational injury in the previous year(χ^2=4.49, p=0.05), respectively as shown in table 4.1.

Table 4-1 General characteristic of qualitative variable of workers

Qualitative variable	Benchmarking group (n=88)		Self evaluation group (n=128)		p - value
	No.	%	No.	%	
1. Sex					
- Male	28	31.82	50	39.06	p=0.276
- Female	60	68.18	78	60.94	(χ^2=1.186 df=1)
2. Education Level					
- Primary School	54	61.36	78	60.94	p=0.036
- Junior High School	20	22.73	19	14.84	(χ^2=8.548 df=3)
- Senior High School	7	7.95	26	20.31	
- Vocational Certification/ High Vocational Certification	7	7.96	5	3.90	

Table 4-1 General characteristic of qualitative variable of workers (continued)

Qualitative variable	Benchmarking group (n=88)		Self evaluation group (n=128)		p – value
	No.	%	No.	%	
3. Age					
- Lowest to 20 yrs	10	11.36	3	2.34	$p < 0.001$
- More than 20 - 30 yrs	28	31.82	55	42.97	(χ^2=21.034
- More than 31 - 40 yrs	33	37.50	64	50.00	df=3)
- More than 41 - 55 yrs	17	19.32	6	4.69	
Mean	32.443		31.426		
SD	9.378		5.637		
Min-Max	17-56		19-44		
4.Working duration					
- Less than 1 yrs	20	22.73	7	5.47	$p < 0.001$
- 1 - 3 yrs	25	28.41	30	23.44	(χ^2=21.973
- More than 3 - 6 yrs	20	22.73	24	18.75	df=4)
- More than 6 - 10 yrs	14	15.91	39	30.47	
- More than 10 yrs	9	10.23	28	21.88	
Mean	4.287		7.147		
SD	3.826		4.616		
Min-Max	0.08-14		0.33-20		
5. Position					
- Labor	88	100.00	128	100.00	-

Table 4-1 General characteristic of qualitative variable of workers (continued)

Qualitative variable	Benchmarking group (n=88)		Self evaluation group (n=128)		p - value
	No.	%	No.	%	
6. Occupational injury since they start work					
- No	77	87.50	121	94.53	p=0.066
- Yes	11	12.50	7	5.47	(χ^2=3.375 df=1)
7. Occupational injury in the previous year					
- No	78	88.64	123	96.09	p=0.034
- Yes	10	11.36	5	3.91	(χ^2=4.488 df=1)

Most of workers in the benchmarking group worked as Bean Choosing workers (34.09%) as shown in table 4-2.

Table 4-2 General characteristics of job of benchmarking group

Job	No.	%
Bean Choosing	30	34.09
Bean Loading	16	18.18
Sweet	15	17.05
Pack Junko	10	11.36
Oven	5	5.68
QC	5	5.68
Maintenance	4	4.55
Stock	3	3.41
Total	88	100.00

Most of workers in the self evaluation group worked as Packing workers (34.09%) as shown in table 4-3.

Table 4-3 General characteristic of job of self evaluation group

Job	No.	%
Packing	17	13.28
PVC Injection	14	10.94
PVC Tube	14	10.94
Case Mill	13	10.16
Package	11	8.59
Pack Chocolate	10	7.81
Technician	10	7.81

Table 4-3 General characteristic of job of self evaluation group (continued)

Job	No.	%
Grains	7	5.47
Powder Preparation	7	5.47
Substance Preparation	7	5.47
Coating	6	4.69
Sheet Cutting	3	2.34
Mix Chocolate	3	2.34
Screen	2	1.56
Cut	2	1.56
The Cover Suck PVC	2	1.56
Total	128	100.00

4.1.2 Working environment knowledge

The benchmarking group answered the question on working environment knowledge, the question that gets the highest score was item 1 about the ways chemicals gets into the body (98.86%).

The self evaluation group answered the question on working environment knowledge, the question that gets the highest score was item 7 about the benefit of safeguard and machine barrier installation (99.22%) as shown in table 4-4.

Table 4-4 Description of working environment knowledge

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
1. How many ways does chemical get in to the body?	98.86 (87)	High	98.44 (126)	High
2. Can the ventilation get rids of the air determination and clouds dilute the air determination?	90.91 (80)	High	82.03 (105)	High
3. If the unsuitable ventilation, the worker will feel not comfortable?	90.91 (80)	High	94.53 (121)	High
4. Can noise effect health make blood pressure pepticulcer and serious?	81.82 (72)	High	73.44 (94)	High
5. Are there four items of surrounding Working Environment, Chemical Environment, Biological Environment, psychological Environment?	94.32 (83)	High	90.63 (116)	High
6. How many centimeters between tool push?	39.77 (35)	Medium	73.44 (94)	High
7. What is the benefit of safeguard and machine barrier installation	97.73 (86)	High	99.22 (127)	High
8. Which one is the dangerous chemical?	92.05 (81)	High	96.88 (124)	High
9. There are step for material lifting as below; 1. To standard in the position. 2. Back stress 3. Arm close the body 4. To strong handle the material 5. To keep chin 6. To lift. Which one is the right answer?	26.14 (23)	Low	42.97 (55)	Medium

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-4 Description of working environment knowledge (continued)

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
10. How many decibel of working seven house not more than eight hours?	92.05 (81)	High	88.28 (113)	High
11. Which one is the correct answer for noise prevention and control three always?	90.91 (80)	High	85.16 (109)	High
12. How many temperature can workers exposure in the workplace?	31.82 (28)	Low	53.13 (68)	Medium
13. How many ventilation?	55.68 (49)	Medium	89.06 (114)	High
14. How many lighting can workers in working details exposure?	42.05 (37)	Medium	50.78 (65)	Medium
15. How many noise frequency of young' s ear?	53.41 (47)	Medium	65.63 (84)	Medium
16. How many hours can workers exposure for TLV?	90.91 (80)	High	78.91 (101)	High
17. Wish one each noise PPE that can minimize the noise 15 dB(A) follow as the notification of ministry of interior?	36.36 (32)	Medium	43.75 (56)	Medium
18. What size of dust can breath into respiratory system?	48.86 (43)	Medium	72.66 (93)	High
19. How many light intensity in wore house, material strong room, passage way, veranda and stair?	59.09 (52)	Medium	35.94 (46)	Medium
20. How many light intensity in wore house, material strong room, passage way, veranda and stair?	97.73 (86)	High	95.31 (122)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.1.3 Opinion on working environment

The benchmarking group had answered the question concerning the opinion on working environment section 1st, the question that gets the highest score was item 1.18 about washing hands with soap instead of the lubricant or other chemical. (96.59%).

The self evaluation group had answered the question concerning the opinion on working environment section 1st, the question that gets the highest score was item 1.18 about washing hands with soap instead of the lubricant or other chemical, item 1.19 about workers expose to chemical need to wash hand before eating or drinking, and item 1.20 about increasing the natural ventilation by increasing the windows and the doors (93.33%) as shown in table 4-5.

Table 4-5 Description of opinion on working environment section 1st

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
1.1.1 There are working environment survey using safety audit about noise.	16.67 (8)	Low	57.47 (50)	Medium
1.1.2 There are working environment survey using safety audit about lighting.	37.35 (31)	Medium	47.66 (61)	Medium
1.1.3 There are working environment survey using safety audit about temperature.	25.00 (5)	Low	47.89 (34)	Medium
1.2.1 There are working environment survey using safety audit about chemical	- (0)	-	19.23 (5)	Low

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-5 Description of opinion on working environment section 1st(continued)

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
1.2.2 There are working environment survey using safety audit about dust	38.55 (32)	Medium	45.07 (32)	Medium
1.3.1 There are the analysis for working environment by using the industrial equipment in the previous year about noise.	58.33 (28)	Medium	29.89 (26)	Low
1.3.2 There are the analysis for working environment by using the industrial equipment in the previous year about lighting.	62.65 (52)	Medium	1.56 (2)	Low
1.3.3 There are the analysis for working environment by using the industrial equipment in the previous year about temperature.	60.00 (6)	Medium	0.00 (0)	Low
1.4.1 There are the analysis for working environment by using the industrial equipment in the previous year about chemical	20.00 (4)	Low	7.69 (2)	Low
1.4.2 There are the analysis for working environment by using the industrial equipment in the previous year about dust.	62.69 (42)	Medium	42.25 (30)	Medium
Noise 1.5 To use earplugs or ear muffs in noisy area.	56.00 (28)	Medium	86.21 (75)	High
1.6 To minimize the noise exposure of workers and moving from noisy area to the other area.	55.56 (25)	Medium	27.59 (24)	Low
1.7 To separate the noisy machines away from working area.	2.22 (1)	Low	70.11 (61)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-5 Description of opinion on working environment section 1st (continued)

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
1.8 There are the measures for noise control and use of noise control equipment on the wall and ceiling or using enclosure of noisy machine.	15.56 (7)	Low	28.74 (25)	Low
Light 1.9 The light is enough for working.	87.50 (77)	High	93.75 (120)	High
1.10 To increase lighting at the roof and windows.	86.36 (76)	High	83.08 (54)	High
1.11 To always clean and maintain the light in the previous year.	97.73 (86)	High	89.84 (115)	High
1.12 To check the expire date of the lamp and change it if expired in the previous year.	82.95 (73)	High	72.66 (93)	High
1.13 To install the adjustable light appropriate for working.	60.34 (35)	Medium	50.00 (6)	Medium
Temperature 1.14 To increase the natural ventilation by increasing the ventilation at the door, wall and roof.	96.47 (82)	High	86.15 (56)	High
1.15 To install the air condition or fan to reduce the temperature.	100.00 (88)	High	86.72 (111)	High
1.16 To install insulation to protect the heat on the roof or wall.	48.19 (40)	Medium	67.74 (63)	High
1.17 There are the insulation or the barrier between the heating material, pipe, machine and worker.	43.94 (29)	Medium	71.23 (52)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-5 Descriptive of opinion on working environment section 1st (continued)

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
Dust, gas and chemical 1.18 To wash hands with soap instead of the lubricant or other chemical.	96.59 (85)	High	93.33 (28)	High
1.19 The workers who expose to chemical need to wash hands before eating or drinking.	90.91 (80)	High	93.33 (28)	High
1.20 To increase the natural ventilation by increasing the windows and the doors.	80.68 (71)	High	93.33 (28)	High
1.21 To have the label about 'do not eat or smoke' in chemical working area.	80.68 (71)	High	76.67 (23)	High
1.22 Should have the specific chemical storage room.	95.83 (23)	High	80.00 (24)	High
1.23 The chemical container should have the label about danger, name of chemical, chemical protection and first aid for each chemical.	91.67 (22)	High	70.00 (21)	High
1.24.1 To install the ventilation system to reduce dust area.	75.00 (3)	High	68.12 (47)	High
1.24.2 To install the ventilation system to reduce gas and chemical area.	0.00 (0)	Low	40.74 (11)	Medium

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.1.4 Opinion on working environment section 2nd

The benchmarking group had answered the question concerning the opinion on working environment section 2nd, the question that gets the highest score was item 2.2 about using the pallet for material handling (98.86%).

The self evaluation group had answered the question concerning the opinion on working environment section 2nd, the question that gets the highest score was item 2.3 about using a push-cart, tray, vehicles or the other mechanical for heavy material (100%) as shown in table 4-6.

Table 4-6 Description of opinion on working environment section 2nd

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
2.1 The worker have to lift the material with ergonomics awareness.	18.18 (16)	Low	89.06 (114)	High
2.2 To use the pallet for material handling.	98.86 (87)	High	99.22 (127)	High
2.3 To use a push – cart, tray, vehicles or the other mechanical for heavy material handling.	97.73 (86)	High	100.00 (128)	High
2.4.1 To have the safety rule for material lifting.	95.45 (84)	High	67.97 (87)	High
2.4.2 To have the safety rule for material handling.	95.45 (84)	High	60.16 (77)	Medium
2.4.3 To have the safety rule for material transportation.	94.32 (83)	High	39.84 (51)	Medium
2.5 To always check the equipment and system of material handing lift.	93.33 (14)	High	96.67 (29)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.1.5 Description of opinion on working environment section 3rd

The benchmarking group had answered the question concerning the opinion on working environment section 3rd , the question that gets the highest score was item 3.9 about the passage way being wide and smooth that suitable for material or goods transferring (100%).

The self evaluation group had answered the question concerning the opinion on working environment section 3rd, the question that gets the highest score was item 3.9 about the passage way being wide and smooth that suitable for material or goods transferring (97.66%) as shown in table 4-7.

Table 4-7 Description of opinion on working environment section 3rd

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
3.1 To remove garbage and unnecessary things out of the working area.	96.59 (85)	High	88.28 (113)	High
3.2 The edge of table of machine have to be smooth, and can protect body injuries.	67.24 (39)	High	72.66 (93)	High
3.3 To set the shelf for material equipment and product storage.	77.36 (41)	High	96.88 (124)	High
3.4 To adjust the level of table to be appropriate with the level of chair.	42.86 (21)	Medium	92.97 (119)	High
3.5 To adjust the level of chair to be appropriate and having the strong back of seat.	16.98 (9)	Low	77.34 (99)	High
3.6 To adjust the level of working control button into the appropriate position.	36.67 (11)	Medium	62.90 (78)	Medium

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-7 Description of opinion on working environment section 3rd (continued)

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
3.7 To change from monotonous work to the other type of working.	43.48 (20)	Medium	59.38 (76)	Medium
3.8 The working area should wide enough for movement of workers.	93.18 (82)	High	96.09 (123)	High
3.9 The pathway should wide and be smooth that suitable for material or goods transferring.	100.00 (88)	High	97.66 (125)	High
3.10 To make the floor smooth without sliding.	67.05 (59)	High	67.19 (86)	High
3.11 Should have the clear mirror at the door between each room.	78.31 (65)	High	91.78 (67)	High
3.12 To paint clearly and mark the pathway or using barrier to protect the danger from machine or vehicle crash.	95.45 (84)	High	63.28 (81)	Medium
3.13 The level of pathway is 1.5 meters higher from the floor, should have a strong rail.	73.53 (25)	High	80.65 (75)	High
3.14 The fork lift way should wide for at least three meters plus the fork lift wide. For two way pathway, it should wide two times of one way pathway.	29.73 (11)	Low	- (0)	-

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.1.6 Description of opinion on working environment section 4th

The benchmarking group had answered the question concerning the opinion on working environment section 4th, the question that gets the highest score was item 4.1 about the covers of knives, sharps, scissors or strong handle (97.44%).

The self evaluation group had answered the question concerning of opinion on working environment section 4th, the question that gets the highest score was item 4.11 about connecting the ground for electrical machine and item 4.12 about the covers for electrical control panel (99.19%) as shown in table 4-8.

Table 4-8 Description of opinion on working environment section 4th

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
Tools and machine 4.1 There are the covers of knives, sharps, scissors or strong handle.	97.44 (38)	High	80.00 (80)	High
4.2 There are boxes for tools.	93.33 (42)	High	93.75 (120)	High
4.3 To have the restrict line for the dangerous machine.	75.38 (49)	High	77.42 (96)	High
4.4 The pathway between machines should wide of at least 80 centimeters.	89.23 (58)	High	88.71 (110)	High
4.5 To install the cover in moving part, rotating clip area of machine.	70.00 (56)	High	90.32 (112)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-8 Description of opinion on working environment section 4th (continued)

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
4.6 The machine cover with opening on the top should be strong enough.	- (0)	-	- (0)	-
4.7 To dress with suitable clothing if the workers have to work near the rotating part of machine.	84.06 (58)	High	79.03 (98)	High
4.8 To install the safety equipment to stop machine in case of accident.	90.63 (58)	High	78.23 (97)	High
4.9 Pre – check the machine following the safety audit form.	81.25 (52)	High	87.10 (108)	High
Electricity 4.10 To set the good electrical system.	67.05 (59)	High	91.94 (114)	High
4.11 To connect the ground for electrical machine.	92.05 (81)	High	99.19 (123)	High
4.12 There are the covers for electrical control panel.	84.09 (74)	High	99.19 (123)	High
4.13 To set minor switch for electrical supply for each machine with separate control to avoid short – circuit.	94.32 (83)	High	96.77 (120)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.1.7 Description of opinion on working environment section 5th

The benchmarking had answered the question concerning the opinion on working environment section 5th, the question that gets the highest score was item 5.4 about recommending the cleaning and maintenance method PPE (93.18%).

The self evaluation group had answered the question concerning the opinion on working environment section 5th, the question that gets the highest score was item 5.3 about recommending the PPE wearing method (96.09%) as shown in table 4-9.

Table 4-9 Description of opinion on working environment section 5th

Question	Benchmarking group		Self evaluation group	
	% (N)	Index	% (N)	Index
5.1 To set PPE appropriate with working. - Safety hat - Safety glasses - Face shield - Chemical safety shield - Dust mask - Heat protective suit - Safety boots - Safety shoes - Chemical gloves - Ear plugs or ear muffs	81.82 (72)	High	65.63 (84)	Medium

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-9 Description of opinion on working environment section 5th (continued)

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
5.2 To recommend the PPE wearing method.	87.50 (77)	High	90.63 (116)	High
5.3 To recommend the PPE wearing method appropriate with working.	87.50 (77)	High	96.09 (123)	High
5.4 To recommend the cleaning and maintenance method for PPE.	93.18 (82)	High	91.41 (117)	High
5.5 Workers should participate and specify the type of PPE required for their work.	84.09 (74)	High	78.13 (100)	High
5.6 To always check PPE.	79.55 (70)	High	85.94 (110)	High
5.7 To control and look after the workers to wear PPE appropriate with work.	92.05 (81)	High	87.50 (112)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.1.8 Description of opinion on working environment section 6th

The benchmarking group had answered the question concerning the opinion on working environment section 6th, the question that gets the highest score was item 6.9 about collecting the information and occupational disease statistic (94.32%).

The self evaluation group had answered the question concerning the opinion on working environment section 6th, the question that gets the highest score was item 6.15 about setting the washbasin in the toilet (100%) as shown in table 4-10.

Table 4-10 Description of opinion on working environment section 6th

Question	Benchmarking group		Self evaluation group	
	N (%)	Index	N (%)	Index
6.1 To separate the rest area from dangerous area.	20.45 (18)	Low	94.53 (121)	High
6.2 To have the activity or equipment of health promotion such as sport equipment, yearly sport game.	26.14 (23)	Low	86.72 (111)	High
6.3 To set the training of first aid for workers.	93.18 (82)	High	92.97 (119)	High
6.4 To distribute the knowledge of occupational disease protection and help problem from doctors in the workplace.	27.27 (24)	Low	81.25 (104)	High
6.5 Physical check up for employee before working and especially occupational disease protection.	4.55 (4)	Low	89.84 (115)	High
6.6 Physical check up following type of working and working environment.	52.27 (46)	Medium	79.69 (102)	High
6.7 Yearly check up.	84.09 (74)	High	99.22 (127)	High
6.8 To inform the result of check up to workers.	70.45 (62)	High	100.00 (128)	High
6.9 To collect the information and occupational disease statistics.	94.32 (83)	High	92.19 (118)	High
6.10 There are the rooms or place for first aid to treat immediately.	5.68 (5)	Low	99.22 (127)	High
6.11 There are doctors, nurse or person who has responsibility in first aid.	2.27 (2)	Low	98.44 (126)	High
6.12 There are the ambulances and vehicles stand by for workplace.	48.86 (43)	Medium	84.38 (108)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-10 Description of opinion on working environment section 6th (continued)

Question	Benchmarking group		Self evaluation group	
	% (N)	Index	% (N)	Index
6.13 The toilet should be separated as male – female.	72.73 (64)	High	98.44 (126)	High
6.14 The toilet is hygienic.	68.18 (60)	High	96.09 (123)	High
6.15 To install the washbasin in the toilet.	86.36 (76)	High	100.00 (128)	High
6.16 The number of toilets should be enough and near the working area.	71.59 (63)	High	93.75 (120)	High
6.17 To provide the drinking water in the workplace.	64.77 (57)	High	96.09 (123)	High
6.18 The canteen should be separated from the working area.	37.50 (33)	Medium	99.22 (127)	High
6.19 To set the personal storage.	29.55 (26)	Low	90.63 (116)	High
6.20 To dispose the garbage, waste, used material following the hygienic procedure.	67.05 (59)	High	98.44 (126)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.1.9 Description of working environment knowledge score, and opinion on working environment score

The survey from production workers in workplace of food factories between benchmarking group and self evaluation group. Benchmarking group, most of them got high working environment knowledge score (64.77%), and high score of opinion on working environment (45.45%). The mean of working environment knowledge score, and opinion on working environment score were 14.11, and 0.55 respectively. Standard deviation of working environment knowledge score, and opinion on working environment score were 2.47, and 0.20 respectively.

For self evaluation group, most of them gained high working environment knowledge scores (82.81%), and high score of opinion on working environment (92.97%). The mean of working environment knowledge score, and opinion on working environment score were 15.39, and 0.80 respectively. The standard deviation of working environment knowledge score, and opinion on working environment score were 2.09, and 0.10 respectively as shown in table 4-11.

Table 4-11 Description of working environment knowledge score, and opinion on working environment score

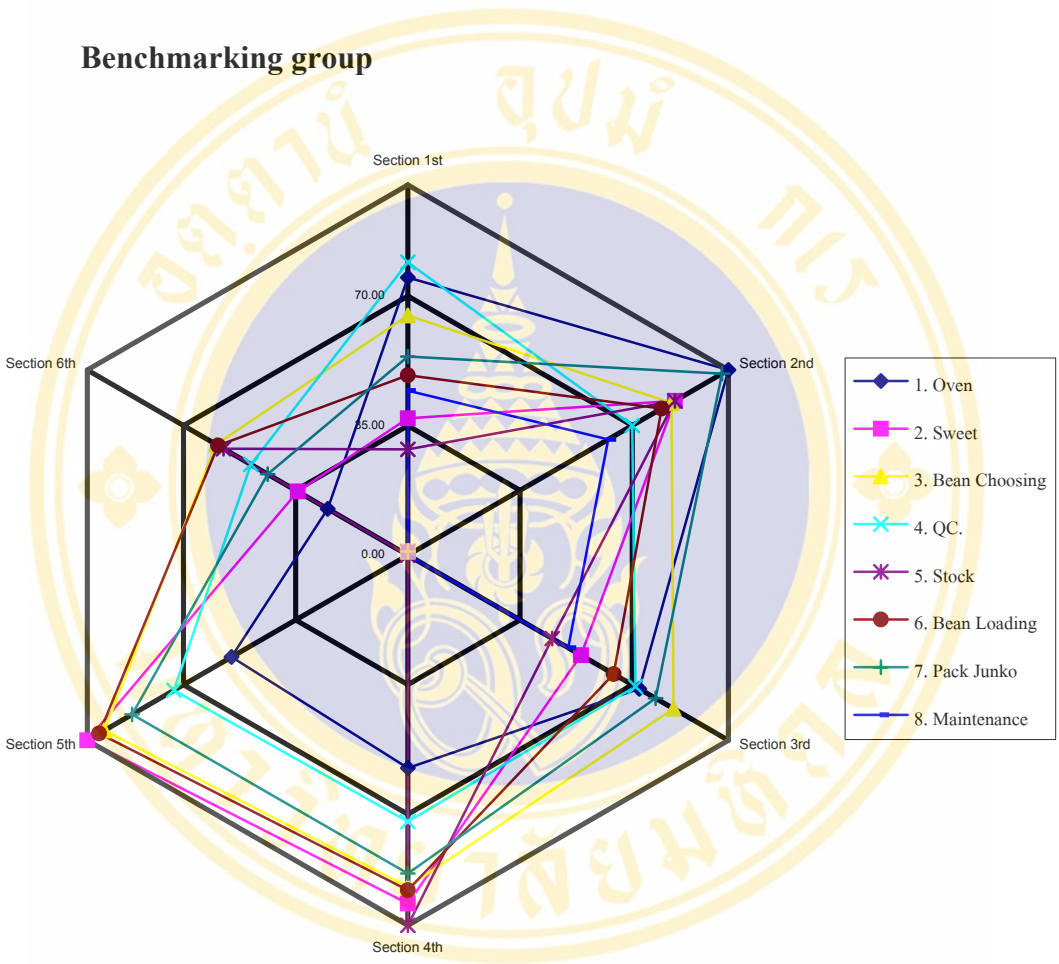
Type of Question	Benchmarking group (n=88)		Self evaluation group (n=128)	
	No.	%	No.	%
Working environment knowledge score				
- Low(Lowest to 6.67)	1	1.14	0	0.00
- Medium(6.68 - 13.34)	30	34.09	22	17.19
- High(13.35-20)	57	64.77	106	82.81
Mean	14.1136		15.3906	
SD	2.4748		2.0857	
Min-Max	4-20		9-20	

Table 4-11 Description of working environment knowledge score, and opinion on working environment score(continued)

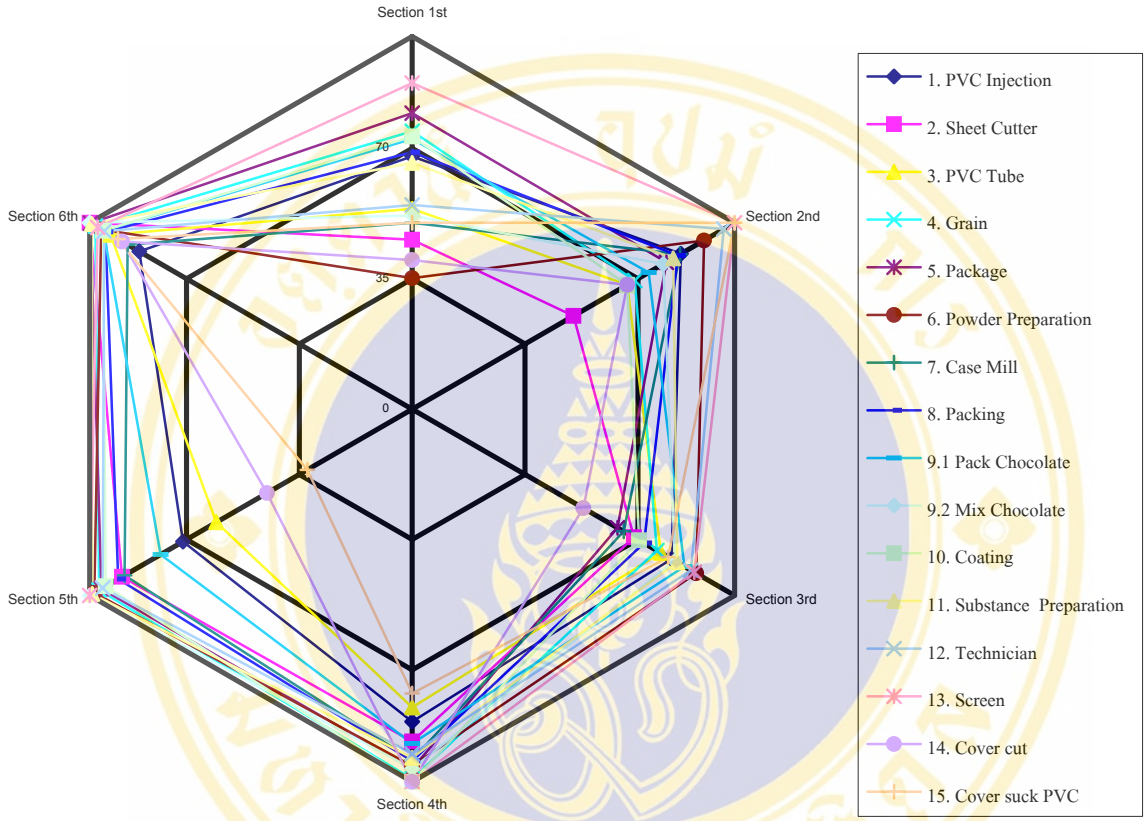
Type of Question	Benchmarking group (n=88)		Self evaluation group (n=128)	
	No.	%	No.	%
Opinion on working environment score				
- Low(Lowest to 0.33)	26	29.55	0	0.00
- Medium(0.34 - 0.66)	22	25.00	9	7.03
- High(0.67-1.00)	40	45.45	119	92.97
Mean	0.5468		0.7978	
SD	0.1961		0.0998	
Min-Max	0.22-0.85		0.44-0.97	

4.2 Evaluation of working environment in 6 sections

The survey from production workers in benchmarking group and self evaluation group about working environment in 6 sections and working environment evaluation in each job as presented in radar graph.



Self evaluation factories



4.3 Analytical analysis (Production workers)

4.3.1 Comparison between working environment knowledge and general characteristic

Independent sample t-test and one – way ANOVA are the tools to compare the means value of working environment knowledge score of worker.

Benchmarking group found that the average working environment knowledge score among male and female were different statistically significant at t = 2.456 (p = 0.05), but variable of educational level, age, working duration , statistic of occupational injury since they start working, statistic of occupational injury in the the previous year , and job were not different as shown in table 4-12.

Self evaluation group found that the average working environment knowledge score among five different working durations were statistically significant at F = 2.649 (p = 0.05), but variable of sex, educational level, age, statistic of occupational injury since they start working, statistic of occupational injury in the the previous year , and job were not different as shown in table 4-13.

Table 4-12 Comparison between working environment knowledge and general characteristics of benchmarking group

Variable	Number	Mean	SD	df	t(F)	p
1. Sex						
(1)Male	28	15.036	2.219	86	2.456*	0.016
(2) Female	60	13.683	2.487			
2. Education Level						
(1)Primary School	54	14.148	2.468	4,83	(0.422)	0.792
(2)Junior High School	20	13.750	2.425			
(3)Senior High School	7	14.000	3.742			
(4)Vocational Certification	4	15.500	0.577			
(5)High Vocational Certification	3	14.333	1.155			

Table 4-12 Comparison between working environment knowledge and general characteristics of benchmarking group(continued)

Variable	Number	Mean	SD	df	t(F)	p
3. Age						
(1) Lowest to 20 yrs	10	12.400	1.776	3,84	(1.889)	0.138
(2) More than 20 - 30 yrs	28	14.393	2.114			
(3) More than 30 - 40 yrs	33	14.364	2.369			
(4) More than 40 - 55 yrs	17	14.176	3.264			
4.Working duration						
(1) Less than 1 yrs	20	14.150	2.207	4,83	(1.623)	0.176
(2) 1 - 3 yrs	25	14.160	2.035			
(3) More than 3 - 6 yrs	20	13.700	2.473			
(4) More than 6 – 10 yrs	14	15.357	1.946			
(5) More than 10 yrs	9	12.889	4.137			
5. Occupational injury since they start work						
(1)Yes	11	13.636	3.957	86	0.682	0.497
(2)No	77	14.182	2.217			
6. Occupational injury in the previous year						
(1)Yes	10	13.700	4.165	86	0.559	0.578
(2)No	78	14.167	2.206			
7. Job						
(1)Bean Choosing/QC	35	14.343	1.662	5,82	1.897	0.104
(2)Bean Loading/ Pack Junko	26	14.154	2.866			
(3)Sweet	15	12.733	3.453			
(4)Oven	5	16.000	1.581			
(5)Maintenance	4	15.250	0.500			
(6)Stock	3	13.333	0.577			

Table 4-13 Comparison between working environment knowledge and general characteristics of self evaluation group

Variable	Number	Mean	SD	df	t(F)	p
1. Sex						
(1)Male	50	15.680	2.065	126	1.260	0.210
(2) Female	78	15.205	2.091			
2. Education Level						
(1)Primary School	78	15.321	1.876	4,123	(1.421)	0.231
(2)Junior High School	19	14.842	2.713			
(3)Senior High School	26	15.846	2.111			
(4)Vocational Certification	2	14.500	3.536			
(5)High Vocational Certification	3	17.333	0.577			
3. Age						
(1) Lowest to 20 yrs	3	14.667	1.528	3,124	(0.888)	0.449
(2) More than 20 - 30 yrs	55	15.509	2.193			
(3) More than 30 - 40 yrs	64	15.219	1.980			
(4) More than 40 - 55 yrs	6	16.500	2.429			
4.Working duration						
(1) Less than 1 yrs	7	15.857	1.215	4,123	(2.649)*	0.036
(2) 1 - 3 yrs	30	15.200	2.156	Different	(3,2)	(3,4)
(3) More than 3 - 6 yrs	24	16.458	1.769	by LSD		
(4) More than 6 – 10 yrs	39	14.795	2.419			
(5) More than 10 yrs	28	15.393	1.618			
5. Occupational injury since they start work						
(1)Yes	7	15.143	2.795	126	0.322	0.748
(2)No	121	15.405	2.052			

Table 4-13 Comparison between working environment knowledge and general characteristics of self evaluation group(continued)

Variable	Number	Mean	SD	df	t(F)	p
6. Occupational injury in the previous year						
(1)Yes	5	14.800	3.271	126	0.644	0.520
(2)No	123	15.415	2.040			
7. Job						
(1)Package/Packing/ Pack Chocolate	38	15.368	1.807	7,120	1.256	0.278
(2)PVC Injection/PVC Tube/ Cover Suck PVC	30	15.433	2.788			
(3)Case Mill	13	15.000	1.633			
(4)Technician	10	16.300	1.059			
(5)Grains	7	14.714	2.690			
(6)Powder Preparation/ Substance Preparation/ Coating/Mix Chocolate	23	15.826	1.527			
(7)Sheet Cutting/Cut	5	13.400	2.608			
(8)Screen	2	15.500	2.121			

4.3.2 Comparison between opinion on working environment and general characteristic

Independent sample t-test and one – way ANOVA are the tools to compare the means value of opinion on working environment score of worker.

Benchmarking group found that average score of opinion on working environment among six different job were statistically significant at F = 54.578 (p = 0.01), but variable of sex, educational level, age, working duration , statistic of occupational injury since they started working, and statistic of occupational injury in the previous year were not different as shown in table 4-14.

Self evaluation found that average score of opinion on working environment among eight different jobs were statistically significant at F = 8.283 (p =

0.01), but variable of sex, educational level, age, working duration, statistic of occupational injury since they started working, and statistic of occupational injury in the the previous year as shown in table 4-15.

Table 4-14 Comparison between the opinion on working environment and general characteristics of benchmarking group.

Variable	Number	Mean	SD	df	t(F)	p
1. Sex						
(1) Male	28	0.604	0.178	58.848	1.976	0.053
(2) Female	60	0.520	0.200			
2. Education Level						
(1)Primary School	54	0.510	0.198	4,83	(1.416)	0.236
(2)Junior High School	20	0.593	0.204			
(3)Senior High School	7	0.656	0.150			
(4)Vocational Certification	4	0.598	0.144			
(5)High Vocational Certification	3	0.583	0.179			
3. Age						
(1) Lowest to 20 yrs	10	0.690	0.133	3,84	(2.459)	0.068
(2) More than 20 - 30 yrs	28	0.552	0.202			
(3) More than 30 - 40 yrs	33	0.528	0.189			
(4) More than 40 - 55 yrs	17	0.491	0.205			
4.Working duration						
(1) Less than 1 yrs	20	0.557	0.208	4,83	(0.896)	0.470
(2) 1 - 3 yrs	25	0.585	0.196			
(3) More than 3 - 6 yrs	20	0.561	0.189			
(4) More than 6 – 10 yrs	14	0.471	0.201			
(5) More than 10 yrs	9	0.506	0.179			

Table 4-14 Comparison between the opinion on working environment and general characteristics of benchmarking group(continued).

Variable	Number	Mean	SD	df	t(F)	p
5. Occupational injury since they start work						
(1)Yes	11	0.562	0.201	86	0.270	0.788
(2)No	77	0.545	0.197			
6. Occupational injury in the previous year						
(1)Yes	10	0.545	0.204	86	0.031	0.975
(2)No	78	0.547	0.196			
7. Job						
(1)Bean Choosing/QC	35	0.381	0.145	5,82	(54.578)	< 0.001
(2)Bean Loading/ Pack Junko	26	0.741	0.039	Different (2,1) (2,4) (2.5) (2,6) (3.1) (3,4)		
(3)Sweet	15	0.700	0.021	(3,5) (3,6) (5,1) (5,4)		
(4)Oven	5	0.330	0.000	by LSD		
(5)Maintenance	4	0.485	0.074			
(6)Stock	3	0.470	0.000			

Table 4-15 Comparison between the opinion on working environment and general characteristics of self evaluation group.

Variable	Number	Mean	SD	df	t(F)	p
1. Sex						
(1)Male	50	0.802	0.084	121.838	0.420	0.675
(2) Female	78	0.795	0.109			

Table 4-15 Comparison between the opinion on working environment and general characteristics of self evaluation group(continued).

Variable	Number	Mean	SD	df	t(F)	p
2. Education Level						
(1)Primary School	78	0.811	0.098	4,123	(2.066)	0.089
(2)Junior High School	19	0.742	0.125			
(3)Senior High School	26	0.805	0.078			
(4)Vocational Certification	2	0.745	0.021			
(5)High Vocational Certification	3	0.797	0.068			
3. Age						
(1) Lowest to 20 yrs	3	0.743	0.076	3,124	(0.413)	0.744
(2) More than 20 - 30 yrs	55	0.794	0.098			
(3) More than 30 - 40 yrs	64	0.804	0.103			
(4) More than 40 - 55 yrs	6	0.795	0.098			
4.Working duration						
(1) Less than 1 yrs	7	0.786	0.062	4,123	(0.796)	0.530
(2) 1 - 3 yrs	30	0.817	0.096			
(3) More than 3 - 6 yrs	24	0.802	0.081			
(4) More than 6 – 10 yrs	39	0.777	0.108			
(5) More than 10 yrs	28	0.806	0.114			
5. Occupational injury since they start worker						
(1)Yes	7	0.806	0.128	126	0.215	0.830
(2)No	121	0.797	0.099			
6. Occupational injury in the previous year						
(1)Yes	5	0.788	0.147	126	0.223	0.834
(2)No	123	0.798	0.098			

Table 4-15 Comparison between the opinion on working environment and general characteristics of self evaluation group(continued).

Variable	Number	Mean	SD	df	t(F)	p
7. Job						
(1)Package/Packing/ Pack Chocolate	38	0.848	0.069	7,120	(8.283)	< .001
(2)PVC Injection/PVC Tube/ Cover Suck PVC	30	0.729	0.116	Different (1,2) (1,3) (1,4) (1,7) (5,2) (5,3)		
(3)Case Mill	13	0.749	0.087	(5,4) (5,7) (6,2) (6,3)		
(4)Technician	10	0.776	0.073	(6,7) (8,2) (8,3) (8,4)		
(5)Grains	7	0.874	0.090	(8,7) by LSD		
(6)Powder Preparation/ Substance Preparation/ Coating/Mix Chocolate	23	0.828	0.061			
(7)Sheet Cutting/Cut	5	0.704	0.065			
(8)Screen	2	0.930	0.042			

4.3.3 The correlation coefficient between opinion on working environment in 6 sections of benchmarking group

Statistical correlation between the opinion on working environment in 6 sections of benchmarking group found that section 1 positively correlated to total sections($r = .420$, $p = .001$), section 3 positively relate to total section ($r = .694$, $p = .001$), section 4 positively correlated to total section ($r = .301$, $p = .01$), and section 5 positively correlated to total section ($r = .923$, $p = .001$), but section 2 and 6 didn't have the relationship with opinion on the total working environment as shown in table 4-16.

Table 4-16 The correlation coefficient between the opinion on working environment 6th sections of benchmarking group.

Section of Questions	2nd	3rd	4th	5th	6th	Total
1st	.120	.246*	-.126	.366**	-.301**	.420**
	(p=.266)	(p=.021)	(p=.328)	(p<.001)	(p=.004)	(p<.001)
2nd		.124	.348**	.030	-.124	.062
		(p=.248)	(p<.001)	(p=.781)	(p=.251)	(p=.566)
3rd			-.001	.580**	-.015	.694**
			(p=.997)	(p<.001)	(p=.890)	(p<.001)
4th				.267*	.154	.301**
				(p=.012)	(p=.151)	(p=.004)
5th					-.020	.923**
					(p=.857)	(p<.001)
6th						.104
						(p=.334)

4.3.4 The correlation coefficient between opinion on working environment 6th sections of self evaluation group

Statistical correlation between the opinion on working environment in 6 sections of self evaluation group found that section 1 positively correlated to total sections (r = .756, p = .001), section 2 positively correlated to total (r = .185, p = .05), section 3 positively correlated to total section (r = .493, p = .001), section 4positively correlated to total section (r = .593, p = .001), and section 5 positively correlated to total section (r = .581, p = .001) and section 6 positively correlated to total section (r = .524, p = .001) as shown in table 4-17.

Table 4-17 The correlation coefficient between the opinion on working environment 6th sections of self evaluation group.

Section of Questions	2nd	3rd	4th	5th	6th	Total
1st	.040 (p=.652)	.150 (p=.091)	.218* (p=.013)	.264** (p=.003)	.259** (p=.003)	.756** (p<.001)
2nd		.185* (p=.037)	.140 (p=.116)	.175* (p=.048)	.003 (p=.972)	.185* (p=.037)
3rd			.198* (p=.025)	.083 (p=.352)	.121 (p=.175)	.493** (p<.001)
4th				.502** (p<.001)	.357** (p<.001)	.593** (p<.001)
5th					.350** (p<.001)	.581** (p<.001)
6th					.	.524** (p<.001)

4.3.5 The relationship of working environment knowledge score and the opinion on working environment score of benchmarking group.

The result showed that working environment knowledge score negatively related to score of opinion on working environment section 5 (r = -.219, p = .05) as shown in table 4-18.

Table 4-18 The relationship of working environment knowledge score and the opinion on working environment score of benchmarking group.

Variable	1st	2nd	3rd	4th	5th	6th	Total
Knowledge	-.030 (p=.781)	.177 (p=.099)	-.076 (p=.483)	-.070 (p=.517)	-.219* (p=.041)	.050 (p=.642)	-.182 (p=.089)

4.3.6 The relationship of working environment knowledge score and the opinion on working environment score of self evaluation group

The result showed that working environment knowledge score positively related to score of opinion on working environment section 2 (r = .245, p = .01) and section 5 (r = .306, p = .001) respectively as shown in table 4-19.

Table 4-19 The relationship of working environment knowledge score and the opinion on working environment score of self evaluation group.

Variable	1st	2nd	3rd	4th	5th	6th	Total
Knowledge	.128	.245**	.062	.091	.306**	.042	.124
	(p=.151)	(p=.005)	(p=.486)	(p=.306)	(p<.001)	(p=.634)	(p=.162)

4.3.7 Comparison of working environment knowledge score between the two factories.

Independent sample t-test was the tools to compare the working environment knowledge score of workers.

The result showed that the average working environment knowledge score among the two different factories were statistically significant at t = 4.095 (p = 0.001) as shown in table 4-20.

Table 4-20 Comparison of working environment knowledge score between the two factories.

Group	Number	Mean	SD	df	t	p
Benchmarking	88	14.1136	2.47485	214	4.095**	<.001
Self evaluation	128	15.3906	2.0857			

4.3.8 Comparison of opinion on working environment score between the two factories.

Independent sample t-test was the tools to compare the working environment score of worker.

The result showed that the average opinion on working environment score among two different factories were statistically significant at t = 11.059 (p = 0.001) as shown in table 4-21.

Table 4-21 Comparison of opinion on working environment score between the two factories.

Group	Number	Mean	SD	df	t	p
Benchmarking	88	0.54682	0.19614	118.187	11.059**	<.001
Self evaluation	128	0.79781	0.09984			

Part 2: Benchmarking team and self evaluation team.

4.4 Descriptive analysis of general information (Benchmarking and self evaluation team).

4.4.1 General characteristics of the two teams

The survey from benchmarking team and self evaluation team in the manufacture, food factory between benchmarking and self evaluation. Benchmarking team found that most of them were male (77.78%) graduated high school upper (77.78%), age during lower to 30 years (88.89%), working duration during lower 4 years (77.78%), leader/supervisor/worker position (66.66%). They had occupational injury in since they start working for 88.89% but all them never had occupational injury in the previous year 100%

The average of age, working duration were 26.11 years and 2.10 years, respectively .

Self evaluation team found that most of them were female (81.25%) graduated equal between primary school and high school upper(50%), age during More than 30 – 55 years (87.50%), working duration during up 4 years (87.50%),

leader/supervisor/worker position (93.75%), all never developed occupational injury since they start working (94.53%). They had occupational injury in since they start working for 100% but all them never had occupational injury in the previous year 100%

The average of age, working duration were 35.75 years and 12.40 years, respectively as shown in table 4-22.

Chi-square was applied to test homogeneity of the variable of workers between the two factories found that variable of education level, position, and occupational injury since they start work were not different but the variable of sex, age, and working duration among the two factories were different statistically significant at sex(p=0.01), age(p=0.01), and working duration (p=0.01), respectively as shown in table 22.

Table 4-22 General characteristics of qualitative variable of teams

Qualitative variable	Benchmarking team (n=9)		Self evaluation team (n=16)		p - value
	No.	%	No.	%	
1. Sex					
- Male	7	77.78	3	18.75	p=0.009 (Fisher's Exact Test)
- Female	2	22.22	13	81.25	
2. Education Level					
- Primary School	2	22.22	8	50.00	p=0.229 (Fisher's Exact Test)
- High School Upper	7	77.78	8	50.00	

Table 4-22 General characteristics of qualitative variable of teams (continued)

Qualitative variable	Benchmarking team (n=9)		Self evaluation team (n=16)		p - value
	No.	%	No	%	
3. Age					
- Lowest to 30 yrs	8	88.89	2	12.50	p<0.001 (Fisher's Exact Test)
- More than 30 – 55 yrs	1	11.11	14	87.50	
Mean	26.111		35.750		
SD	4.400		6.006		
Min-Max	19-35		22-45		
4.Working duration					
- Lower 4 yrs	7	77.78	2	12.50	p=0.002 (Fisher's Exact Test)
- Up 4 yrs	2	22.22	14	87.50	
Mean	2.102		12.396		
SD	1.488		5.339		
Min-Max	0.17-4		1-18		
5. Position					
- Leader/ Supervisor/ Worker	6	66.66	15	93.75	p=0.116 (Fisher's Exact Test)
- Manager/ Safety Officer	3	33.34	1	6.25	
6. Occupational injury since they start work					
- No	1	11.11	0	0.00	p=0.360 (Fisher's Exact Test)
- Yes	8	88.89	16	100.00	
7. Occupational injury in the previous year					
- No	9	100.00	16	100.00	-
- Yes	0	0.00	0	0.00	

4.4.2 Recognition to knowledge of safety policy and management

Benchmarking team answered the question about the recognition to knowledge of safety policy and management, the questions that get highest score were item 10 about safety section directing to the executive or the other section but can report directly the executive (100%).

Self evaluation team answered the question about the recognition to knowledge of safety policy and management, the questions that get highest score were item 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.8, 2.12, 2.13, 2.16, and 2.17 (100%) as shown in table 4-23.

Table 4-23 Description of recognition to knowledge of safety policy and management.

Question	Benchmarking team		Self evaluation team	
	% (N)	Index	% (N)	Index
2.1 General policy of organization show safety management by writing.	66.67 (6)	Medium	100.00 (16)	High
2.2 Yearly safety plan	77.78 (7)	High	100.00 (16)	High
2.3 To set safety officer at supervisor and safety officer at executive	88.89 (8)	High	100.00 (16)	High
2.4 To set the punishment for safety rule.	44.44 (4)	Medium	100.00 (16)	High
2.5 To set the guideline for praise commendation.	55.56 (5)	Medium	100.00 (16)	High
2.6 To set the safety sign.	55.56 (5)	Medium	100.00 (16)	High
2.7 Choose new worker have test attitude about safety.	22.22 (2)	Low	87.50 (14)	High
2.8 An orientation and to new worker about safety.	88.89 (8)	High	100.00 (16)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-23 Description of recognition to knowledge of safety policy and management (continued).

Question	Benchmarking team		Self evaluation team	
	% (N)	Index	% (N)	Index
2.9 To inform the policy and notice policy.	33.33 (3)	Low	93.75 (15)	High
2.10 Safety section direct to the executive or the other section but can report directly the executive.	100.00 (9)	High	93.75 (15)	High
2.11 Safety officer have only responsibility.	77.78 (7)	High	68.75 (11)	High
2.12 To set safety officer at supervision level control worker working to be safe.	88.89 (8)	High	100.00 (16)	High
2.13 To inform the worker report the dangerous condition to supervision.	77.78 (7)	High	100.00 (16)	High
2.14 Safety rule with writing and informing worker.	55.56 (5)	Medium	93.75 (15)	High
2.15 Worker copulation in safety rule.	33.33 (3)	Low	62.50 (10)	Medium
2.16 To set the safety committee.	88.89 (8)	High	100.00 (16)	High
2.17 To investigate the accident in workplace.	77.78 (7)	High	100.00 (16)	High
2.18 It safety committee walk though survey at least once a month.	44.44 (4)	Medium	93.75 (15)	High
2.19 To report safety officer performance and report accident rate follow as safety officer 3 every three months.	66.67 (6)	Medium	93.75 (15)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.4.3 Description of benchmarking knowledge

Benchmarking team answered the question about the benchmarking, the questions that get highest score were item 1, 2, 3, 5, 6, and 10 (100%).

Self evaluation team answered the question about the benchmarking knowledge, the questions that get highest score were item 1 about the meaning of benchmarking, and item 2 about the meaning of best practice (100%) as shown in table 4-24.

Table 4-24 Description of benchmarking knowledge

Question	Benchmarking team		Self evaluation team	
	% (N)	Index	% (N)	Index
1. What is the meaning of Benchmarking?	100.00 (9)	High	100.00 (16)	High
2. What is the meaning of best practice?	100.00 (9)	High	100.00 (16)	High
3. Which one is Benchmarking – cross factory.	100.00 (9)	High	87.50 (14)	High
4. Which one is the first step of Benchmarking process?	33.33 (3)	Low	87.50 (14)	High
5. Which one is the famous tool for Benchmarking analyze?	100.00 (9)	High	81.25 (13)	High
6. Which one is the right for Benchmarking process?	100.00 (9)	High	81.25 (13)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-24 Description of benchmarking knowledge (continued)

Question	Benchmarking team		Self evaluation team	
	% (N)	Index	% (N)	Index
7. How many type of Benchmarking process?	11.11 (1)	Low	81.25 (13)	High
8. Which one is the benefit of internal Benchmarking?	88.89 (8)	High	93.75 (15)	High
9. What happened if not have Generic Benchmarking?	77.78 (7)	High	87.50 (14)	High
10. Which one is the importance result of organization emphasizes Benchmarking process?	100.00 (9)	High	81.25 (13)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.4.4 Description of evaluation knowledge

Benchmarking team answered the question about of evaluation, the questions that get highest score were item 1, 3, 4, 5, 7, 8 and 9 (100%).

Self evaluation team answered the question about the evaluation knowledge, the questions that get highest score were item 1, 2 and 3 (100%) as shown in table 4-25.

Table 4-25 Description of evaluation knowledge

Question	Benchmarking team		Self evaluation team	
	% (N)	Index	% (N)	Index
1. Which one is the object of Self Evaluation?	100.00 (9)	High	100.00 (16)	High
2. Which one is the meaning of Self Evaluation?	88.89 (8)	High	100.00 (16)	High
3. What is the objective of Self Evaluation?	100.00 (9)	High	100.00 (16)	High
4. Which one is the limit of self evaluation?	100.00 (9)	High	68.75 (11)	High
5. Is self evaluation the importance of evaluation?	100.00 (9)	High	93.75 (15)	High
6. Which one is the benefit from Self Evaluation?	77.78 (7)	High	87.50 (14)	High
7. Which one is Philosophy agree Self Evaluation of Boorachai Sirihasakron?	100.00 (9)	High	93.75 (15)	High
8. Which one is the right for Self Evaluation?	100.00 (9)	High	87.50 (14)	High
9. Which one is the dominance of Self Evaluation?	100.00 (9)	High	81.25 (13)	High
10. Which one is the criteria of quality in Self Evaluation?	22.22 (2)	Low	81.25 (13)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.4.5 Description of working environment knowledge

Benchmarking team answered the question about the working environment knowledge, the questions that get highest score were item 1, 2, 3, 4, 5, 7, 8, 10, 11, 16, 17, 19, and 20 (100%).

Self evaluation team answered the question about the working environment knowledge, the questions that get highest score were item 3, 7, 8, 10, 11, 13, and 20 points (100%) as shown in table 4-26.

Table 4-26 Description of working environment knowledge.

Question	Benchmarking team		Self evaluation team	
	% (N)	Index	% (N)	Index
1. How many ways does chemical get in to the body?	100.00 (9)	High	93.75 (15)	High
2. Can the ventilation get rids of the air determination and clouds dilute the air determination?	100.00 (9)	High	81.25 (13)	High
3. If the unsuitable ventilation, the worker will feel not comfortable?	100.00 (9)	High	100.00 (16)	High
4. Can noise effect health make blood pressure pepticulcer and serious?	100.00 (9)	High	87.50 (14)	High
5. Are there four items of surrounding Working Environment, Chemical Environment, Biological Environment, psychological Environment?	100.00 (9)	High	93.75 (15)	High
6. How many centimeters between tool push?	33.33 (3)	Low	81.25 (13)	High
7. What is the benefit of safeguard and machine barrier installation?	100.00 (9)	High	100.00 (16)	High
8. Which one is the dangerous chemical?	100.00 (9)	High	100.00 (16)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-26 Description of working environment knowledge (continued).

Question	Benchmarking team		Self evaluation team	
	% (N)	Index	% (N)	Index
9. There are step for material lifting as below; 1. To standard in the position. 2. Back stress 3. Arm close the body 4. To strong handle the material 5. To keep chin 6. To lift. Which one is the right answer?	11.11 (1)	Low	50.00 (8)	Medium
10. How many decibel of working seven house not more than eight hours?	100.00 (9)	High	100.00 (16)	High
11. Which one is the correct answer for noise prevention and control three always?	100.00 (9)	High	100.00 (16)	High
12. How many temperature can workers exposure in the workplace?	33.33 (3)	Low	81.25 (13)	High
13. How many ventilation?	55.56 (5)	Medium	100.00 (16)	High
14. How many lighting can workers in working details exposure?	88.89 (8)	High	75.00 (12)	High
15. How many noise frequency of young' s ear?	88.89 (8)	High	75.00 (12)	High
16. How many hours can workers exposure for TLV?	100.00 (9)	High	93.75 (15)	High
17. Which one is noise PPE that can minimize the noise 15 dB(A) follow as the notification of ministry of interior?	100.00 (9)	High	93.75 (15)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

Table 4-26 Description of working environment knowledge (continued)

Question	Benchmarking team		Self evaluation team	
	% (N)	Index	% (N)	Index
18. What size of dust can breath into respiratory system?	22.22 (2)	Low	75.00 (12)	High
19. How many light intensity in wore house, material strong room, passate way	100.00 (9)	High	62.50 (10)	Medium
20. Which one is the heat danger?	100.00 (9)	High	100.00 (16)	High

Remark: 0.00 – 33.33% = Low, 33.34 – 66.67% = Medium, 66.68 – 100% = High

4.4.6 Description of recognition of knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice

In the survey from benchmarking team and self evaluation team in workplace of food factories. The benchmarking team, most of them got high score for recognition of knowledge of safety policy and management (55.56%), medium score of benchmarking knowledge (88.89%), medium score of evaluation knowledge (100%), high score of environment knowledge (100%) and low practice score (100%).

The average score of policy recognition ,benchmarking knowledge, evaluation knowledge, environment knowledge and practice were 12.33, 8.11, 8.89, 16.33, and 0.17 respectively.

The self evaluation team, most of them got high score for recognition of knowledge of safety policy and management (100%), medium score of benchmarking knowledge (93.75%), medium score of evaluation knowledge (100%), high score of environment knowledge (100%) and low practice score (87.50%).

The average score of policy recognition ,benchmarking knowledge, evaluation knowledge, environment knowledge and practice were 18.00, 8.81, 8.94, 17.44, and 0.17 respectively as shown in table 4-27.

Table4-27 Description of recognition to knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice.

Type of Question	Benchmarking team (n=9)		Self evaluation team (n=16)	
	No.	%	No.	%
Policy recognition				
- Low(Lowest to 6.33)	0	0.00	0	0.00
- Medium(6.34 - 12.66)	4	44.44	0	0.00
- High(12.67-19)	5	55.56	16	100.00
Mean	12.3333		18.0000	
SD	4.6368		1.5916	
Min-Max	7-19		13-19	
Benchmarking Knowledge				
- Low(Lowest to 6.67)	1	11.11	1	6.25
- Medium(6.68 - 13.34)	8	88.89	15	93.75
- High(13.35-20)	0	0.00	0	0.00
Mean	8.1111		8.8125	
SD	1.1667		1.2230	
Min-Max	6-10		5-10	
Evaluation Knowledge				
- Low(Lowest to 5)	0	0.00	0	
- Medium(5.01 - 10)	9	100.00	16	
- High(10.01-15)	0	0.00	0	
Mean	8.8889		8.9375	
SD	0.9280		1.0626	
Min-Max	7-10		7-10	

Table 4-27 Description of recognition to knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice (continued).

Type of Question	Benchmarking team (n=9)		Self evaluation team (n=16)	
	No.	%	No.	%
Environmental Knowledge				
- Low(Lowest to 6.67)	0	0.00	0	0.00
- Medium(6.68 - 13.34)	0	0.00	0	100.00
- High(13.35-20)	9	100.00	16	0.00
Mean	16.3333		17.4375	
SD	1.8708		1.4592	
Min-Max	14-20		15-20	
Practice				
- Low(Lowest to 0.33)	7	100.00	14	87.50
- Medium(0.34 - 0.66)	0	0.00	2	12.50
- High(0.67-1.00)	0	0.00	0	0.00
Mean	0.1704		0.1737	
SD	0.0300		0.1226	
Min-Max	.14-.23		.06-.48	

4.5 Analytical analysis (benchmarking and self evaluation teams)

4.5.1 Comparison between the recognition of knowledge of safety policy and management and general characteristic

Independent sample t-test are the tools to compare the average recognition to knowledge of safety policy and management score of team.

The benchmarking team found that variable of sex, educational level and working duration were not different as shown in table 4-28.

The self evaluation team found that variable of sex, education level and working duration were not different as shown in table 4-29.

Table 4-28 Comparison between the recognition to knowledge of safety policy and management and general characteristic of benchmarking team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	7	11.714	4.751	7	0.437	0.675
(2) Female	2	11.000	5.657			
2. Education Level						
(1)Primary School	2	11.500	6.364	7	0.271	0.794
(2) High School Upper	7	12.571	4.650			
3. Work age						
(1)Lower 4 yrs	7	10.857	4.059	7	2.156	0.068
(2) Up 4 yrs	2	17.500	2.121			

Table 4-29 Comparison between the recognition to knowledge of safety policy and management and general characteristic of self evaluation team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	3	18.000	1.732	14	0.000	1.000
(2) Female	13	18.000	1.633			
2. Education Level						
(1)Primary School	8	18.000	2.138	14	0.000	1.000
(2) High School Upper	8	18.000	0.926			
3. Work age						
(1)Lower 4 yrs	2	17.000	1.414	14	0.947	0.360
(2)Up 4 yrs	14	18.143	1.610			

4.5.2 Comparison between the benchmarking knowledge and general characteristic

Independent sample t-test was the tools to compare the average of benchmarking knowledge score of team.

The benchmarking team found that variable of sex, education level and working duration were not different as shown in table 4-30.

The self evaluation team found that variable of sex, education level and working duration were not different as shown in table 4-31.

Table 4-30 Comparison between the benchmarking knowledge and general characteristics of benchmarking team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	7	8.286	1.254	7	0.823	0.438
(2) Female	2	7.500	0.707			
2. Education Level						
(1)Primary School	2	7.000	1.414	7	1.697	0.133
(2) High School Upper	7	8.429	0.976			
3. Work age						
(1)Lower 4 yrs	7	8.286	0.951	7	0.823	0.438
(2)Up 4 yrs	2	7.500	2.121			

Table 4-31 Comparison between the benchmarking knowledge and general characteristic of self evaluation team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	3	9.333	0.577	14	0.809	0.432
(2) Female	13	8.692	1.316			
2. Education Level						
(1)Primary School	8	8.375	1.506	14	1.488	0.159
(2) High School Upper	8	9.250	0.707			
3. Work age						
(1)Lower 4 yrs	2	9.000	0.000	14	0.224	0.826
(2)Up 4 yrs	14	8.786	1.311			

4.5.3 Comparison between the evaluation knowledge and general characteristics

Independent sample t-test was the tools to compare the average evaluation knowledge score of team.

The benchmarking team found that variable of sex, education level and working duration were not different as shown in table 4-32.

The self evaluation team found that variable of sex, education level and working duration were not different as shown in table 4-33.

Table 4-32 Comparison between the evaluation knowledge and general characteristics of benchmarking team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	7	8.857	1.069	7	0.180	0.862
(2) Female	2	9.000	0.000			
2. Education Level						
(1)Primary School	2	9.000	1.414	7	0.180	0.862
(2) High School Upper	7	8.857	0.900			
3. Work age						
(1)Lower 4 yrs	7	9.000	1.000	7	0.647	0.538
(2)Up 4 yrs	2	8.500	0.707			

Table 4-33 Comparison between the evaluation knowledge and general characteristics of self evaluation team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	3	8.000	1.732	2.201	1.126	0.368
(2) Female	13	9.154	0.801			
2. Education Level						
(1)Primary School	8	8.500	0.926	14	1.758	0.101
(2) High School Upper	8	9.375	1.061			
3. Work age						
(1)Lower 4 yrs	2	10.000	0.000	14	1.586	0.135
(2)Up 4 yrs	14	8.786	1.051			

4.5.4 Comparison between the environment knowledge and general characteristics

Independent sample t-test was the tools to compare the average environment score of team.

The benchmarking team found that variable of sex, education level and working duration were not different as shown in table 4-34.

The self evaluation team found that variable of sex, education level and working duration were not different as shown in table 4-35.

Table 4-34 Comparison between the environment knowledge and general characteristics of benchmarking team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	7	16.000	1.414	1.093	0.587	0.655
(2) Female	2	17.500	3.536			
2. Education Level						
(1)Primary School	2	15.500	2.121	7	0.691	0.512
(2) High School Upper	7	16.571	1.902			
3. Work age						
(1)Lower 4 yrs	7	16.143	2.116	7	0.546	0.602
(2)Up 4 yrs	2	17.000	0.000			

Table 4-35 Comparison between the environment knowledge and general characteristics of self evaluation team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	3	17.333	0.577	14	0.133	0.896
(2) Female	13	17.462	1.613			
2. Education Level						
(1)Primary School	8	17.250	1.282	14	0.501	0.624
(2) High School Upper	8	17.625	1.685			
3. Work age						
(1)Lower 4 yrs	2	17.000	0.000	13.000	1.202	0.251
(2)Up 4 yrs	14	17.500	1.557			

4.5.5 Comparison between the practice and general characteristics

Independent sample t-test was the tools to compare the average practice score of team.

The benchmarking team found that variable of education level and working duration were not different as shown in table 4-36.

The self evaluation team found that variable of sex, education level and working duration were not different as shown in table 4-37.

Table 4-36 Comparison between the practice and general characteristic of benchmarking team

Variable	Number	Mean	SD	df	t	p
1. Education Level						
(1)Primary School	2	0.196	0.055	1.036	0.893	0.532
(2) High School Upper	5	0.160	0.012			
2. Work age						
(1)Lower 4 yrs	5	0.163	0.008	1.014	0.593	0.658
(2)Up 4 yrs	2	0.190	0.064			

Table 4-37 Comparison between the practice and general characteristic of self evaluation team

Variable	Number	Mean	SD	df	t	p
1. Sex						
(1)Male	3	0.258	0.192	14	1.364	0.194
(2) Female	13	0.154	0.102			
2. Education Level						
(1)Primary School	8	0.194	0.112	14	0.661	0.520
(2) High School Upper	8	0.153	0.137			
3. Work age						
(1)Lower 4 yrs	2	0.316	0.232	14	1.895	0.079
(2)Up 4 yrs	14	0.153	0.098			

4.5.6 The relationship of recognition of knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice of benchmarking team

The result showed that all variables did not have relationship with practice as shown 4-38.

Table 4-38 The relation of recognition to knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice of benchmarking team

Group of Questions	Bench	Evaluation	Environment	Practice
Policy	-.193	-.513	.605	.130
	(p=.620)	(p=.158)	(p=.084)	(p=.781)
Bench		.475	-.134	-.709
		(p=.197)	(p=.732)	(p=.074)
Evaluation			-.552	-.362
			(p=.123)	(p=.425)
Environment				.019
			.	(p=.967)

4.5.7 The relationship of recognition of knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice of self evaluation team

The result showed that all variables did not have relationship with practice as shown in 4-39.

Table 4-39 The relation of recognition to knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice of self evaluation team

Group of Questions	Benchmarking	Evaluation	Environment	Practice
Policy	.788**	-.197	.431	-.247
	(p<.001)	(p=.464)	(p=.096)	(p=.357)
Bench		.042	.572*	-.244
		(p=.878)	(p=.021)	(p=.362)
Evaluation			.105	.078
			(p=.699)	(p=.773)
Environment				.048
			.	(p=.860)

4.5.8 Comparison of recognition to knowledge of safety policy and management between the two teams

Independent sample t-test was the tools to compare the recognition of knowledge of safety policy and management score of the two teams.

It was found that the average recognition of knowledge of safety policy and management score among the two different factories were statistically significant at t = 3.551 (p = 0.01) as shown in table 4-40.

Table 4-40 Comparison of the recognition to knowledge of safety policy and management between the two teams

Team	Number	Mean	SD	df	t	p
Benchmarking	9	12.333	4.637	9.047	3.551**	0.006
Self evaluation	16	18.000	1.592			

4.5.9 Comparison of benchmarking knowledge between the two teams

Independent sample t-test was the tools to compare the benchmarking knowledge of two teams.

It was found that the average benchmarking knowledge score between the two teams was not different as shown in table 4-41.

Table 4-41 Comparison of benchmarking knowledge between the two teams

Team	Number	Mean	SD	df	t	p
Benchmarking	9	8.111	1.167	23	1.398	0.175
Self evaluation	16	8.813	1.223			

4.5.10 Comparison of evaluation knowledge between the two teams

Independent sample t-test was the tools to compare the evaluation knowledge of two teams.

It was found that the average evaluation knowledge score of the two teams was not different as shown in table 4-42.

Table 4-42 Comparison of evaluation knowledge between the two teams

Team	Number	Mean	SD	df	t	p
Benchmarking	9	8.889	0.928	23	0.115	0.91
Self evaluation	16	8.938	1.063			

4.5.11 Comparison of environment knowledge between the two teams

Independent sample t-test was the tools to compare the environment knowledge of the two teams.

It was found that the average environment knowledge score of the two teams was not different as shown in table 4-43.

Table 4-43 Comparison of environment knowledge between teams

Team	Number	Mean	SD	df	t	p
Benchmarking	9	16.333	1.871	23	1.642	0.114
Self evaluation	16	17.438	1.459			

4.5.12 Comparison of practice between the two teams

Independent sample t-test was the tools to compare the practice of the two teams.

It was found that the average practice score of the two teams was not different as shown in table 4-44.

Table 4-44 Comparison of practice between the two teams

Team	Number	Mean	SD	df	t	p
Benchmarking	7	0.170	0.030	18.529	0.101	0.921
Self evaluation	16	0.174	0.123			

CHAPTER V
DISCUSSION

The discussion concerned with the study design for comparative practice of working environment improvement in food factories between benchmarking and self evaluation.

The subjects composed of 2 groups

Group 1: Number of production workers of benchmarking factory and self evaluation factory about were 216 persons.

Group 2: Number of benchmarking team and self evaluation team for the correction of activities included 25 persons mostly administrative as followed:

The production worker should consider the environment knowledge and opinion on working environment. For the benchmarking team and self evaluation team should considered the recognition of knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice of working environment improvement.

5.1 Discussion of the study design

The error of data collection and analyzing might be occurred. Thus, the researcher controlled the errors by the listed below:

5.1.1 Personal error:

5.1.1.1 From survey data of working environment for production worker using questionnaire, it was found that some workers copied the answer of the questionnaire of their friends in the same department which could lead to some error of the result. The researcher prevented method from data error which may occurred. To reduce the error of data collection, the subjects had to answer the question by themselves. Each subject sat separately while answering the question in the questionnaire.

5.1.2 Instrument error:

Error from this research happened from questionnaire did not appropriate for worker to answer because it had many items. They didn't willing to answer the question.

5.2 Discussion of study results

5.2.1 Comparison of practices for improving working environment between two teams found that the average practice score was not different.

5.2.2 Comparison of recognition of knowledge of safety policy and management between the two teams found that the average recognition of knowledge of safety policy and management score between the two different factories was different. It is found that the self evaluation team had more recognition concerning the knowledge of safety policy and management than the benchmarking team.

5.2.2.1 Cause of self evaluation team had more recognition of knowledge of safety policy and management than benchmarking team because variable of sex, age, and working duration.

Sex; from survey benchmarking team and self evaluation team found that self evaluation team, the most of them were female. It is demonstrated that female had more delicate thinking than male; she could have higher recognition of knowledge of safety policy and management than the male.

Age; self evaluation team, the most of age were more than 30 to 55 years but benchmarking team, the most of age were lowest to 30 years. It is because the workers having age more than 30 to 55 years had more experience than those worker having age lowest to 30 years when they had higher age, the had increase recognition of knowledge of safety policy and management.

Working duration; self evaluation team, the most of working duration 4 years up but benchmarking team, the most of working duration were lower 4 years. It is demonstrated that the worker to have graduate do not understand policy, they had reduce recognition of knowledge of safety policy and management.

5.2.2.2 It is because the self evaluation team has carried on the project of Thai Labour Standard under the committee management of Thai Labour Standard, Ministry of Labour. They have protocol about safety and occupational health and working environment and welfare. So, the factory has provided the suitable working environment, safety and acknowledge hazard from the industrial process. The workers will get training about safety. Therefore, the self evaluation team has practices for improving working environment not different from benchmarking team.

That is confirm basic general characteristics of teams and project of Thai Labour Standard had factor influence this result study were not different for working environment improvement. The result is in accordance with the objective.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study was quasi experimental study which was determined to compare the practice of working environment improvement in workplace between benchmarking and self evaluation factories. The results from this study were summarized as follows:

Part 1: Production workers of benchmarking group and self evaluation group.

6.1.1 The homogeneity of the variable of workers between the two factories found that variable of sex, education level and occupational injury since they start work were not different but the variable of age, working duration and occupational injury in the previous year among the two factories were different statistically significant at education level (χ^2=8.55, p=0.05), age (χ^2=21.03, p=0.001), working duration (χ^2=21.97, p=0.001) and occupational injury in the previous year(χ^2=4.49, p=0.05), respectively

6.1.2 Comparison between the working environment knowledge and general characteristic of benchmarking group found that the average working environment knowledge score among two different sex were statistically significant at t = 2.456 (p = 0.05), but variable of education level, age, working duration, statistic of occupational injury since they started working, statistic of occupational injury in the previous year , and job were not different.

6.1.3 Comparison between the working environment knowledge and general characteristic of self evaluation group found that the average working environment knowledge score among five different working duration were statistically significant at F = 2.649 (p = 0.05), but variables of sex, education level, age, statistic of occupational injury since they started working, statistic of occupational injury in the previous year, and job were not different.

6.1.4 Comparison between the opinion on working environment score and general characteristic of benchmarking group found that the average opinion on working environment score among six different jobs were statistically significant at F = 54.578 (p = 0.01), but variables of sex, education level, age, working duration, statistic of occupational injury since they started working, and statistic of occupational injury in the previous year were not different.

6.1.5 Comparison between the opinion on working environment score and general characteristic of benchmarking group found that the average opinion on working environment score among eight different jobs were statistically significant at F = 8.283 (p = 0.01), but variables of sex, education level, age, working duration, statistic of occupational injury since they started work, and statistic of occupational injury in the previous year were not different.

6.1.6 Statistical correlation between the opinion score on working environment in 6 sections of benchmarking group found that section 1 positively related to total section (r = .420, p = 0.001), section 3 positively related to total section (r = .694, p = 0.001), section 4 positively related to total section (r = .301, p = 0.01), and section 5 positively related to total section (r = .923, p = 0.001). But section 2 and 6 did not have the relationship to opinion on the total working environment score.

6.1.7 Statistical correlation between the opinion on working environment in 6 sections of self evaluation group found that section 1 positively related to total (r = .756, p = 0.001), section 2 positively related to total section (r = .185, p = 0.05), section 3 positively related to total section (r = .493, p = 0.001), section 4 positively related to total section (r = .593, p = 0.001), and section 5 positively related to total section(r = .581, p = 0.001) and section 6 positively related to total section(r = .524, p = 0.001).

6.1.8 The relationship of working environment knowledge score and opinion on working environment score of benchmarking group found that working environment knowledge score negatively related to opinion on working environment score in section 5(r = -.219, p = 0.05).

6.1.9 The relationship of working environment knowledge score and opinion on working environment score of self evaluation group found that working environment knowledge score positively related to opinion on working environment score in section 2 ($r = .245$, $p = 0.01$) and section 5 ($r = .306$, $p = 0.001$) respectively.

6.1.10 Comparison of the working environment knowledge score between two factories found that the average working environment knowledge score among two different factories were statistically significant at $t = 4.095$ ($p = 0.001$).

6.1.11 Comparison of opinion on working environment score between two factories found that the average opinion on working environment score among two different group were statistically significant at $t = 11.059$ ($p = 0.001$).

Part 2: Benchmarking team and self evaluation team.

6.1.12 The homogeneity of the variable of workers between the two factories found that variable of education level, position, and occupational injury since they start work were not different but the variable of sex, age, and working duration among the two factories were different statistically significant at sex($p=0.01$), age($p=0.01$), and working duration ($p=0.01$), respectively

6.1.13 Comparison of recognition of knowledge of safety policy and management and general characteristics of benchmarking team found that variables of sex, educational level and working duration were not different.

6.1.14 Comparison between the recognition to knowledge of safety policy and management and general characteristic of self evaluation team found that variable of sex, education level and working duration were not different.

6.1.15 Comparison between the benchmarking knowledge and general characteristic of benchmarking team found that variable of sex, education level and working duration were not different.

6.1.16 Comparison between the benchmarking knowledge score and general characteristic of self evaluation team found that variables of sex, education level and working duration were not different.

6.1.17 Comparison between the evaluation knowledge score and general characteristic of benchmarking team found that variables of sex, education level and working duration were not different.

6.1.18 Comparison between the evaluation knowledge score and general characteristic of self evaluation team found that variables of sex, education level and working duration were not different.

6.1.19 Comparison between the environment knowledge score and general characteristic of benchmarking team found that variables of sex, education level and working duration were not different.

6.1.20 Comparison between the environment knowledge score and general characteristic of self evaluation team found that variables of sex, education level and working duration were not different.

6.1.21 Comparison between the practice and general characteristic of benchmarking team found that variables of education level and working duration were not different.

6.1.22 Comparison between the practice and general characteristic of self evaluation team found that variables of sex, education level and working duration were not different.

6.1.23 The relationship of recognition of knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice of benchmarking team found that all variables did not relate to practice.

6.1.24 The relationship of recognition of knowledge of safety policy and management, benchmarking knowledge, evaluation knowledge, environment knowledge and practice of self evaluation team found that all variables did not relate to practice.

6.1.25 Comparison of recognition of knowledge of safety policy and management between teams found that the average recognition to knowledge of safety policy and management score among two different teams were statistically significant at $t = 3.551$ ($p = 0.01$).

6.1.26 Comparison of benchmarking knowledge, evaluation knowledge, and environment knowledge between the two teams found that the average score was not different.

6.1.27 Comparison of practice between the two teams found that the average practice score was not different.

6.2 Recommendation

6.2.1 Recommendation from this study are as the following:

6.2.1.1 This research is the working environment improvement method design for food factories that can apply to use in the same categories and other type of factories for controlling the working environment for safety.

6.2.1.2 The staff in factory can use the research result for the guideline of improvement and safety management information.

6.2.1.3 To inform and prepare the regulations of working environment improvement in factory.

6.2.1.4 To follow up the regulations of working environment improvement to be a safe workplace.

6.2.1.5 If the workers in each section do not follow the regulations of working environment improvement, they should be strictly controlled for compliance with the regulations.

6.2.2 Recommendation for further study

6.2.2.1 Result finding of the regulations of working environment improvement should continuously follow up the result of working environment as stated by the regulations.

6.2.2.2 To study the unsafe working environment factors which can cause of accident.

6.2.2.3 To study the addition of working environment factors beside six sections of research and compare between the factory with the good safety policy and management and the factory with different safety policy and management.

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APPENDIX

APPENDIX A

PERMIT

The permit was shown in figure below.

ที่ รง 0506.8/ 214 ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8
176 หมู่ 13 ถนนพหลโยธิน จ.ปทุมธานี 12120

14 พฤษภาคม 2547

เรื่อง ขอความร่วมมือเข้าร่วมโครงการปรับปรุงสภาพแวดล้อมการทำงาน

เรียน กรรมการผู้จัดการบริษัท ไมเดิร์น ฟู้ด อินดัสตรี้ จำกัด

สิ่งที่ส่งมาด้วย 1. รายละเอียดโครงการ จำนวน 1 ฉบับ
2. ตารางการประชุมเชิงปฏิบัติการ จำนวน 1 ฉบับ
3. แบบตอบรับการเข้าร่วมโครงการ จำนวน 1 ฉบับ

ด้วยศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 กรมสวัสดิการและคุ้มครองแรงงาน กระทรวงแรงงาน ได้จัดทำโครงการปรับปรุงสภาพแวดล้อมการทำงาน เพื่อให้สภาพการทำงานที่ผู้ปฏิบัติงานต้องสัมผัสในสถานที่ทำงานอยู่ในสภาพที่เหมาะสมสำหรับการทำงาน ให้มีความปลอดภัยต่อผู้ปฏิบัติงานโดยใช้กระบวนการ Benchmarking เพื่อค้นหาวิธีการปฏิบัติงานที่ดีที่สุด (best practice) และทำโดยเปรียบเทียบกระบวนการหรือวิธีปฏิบัติกับผู้ที่ทำได้ดีกว่าและนำผลของการเปรียบเทียบนั้นมาปรับปรุงองค์กรของตนเองให้ดีขึ้น ช่วยให้ผู้ประกอบการลดเวลาในการปรับปรุงองค์กร

Benchmarking ทำให้ได้มาซึ่ง Best Practice (วิธีปฏิบัติที่ดีที่สุด) เพื่อให้องค์กรก้าวไปสู่ความเป็นเลิศ (Best of the Best) ดังรายละเอียดโครงการที่แนบมาพร้อมนี้

ในการนี้ การจัดทำโครงการดังกล่าว จะมีการเข้าเยี่ยมชมสถานประกอบกิจการ และวางแผนกิจการการปรับปรุงสภาพแวดล้อมการทำงาน ดังนั้น ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 จึงขอความร่วมมือมายังบริษัท ไมเดิร์น ฟู้ด อินดัสตรี้ จำกัด เพื่อโปรดพิจารณาเข้าร่วมโครงการ พร้อมส่งแบบตอบรับการเข้าร่วมโครงการ ไปยังศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 ทางโทรสาร หมายเลข 02-529-0311 ภายในวันที่ 30 พฤษภาคม 2547

จึงเรียนมาเพื่อโปรดพิจารณาให้ความร่วมมือในครั้งนี้ด้วย จักขอบพระคุณยิ่ง

ขอแสดงความนับถือ

(นายสำเริง พุฒวันเพ็ญ)
ผู้อำนวยการศูนย์ความปลอดภัยในการทำงานพื้นที่ 8

ฝ่ายส่งเสริมการปรับปรุงสภาพการทำงาน
โทรศัพท์ 0 2529 0916 โทรสาร 0 2529 0311

ที่ รง 0506.8/ 536

ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8
176 หมู่ 13 ถนนพหลโยธิน จ.ปทุมธานี 12120

21 ตุลาคม 2547

เรื่อง ขอความร่วมมือเข้าร่วมโครงการปรับปรุงสภาพแวดล้อมการทำงานเพื่อลดการประสบอันตรายจากการทำงาน ด้วยวิธีประเมินตนเอง

เรียน กรรมการผู้จัดการบริษัท ชวนพัฒน์ จำกัด

สิ่งที่ส่งมาด้วย 1. รายละเอียดโครงการ จำนวน 1 ฉบับ
2. ตารางการประชุมเชิงปฏิบัติการ จำนวน 1 ฉบับ
3. แบบตอบรับการเข้าร่วมโครงการ จำนวน 1 ฉบับ

ด้วยศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 กรมสวัสดิการและคุ้มครองแรงงาน ได้จัดทำโครงการปรับปรุงสภาพแวดล้อมการทำงาน เพื่อให้สภาพการทำงานที่ผู้ปฏิบัติงานต้องสัมผัสเป็นประจำในสถานที่ทำงานอยู่ในสภาพที่เหมาะสมและปลอดภัยต่อผู้ปฏิบัติงาน ด้วยวิธีการส่งเสริมให้สถานประกอบกิจการแก้ไขปัญหาและดูแลตนเอง เป็นการบูรณาการโดยร่วมคิดและพนักงานมีส่วนร่วมวางแผนดำเนินงานตามความเหมาะสม เพื่อลดอันตรายต่อสุขภาพของผู้ปฏิบัติงานให้น้อยลง

ในการนี้ การจัดทำโครงการดังกล่าว จะมีการดำเนินงานวางแผนกิจการ การปรับปรุงสภาพแวดล้อมการทำงาน ดังนั้น ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 จึงขอความร่วมมือมายังบริษัท ชวนพัฒน์ จำกัด เพื่อโปรดพิจารณาเข้าร่วมโครงการ พร้อมส่งแบบตอบรับการเข้าร่วมโครงการ ไปยังศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 ทางโทรสาร หมายเลข 02-529-0916

จึงเรียนมาเพื่อโปรดพิจารณาให้ความร่วมมือในครั้งนี้ด้วย ขอขอบพระคุณยิ่ง

ขอแสดงความนับถือ

(นายสำเริง พุฒวันเพ็ญ)
ผู้อำนวยการศูนย์ความปลอดภัยในการทำงานพื้นที่ 8

ฝ่ายส่งเสริมการปรับปรุงสภาพการทำงาน
โทรศัพท์ 0 2529 0311 โทรสาร 0 2529 0916

ที่ รง 0506.8/ 516

ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8
176 ถนนพหลโยธิน จ.ปทุมธานี 12120

12 ตุลาคม 2547

เรื่อง ขออนุญาตดูงานด้านความปลอดภัย และสภาพแวดล้อมในการทำงาน

เรียน กรรมการผู้จัดการทั่วไป บริษัท สยามบรรจุภัณฑ์ จำกัด

ด้วยศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 กรมสวัสดิการและคุ้มครองแรงงาน กระทรวงแรงงาน จะจัดฝึกอบรมหลักสูตร "การปรับปรุงสภาพแวดล้อมการทำงาน เพื่อลดการประสบอันตรายแบบรวดเร็วด้วยวิธี เบนช์มาร์กกิ้ง" ระหว่างวันที่ 19 – 20 พฤศจิกายน 2547 ณ ห้องประชุม บริษัท โมเดร์น ฟู้ด อินดัสตรี้ จำกัด โดยผู้เข้ารับการฝึกอบรม เป็นพนักงานของ บริษัท โมเดร์น ฟู้ด อินดัสตรี้ จำกัด จ.ปทุมธานี ประกอบกิจการ ผลิตถั่วลิสงอบกรอบ จำนวน 16 คน ซึ่งในหลักสูตรดังกล่าว จะประกอบด้วยการบรรยายจากวิทยากรผู้ทรงความรู้ อีกทั้งมีการดูงานด้านความปลอดภัย และสภาพแวดล้อมในการทำงานนอกสถานที่

ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 พิจารณาแล้วเห็นว่าสถานประกอบกิจการของท่านมีมาตรฐานการดำเนินงานด้านความปลอดภัย และสภาพแวดล้อมในการทำงานที่เหมาะสมเป็นแบบอย่าง จึงขออนุญาตนำผู้เข้ารับการฝึกอบรม จำนวน 16 คน เข้าดูงานด้านความปลอดภัย และสภาพแวดล้อมในการทำงาน ของบริษัท สยามบรรจุภัณฑ์ จำกัด ในวันที่ 20 พฤศจิกายน 2547 ระหว่างเวลา 9.00 – 12.00 น. โดยมอบหมายให้ นางสาวสุภาภรณ์ สุวรรณพิทักษ์ นักวิชาการแรงงาน เป็นผู้ประสานงานต่อไป

ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 หวังว่าคงได้รับความอนุเคราะห์อย่างดียิ่งจากท่าน และขอขอบคุณเป็นอย่างสูงมา ณ โอกาสนี้

ขอแสดงความนับถือ

(นายสำเริง พุฒวันเพ็ญ)
ผู้อำนวยการศูนย์ความปลอดภัยในการทำงานพื้นที่ 8

ฝ่ายส่งเสริมการปรับปรุงสภาพการทำงาน
โทรศัพท์ 0 2529 0916 โทรสาร 0 2529 0311

ที่ รง 0506.8/ 514

ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8
176 ถนนพหลโยธิน จ.ปทุมธานี 12120

12 ตุลาคม 2547

เรื่อง ขอเชิญวิทยากรบรรยาย

เรียน ผู้อำนวยการศูนย์เทคโนโลยี โลหะ และวัสดุแห่งชาติ

ด้วยศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 กรมสวัสดิการและคุ้มครองแรงงาน กระทรวงแรงงาน จะจัดฝึกอบรมหลักสูตร "การปรับปรุงสภาพแวดล้อมการทำงาน เพื่อลดการประสบอันตราย แบบรวดเร็วด้วยวิธี เบนช์มาร์กกิ้ง" ระหว่างวันที่ 19 – 20 พฤศจิกายน 2547 ณ ห้องประชุม บริษัท โมเดร์น ฟู้ด อินดัสตรี้ จำกัด โดยผู้เข้ารับการฝึกอบรม เป็นพนักงานของ บริษัท โมเดร์น ฟู้ด อินดัสตรี้ จำกัด จ.ปทุมธานี ประกอบกิจการ ผลิตถั่วลิสงอบกรอบ จำนวน 16 คน โดยไม่เสียค่าใช้จ่ายใด ๆ ทั้งสิ้น

ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 จึงขอเรียนเชิญ ดร. สมนึก ศิริสุนทร เป็นวิทยากรบรรยายหัวข้อ "ความเป็นมา ชนิด ขั้นตอนการทำ และประโยชน์ของการทำเบนช์มาร์กกิ้ง ด้านการปรับปรุงสภาพแวดล้อมการทำงาน" ในวันที่ 19 พฤศจิกายน 2547 ระหว่างเวลา 09.00 – 12.00น. ณ ห้องประชุม บริษัท โมเดร์น ฟู้ด อินดัสตรี้ จำกัด จ. ปทุมธานี โดยมอบหมายให้ นางสาวสุภาครณ์ สุวรรณเพิทักษ์ นักวิชาการแรงงาน เป็นผู้ประสานงานต่อไป

ศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 หวังว่าคงได้รับความอนุเคราะห์อย่างดียิ่งจากท่าน และขอขอบคุณเป็นอย่างสูงมา ณ โอกาสนี้

ขอแสดงความนับถือ

(นายสำเริง พุฒวันเพ็ญ)
ผู้อำนวยการศูนย์ความปลอดภัยในการทำงานพื้นที่ 8

ฝ่ายส่งเสริมการปรับปรุงสภาพการทำงาน
โทรศัพท์. 0 2529 0916 โทรสาร. 0 2529 0311

Thai containers

ศูนย์ความปลอดภัยในการทำงานพื้นที่
รับที่ 865
วันที่ 18 ต.ค. 2547
เวลา 09.00 น.

<u>บันทึก</u>

6 ตุลาคม 2547

เรื่อง ดูงานความปลอดภัย

เรียน ผู้อำนวยการศูนย์ความปลอดภัยในการทำงานพื้นที่ 8 นวนคร

จากหนังสือ ที่ รง 0506.8/418 เรื่อง ขออนุญาตดูงานความปลอดภัย และสภาพแวดล้อมในการทำงาน บริษัทฯ มีความยินดีเป็นอย่างยิ่ง และพร้อมให้การต้อนรับ คณะดูงาน ในวันที่ 20 พ.ย. 2547 เวลา 9.00 – 12.00 น. ทั้งนี้ใคร่ขอให้คณะ ดำเนินการตามระเบียบของโรงงานที่แนบมาด้วยอย่างเคร่งครัด

จึงเรียนมาเพื่อทราบ

(นายดำรงค์ ธรรมโพธิทอง)
ผู้จัดการส่วนส่งเสริมการผลิตและการขาย

- ทราบ
คุณ สุภาภรณ์ ดำเนินการต่อ
18 ต.ค. 48

<u>ผู้ประสานงาน</u> นายปกรณ์ เล็กสกุล เจ้าหน้าที่ความปลอดภัย
0-2529-0065, 0-1856-1465

ข้อกำหนดความปลอดภัย

1. ห้ามแต่งกายด้วยเสื้อผ้าที่ไม่รัดกุมหรือใส่กางเกงขาสั้นหรือสวมใส่รองเท้าแตะขณะปฏิบัติงาน
2. ห้ามโหน เกาะ หรืออาศัยไปกับรถที่ใช้งาน ซึ่งมิใช่รถโดยสาร
3. ต้องสวมใส่อุปกรณ์ป้องกันอันตรายส่วนบุคคลตามที่กำหนดให้เหมาะสมกับลักษณะงานทุกครั้ง
4. ห้ามเสพยาเสพติด สุรา หรือเครื่องดองของมึนเมา ในบริเวณโรงงานหรือมีอาการมึนเมาเข้ามาปฏิบัติงานหรือเข้ามาในเขตโรงงาน
5. ห้ามก่อให้เกิดไฟ ในบริเวณโรงงาน ก่อนได้รับอนุญาตจากผู้มีหน้าที่รับผิดชอบ
6. ห้ามสูบบุหรี่ในบริเวณโรงงาน
7. ห้ามนำหรือขับขี่ยานพาหนะเข้าเขตปฏิบัติงานหรือในบริเวณอาคาร ยกเว้นที่ได้รับอนุญาต
8. ห้ามผู้ไม่มีหน้าที่เกี่ยวข้องใช้เครื่องจักรและอุปกรณ์ หรือเครื่องมือ เครื่องใช้ของบริษัทฯ ก่อนได้รับอนุญาตจากผู้มีหน้าที่รับผิดชอบ
9. ห้ามเล่น หยอกล้อ หรือการกระทำใดๆ ซึ่งอาจก่อให้เกิดอันตรายต่อตนเองหรือผู้อื่น หรือทรัพย์สินของบริษัทฯ
10. ห้ามใช้ลมในระบบการใช้งานสำหรับเครื่องจักร อุปกรณ์ เป่าร่างกายหรือเสื้อผ้าของใช้ประจำตัวและอื่นๆ
11. ต้องแขวนป้าย "อันตราย" ทุกครั้งที่มี :-
    11.1 การตรวจซ่อมหรือทำความสะอาดเครื่องจักรและห้ามใช้เครื่องจักรหรืออุปกรณ์ที่มีป้าย "อันตราย" แขวนอยู่ กรณีที่จะทดลองหรือเดินเครื่องจะต้องติดต่อผู้มีหน้าที่เกี่ยวข้องเสียก่อน
    11.2 การขนถ่ายสารเคมีอันตราย และติดรายละเอียดของสารเคมีอันตราย (MSDS) ที่บริเวณขนถ่าย
12. ต้องแขวนป้าย "ห้ามเข้า" ในสถานที่ปฏิบัติงานที่เป็นอันตราย
13. ห้ามอาศัยขึ้นหรือลงลิฟท์ขนส่งกระดานและสัญจรในเส้นทางลำเลียงกระดาษ
14. ห้ามปฏิบัติงานคนเดียวในจุดที่กำหนดให้มีผู้ปฏิบัติงานมากกว่า 1 คน
15. ต้องจัดทำและตรวจสอบตามใบขออนุญาตทำงาน (ME-F01) ร่วมกับหน่วยงานที่เข้าไปปฏิบัติงานก่อนการปฏิบัติงานทุกครั้ง

รหัสเอกสาร OH-S14
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APPENDIX B

CHART OF TEAM

B.1 The benchmarking team chart of Modern Food Industry Company Limited

The benchmarking team chart of Modern Food Industry Company Limited was shown in figure B1.

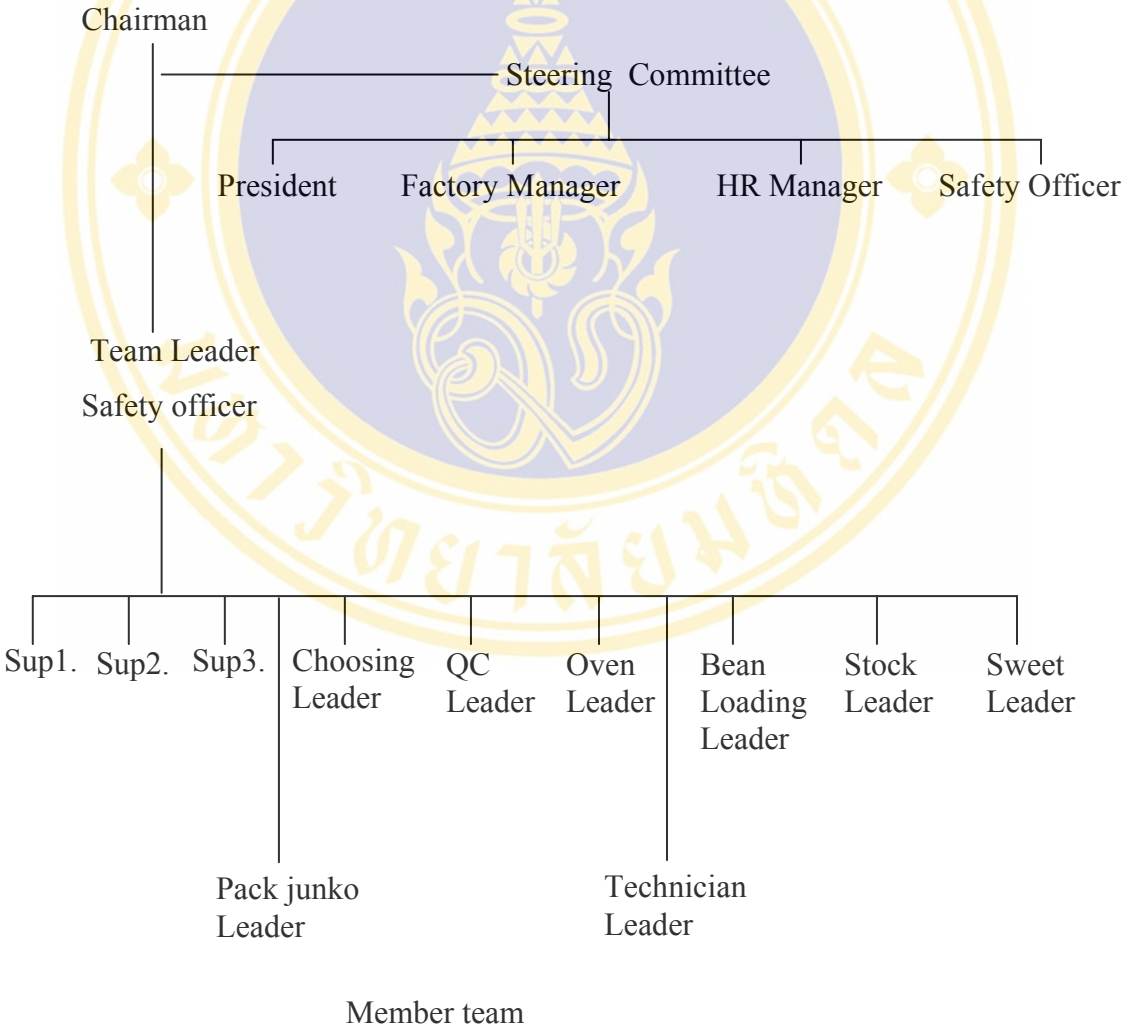

Figure B1 The benchmarking team chart of Modern Food Industry Company Limited.

B.2 The self evaluation team chart of Chawanapat Company Limited

The self evaluation team chart of Chawanapat Company Limited was shown in figure B2.

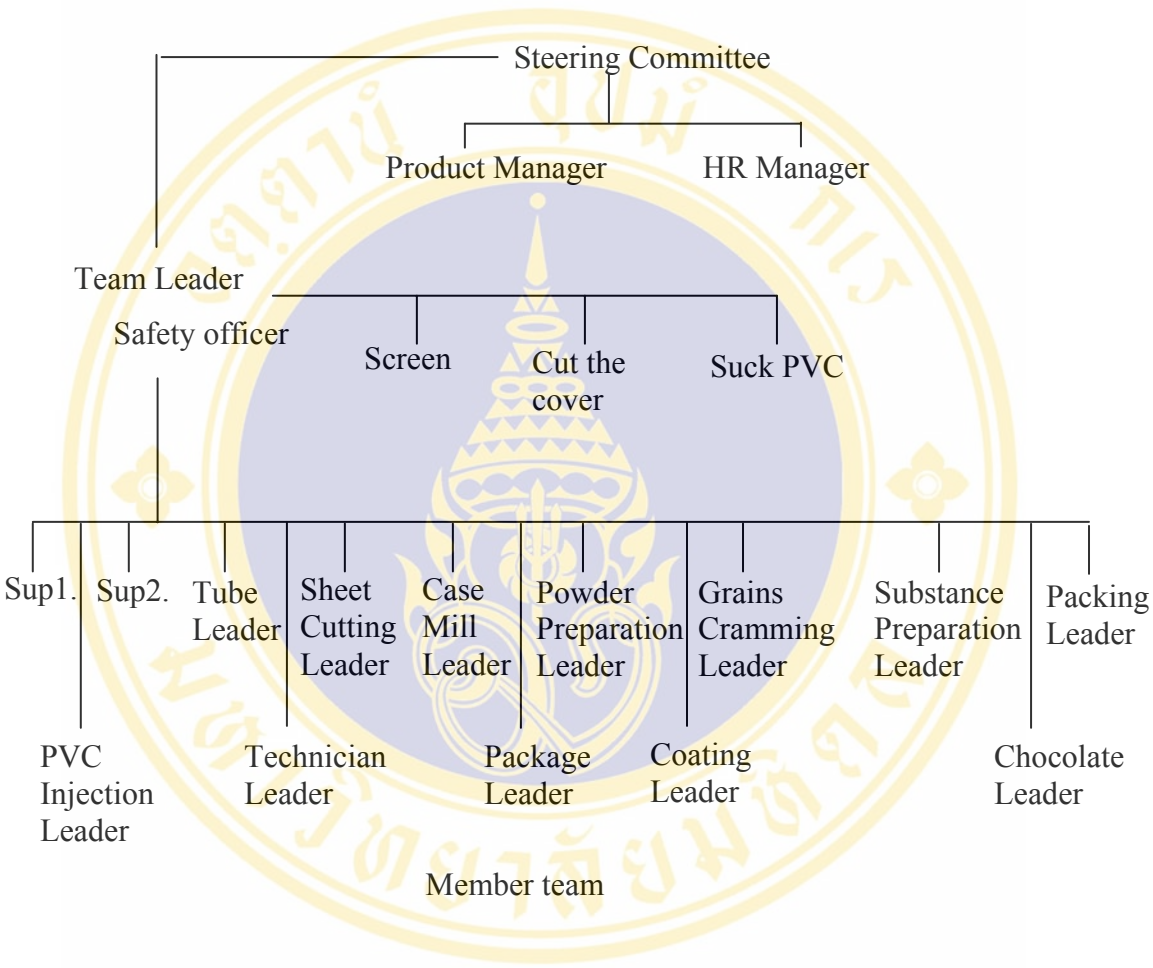

Figure B2 The self evaluation team chart of Chawanapat Company Limited.

APPENDIX C

AGENDA

C.1 Benchmarking team agenda

The benchmarking team agenda was shown in table C1.

Table C1 Benchmarking team agenda.

Date / Time	Activities	Target
<u>The first date</u>		
09.00 am. - 09.30 am.	- To introduce the Safety and Working Environment policy of the Ministry of Labour	Benchmarking Team
09.30 am. - 12.00 am.	- To describe on benchmarking type, step and the benefit of benchmarking in working environment improvement - To select the process for benchmarking	Benchmarking Team
01.00 pm. – 04.00 pm.	- To evaluate the information result working environment from questionnaire of production workers .	Benchmarking Team
<u>The second date</u>		
09.00 am. – 12.00 am.	-To visit the factory with best practice on safety and working environment.	Benchmarking Team
01.00 pm. – 04.00 pm.	- Conclude the result of the best practices on working environment improvement for practice in their own workplace.	Benchmarking Team

Remark 10.30 am. – 10.45 am. Break
12.00 am. – 01.00 pm. Lunch
02.30 pm. – 02.45 pm. Break

C.2 Self evaluation team agenda

The self evaluation team agenda was shown in table C2.

Table C2 Self evaluation team agenda.

Date / Time	Activities	Target
The first date		
09.00 am. – 09.30 am.	- To introduce the Safety and Working Environment policy of the Ministry of Labour.	Self Evaluation Team
09.30 am. – 12.00 am.	- To describe on the self evaluation method, steps and the benefit of self evaluation. -To choose the process for self evaluation.	Self Evaluation Team
.	-To evaluate the information result working environment from questionnaires of the production workers.	Self Evaluation Team

Table C2 Self evaluation team agenda.(continued)

Date / Time	Activities	Target
1.00 pm.-4.00 pm.(continued)	Conclude the result of the best practices on working environment improvement for practice in their own workplace.	Self Evaluation Team
Remark	10.30 am. – 10.45 am.	Break
	12.00 am. – 01.00 pm.	Lunch
	02.30 pm. – 02.45 pm.	Break

APPENDIX D

LABOUR QUESTIONNAIRE

Set 1st General Information

Instruction: check / in ( ) as required and fill in the blanks with correct information

1. Sex ( ) 1.mail ( ) 2. Female
2. Age ……years
3. Section ……Position……
4. Working period …….year (especially the present company)
5. The most education……..
6. The statistics of occupational injury

6.1 Start working

☐ Never

☐ Ever describe……

6.2 In the previous year

☐ Never

☐ Ever describe……

Set 2nd: Idea for working environment

Instruction: to put the score in each question with consideration the truth. One score mean available / yes 0 score mean not available / no (v) in the correct answer.

Section 1st Dangerous controlling from working environment and chemical.

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	Remark
1.1 There are working environment survey using safety audit from such as below; - Noise - Lighting - Temperature 1.2 There are working environment survey using safety audit from such as below; - Chemical - Dust 1.3 There are the analysis for working environment by using the industrial equipment in the previous year such as below; - Noise - Lighting - Temperature				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	Remark
1.4 There are the analysis for working environment by using the industrial equipment in the previous year such as below; - Chemical - Dust **Noise** 1.5 To use earplugs or ear muffs in noisy area. 1.6 To minimize the noise exposure of workers and moving from noisy area to the other area. 1.7 To separate the noisy machines away from working area. 1.8 There are the measures for noise control and use of noise control equipment on the wall and ceiling or using enclosure of noisy machine.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	Remark
Light 1.9 The light is enough for working. 1.10 To increase lighting at the roof and windows. 1.11 To always clean and maintain the light in the previous year. 1.12 To check the expire date of the lamp and change it if expired in the previous year. 1.13 To install the adjustable light appropriate for working. **Temperature** 1.14 To increase the natural ventilation by increasing the ventilation at the door, wall and roof. 1.15 To install the air condition or fan to reduce the temperature.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	Remark
1.16 To install insulation to protect the heat on the roof or wall. 1.17 There are the insulation or the barrier between the heating material, pipe, machine and worker. **Dust, gas and chemical** 1.18 To wash hands with soap instead of the lubricant or other chemical 1.19 The workers who expose to chemical need to wash hands before eating or drinking. 1.20 To increase the natural ventilation by increasing the windows and the doors. 1.21 To have the label about 'do not eat or smoke' in chemical working area. 1.22 Should have the specific chemical storage room.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
1.23 The chemical container should have the label about danger, name of chemical, chemical protection and first aid for each chemical. 1.24 To install the ventilation system to reduce such as below; - Dust - Gas and Chemical				

Section 2nd Safety in material handling

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
2.1 The worker have to lift the material with ergonomics awareness. 2.2 To use the pallet for material handling. 2.3 To use a push – cart, tray, vehicles or the other mechanical for heavy material handling. 2.4 To have the safety rule for - Material lifting - Material handing -Material transportation 2.5 To always check the equipment and system of material handing lift.				

Section 3rd Workplace, working condition or working area

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
3.6 To adjust the level of working control button into the appropriate position. 3.7 To change from monotonous work to the other type of working.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
3.8 The working area should wide enough for movement of workers. 3.9 The pathway should wide and be smooth that suitable for material or goods transferring. 3.10 To make the floor smooth without sliding. 3.11 Should have the clear mirror at the door between each room. 3.12 To paint clearly and mark the pathway or using barrier to protect the danger from machine or vehicle crash. 3.13 The level of pathway is 1.5 meters higher from the floor, should have a strong rail.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
3.14 The fork lift way should wide for at least three meters plus the fork lift wide. For two way pathway, it should wide two times of one way pathway.				

Section 4th Dangerous control from tool, machine and electrical

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
Tools and machine 4.1 There are the covers of knives, sharps, scissors or strong handle. 4.2 There are boxes for tools. 4.3 To have the restrict line for the dangerous machine. 4.4 The pathway between machines should wide of at least 80 centimeters. 4.5 To install the cover in moving part, rotating clip area of machine. 4.6 The machine cover with opening on the top should be strong enough. 4.7 To dress with suitable clothing if the workers have to work near the rotating part of machine.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
4.8 To install the safety equipment to stop machine in case of accident. 4.9 Pre – check the machine following the safety audit form. Electricity 4.10 To set the good electrical system. 4.11 To connect the ground for electrical machine. 4.12 There are the covers for electrical control panel. 4.13 To set minor switch for electrical supply for each machine with separate control to avoid short – circuit.				

Section 5th Personal Protective Equipment

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
5.1 To set PPE appropriate with working. - Safety hat - Safety glasses - Face shield -Chemical safety shield - Dust mask - Heat protective suit -Safety shoes - Chemical gloves -Ear plugs or ear muffs. 5.2 To recommend the PPE wearing method. 5.3 To recommend the PPE wearing method appropriate with working. 5.4 To recommend the cleaning and maintenance method for PPE. 5.5 Workers should participate and specify the type of PPE required for their work. 5.6 To always check PPE. 5.7 To control and look after the workers to wear PPE appropriate with work.				

Section 6th Welfare and occupational health providing

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
6.1 To separate the rest area from dangerous area. 6.2 To have the activity or equipment of health promotion such as sport equipment, yearly sport game. 6.3 To set the training of first aid for workers. 6.4 To distribute the knowledge of occupational disease protection and help problem from doctors in the workplace. 6.5 Physical check up for worker before working and especially occupational disease protection. 6.6 Physical check up following type of working and working environment. 6.7 Yearly check up. 6.8 To inform the result of check up to workers.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
6.9 To collect the information and occupational disease statistics. 6.10 There are the rooms or place for first aid to treat immediately. 6.11 There are doctors, nurse or person who has responsibility in first aid. 6.12 There are the ambulances and vehicles stand by for workplace. **Storage room, toilet, canteen and disposal** 6.13 The toilet should be separated as male – female. 6.14 The toilet is hygienic. 6.15 To install the washbasin in the toilet. 6.16 The number of toilets should be enough and near the working area. 6.17 To provide the drinking water in the workplace.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
6.18 The canteen should be separated from the working area. 6.19 To set the personal storage. 6.20 To dispose the garbage, waste, used material following the hygienic procedure.				

Set 3rd Questionnaire of the knowledge about Working Environment.

Instruction: circle 0 in the correct answer.

1. How many ways does chemical get in to the body?
   a. 3 ways are inhalation, ingestion and absorbing
   b. 2 ways are inhalation and absorbing
2. Can the ventilation get rids of the air determination and clouds dilute the air determination?
   a. Yes
   B. No
3. If the unsuitable ventilation, the worker will feel not comfortable?
   a. Yes
   B. No
4. Can noise effect health make blood pressure pepticulcer and serious?
   a. Yes
   B. No
5. Are there four items of surrounding Working Environment, Chemical Environment, Biological Environment, psychological Environment?
   a. Yes
   B. No
6. How many centimeters between tool push?
   a. 100 centimeters
   b. 40 centimeters
7. What is the benefit of safeguard and machine barrier installation
   a. To protect the accident from machine
   b. to health material handling into machine
8. Which one is the dangerous chemical?
   a. Corrosive chemical, gas
   b. Dust, smoke

9. There are step for material lifting as below;
    1. To standard in the position.
    2. Back stress
    3. Arm close the body
    4. To strong handle the material
    5. To keep chin
    6. To lift.
    a. 1, 2, 3, 4, 5, 6
    b. 1, 3, 4, 2, 5, 6
10. How many decibel of working seven house not more than eight hours?
    a. 90 decibels (A)
    b. 91 decibels (A)
11. Which one is the correct answer for noise prevention and control three always?
    a. Source control, path control, receive control
    b. Source control, control workers who path, , receive control

12. How many temperature can workers exposure in the workplace?
    a. 35 °C
    b. 38 °C
13. How many ventilation?
    a. One type is the dilution
    b. Two type are the dilution and specification
14. How many lighting can workers in working details exposure?
    a. 300 Lux
    b. 200 Lux
15. How many noise frequency of young' s ear?
    a. Between 20 – 20,000 Hz.
    b. Between 30 – 20,000 Hz.
16. How many hours can workers exposure for TLV?
    a. 8 hours a day all working time.
    b. 12 hours a day all working time.

17. Wish one each noise PPE that can minimize the noise 15 dB(A) follow as the notification of ministry of interior?
    a. Ear Plugs
    b. Ear muffs
18. What size of dust can breath into respiratory system?
    a. Small dust less than 10 micron.
    b. Small dust less than 15 micron.
19. How many light intensity in wore house, material strong room, passate way, veranda and stair?
    a. 50 Lux
    b. 100Lux
20. How many light intensity in wore house, material strong room, passate way, veranda and stair?
    a. Heat exhaustion
    b. Muscle exhaustion

APPENDIX E

TEAM QUESTIONNAIRE

Set 1st General Information

Instruction: Check / in ( ) as required and fill in the blanks with correct information.

1. Sex ( ) 1. male 2. ( ) female
2. Age……years
3. Section ……. Position……
4. Working period ……Year (especially the present company)
5. The most education ……
6. The statistic of occupational injury

6.1 Start working

☐ Never

☐ Ever describe……

6.2 In the previous year

☐ Never

☐ Ever describe……

Set 2nd Policy and safety management

Instruction: To put the score in each question with consideration the truth. One score available / yes 0 score mean not available / no (true) in the correct answer.

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
2.1 General policy of organization show safety management by writing. 2.2 Yearly safety plan. 2.3 To set safety officer at supervisor and safety officer at executive. 2.4 To set the punishment for safety rule. 2.5 To set the guideline for praise commendation. 2.6 To set the safety sign. 2.7 Choose new worker have test attitude about safety. 2.8 An orientation and to new worker about safety 2.9 To inform the policy and notice policy. 2.10 Safety section direct to the executive or the other section but can report directly the executive.				

Question	Available / Yes	Not available / no	Not concern or Not necessary for working	remark
2.11 Safety officer have only responsibility. 2.12 To set safety officer at supervision level control worker working to be safe. 2.13 To inform the worker report the dangerous condition to supervision. 2.14 Safety rule with writing and informing worker. 2.15 Worker copulation in safety rule. 2.16 To set the safety committee. 2.17 To investigate the accident in workplace. 2.18 It safety committee walk though survey at least once a month. 2.19 To report safety officer performance and re[ort accident rate follow as safety officer 3 every three months.				

Set 3rd Questionnaire or the knowledge about Benchmarking Method.

Instruction: Circle O in the right answer.

1. What is the meaning of Benchmarking?
   a. Is the method for measure and product, service and best practice comparison to use the comparison result for organization improvement.
   b. Is product service and best practice duplication method to apply in there organization .
2. What is the meaning of best practice?
   a. The criteria for measure or comparison.
   b. To do the best working.
3. Which one is Benchmarking – cross industry.
   a. Generic Benchmarking
   b. Internal Benchmarking
4. Which one is the first step of Benchmarking process?
   a. Choosing the process for measure or comparison.
   b. To find out the organization for comparison.
5. Which one is the famous tool for Benchmarking analyze?
   a. Criteria testing matrix
   b. TPM
6. Which one is the right for Benchmarking process?
   a. Benchmarking team choose be the representative of worker in each section only.
   b. Benchmarking process require the leader corporation
7. How many type of Benchmarking process?
   a. 2 types
   b. 4 types
8. Which one is the benefit of internal Benchmarking?
   a. It could make adaptation for working and training in organization.
   b. To have a change to increase the relation between is organization.

9. What happened if not have Generic Benchmarking?
    a. Not open mind and do not check the information to compare with variety industry.
    b. To be competitive between the person who would like to increase their personal ability.
10. Which one is the importance result of organization emphasizes Benchmarking process?
    a. To improve quickly working step because of Benchmarking Process has proved and became success.
    b. It is fashionable for administration

Set 4th Questionnaire of the knowledge about Self Evaluation method.

Instruction: Circle O in the right answer.

1. Which one is the object of Self Evaluation?
    a. To decide quality of anything with expert.
    b. To get the information technology or project by themselves to apply in working.
2. Which one is the meaning of Self Evaluation?
    a. Self evaluation is the process for using knowledge to find out the result and correction method.
    b. Self evaluation is decision for value of anything by using the expert ideas.
3. What is the objective of Self Evaluation?
    a. To success follow as the objective.
    b. To apply evaluation for self improvement and organization development to be effective.
4. Which one is the limit of self evaluation?
    a. To use more explain creation could decrease people their creation.
    b. It is difficult for evaluation.
5. Is self evaluation the importance of evaluation?
    a. Yes
    b. No

6. Which one is the benefit from Self Evaluation?
    a. It is easy for evaluation and efficiency including expert decision.
    b. It is the process for working improvement and development to be effective, the working evaluate themselves to make them recognition.
7. Which one is Philosophy agree Self Evaluation of Boorachai Sirihasakron?
    a. The first win is win ourselves.
    b. Practice without theory mean blind.
8. Which one is the right for Self Evaluation?
    a. Self Evaluation recognizable in studying to develop themselves and find out the truth and goodness.
    b. Self Evaluation is following evaluation and can pass standard or not.
9. Which one is the dominance of Self Evaluation?
    a. Evaluation with theory to get the evaluation with result.
    b. Working process system completely, evaluator and evaluatee is the same person and use the evaluation result fore improvement.
10. Which one is the criteria of quality in Self Evaluation?
    a. To consider and not bias, use internal and external information including using evaluation result itself, working or organization improvement.
    b. To use the criteria that is well – know and expert qualification.

Step 5th Questionnaire of the knowledge about working Environment.

Instruction: Circle O in the correct answer.

1. How many ways does chemical get in to the body?
    a. 3 ways are inhalation, ingestion and absorbing
    b. 2 ways are inhalation and absorbing
2. Can the ventilation get rids of the air determination and could dilute the air determination?
    a. Yes
    B. No
3. If the unsuitable ventilation, the worker will feel not comfortable?
    a. Yes
    B. No

4. Can noise effect health make blood pressure pepticulcer and serious?

a. Yes

B. No

5. Are there four items of surrounding Working Environment, such as Physical Environment, Chemical Environment, Biological Environment, Psychological Environment?

a. Yes

B. No

6. How many centimeters between tool push?

a. 100 centimeters

b. 40 centimeters

7. What is the benefit of safeguard and machine barrier installation ?

a. To protect the accident from machine

b. to health material handling into machine

8. Which one is the dangerous chemical?

a. Corrosive chemical, gas

b. Dust, smoke

9. There are step for material lifting as below;

1. To standard in the position.

2. Back stress

3. Arm close the body

4. To strong handle the material

5. To keep chin

6. To lift.

a. 1, 2, 3, 4, 5, 6

b. 1, 3, 4, 2, 5, 6

10. How many decibel of working seven hours not more than eight hours?

a. 90 decibels (A)

b. 91 decibels (A)

11. Which one is the correct answer for noise prevention and control three always?

a. Source control, path control, receive control

b. Source control, control workers who path, , receive control

12. How many temperature can workers exposure in the workplace?

a. 35 °C

b. 38 °C

13. How many ventilation?

a. One type is the dilution

b. Two type are the dilution and specification

14. How many lighting can workers in working details exposure?

a. 300 Lux

b. 200 Lux

15. How many noise frequency of young' s ear?

a. Between 20 – 20,000 Hz.

b. Between 30 – 20,000 Hz.

16. How many hours can workers exposure for TLV?

a. 8 hours a day all working time.

b. 12 hours a day all working time.

17. Which one is noise PPE that can minimize the noise 15 dB(A) follow as the notification of ministry of interior?

a. Ear Plugs

b. Ear muffs

18. What size of dust can breathe into respiratory system?

a. Small dust less than 10 micron.

b. Small dust less than 15 micron.

19. How many light intensity in wore house, material strong room, passage way, veranda and stair?

a. 50 Lux

b. 100 Lux

20. Which one is the heat danger?

a. Heat exhaustion

b. Muscle exhaustion

APPENDIX F

PRACTICE IN WORKING ENVIRONMENT IMPROVEMENT

Section 1st Dangerous controlling from working environment and chemical

Process Indicator	The practice for working environment management And looking after
4 marks	1. To take the suggestion of employee to consider and correct the unsafe environment. 2. To show the trend of Working Environment monitoring. 3. To have the manual, document, standard of Working Environment for workers in order to studying and research.
3 marks	1. To plan the yearly environment monitoring in chemical and physical. 2. To set the rule for looking after the working environment of workplace. 3. All workers acknowledge the rule from training and manual. 4. To provide the working environment training plan or course for workers and workers who change their job.
2 marks	1.There are the chemical, dust analysis with the industrial equipment. 2. There are the heat, lighting and noise analysis with industrial equipment. 3. There are the information board for working environment. 4. There are the exhibition for working environment to stimulate the recognizable employee in working environment including the promotion for working environment.
1 mark	1. To the survey working environment in chemical and dust. 2. To survey working environment in heat, lighting and noise.

Process Indicator	The practice for noise control improvement
4 marks	- To minimize the noise by changing technique, repairing noise machine and equipment.
3 marks	1. To separate the worker who exposure the noise from the unused machine, equipment away from the noise area. 2. To minimize the noise from equipment or take it away from working area. 3. To use material, partition in pass way of noise. 4. To cover the room which have the noise machine not pass standard, if cannot correct choose move that machine to on working area.
2 marks	- To use the noise absorbing mattering at the wall, ceiling or the cover of noise machine.
1 mark	- To provide PPE, earplugs or ear muffs for workers.

Process Indicator	The practice for lighting control improvement
4 marks	- To install the specific light adjustable for enough lighting and appropriate with work.
3 marks	1. To always, maintain the lighting equipment. 2. To always check the efficiency of lighting follow to the preventive maintenance.
2 marks	1. To increase the lighting capillary and always clean the lighting capillary at the roof and the windows. 2. To paint the working floor with the rough color instead of glossy color to minimize glare, reflex. 3. To improve the lighting condition from sunshine by installation the window, the capillary with clear mirror.
1 mark	- To adjust the lighting intensity in working are to be appropriate to the job with eye requirement for detail by adjust table the high of lighting or lamp to be lower.

Process Indicator	The practice for temperature and ventilation
4 marks	- To test the ventilation efficiency follow the plane.
3 marks	1. To install the specific ventilation system for heat and pollution protection. 2. To install the exhaust fan on the roof of production building 3. To install the exhaust fan on the wall of production line. 4. To install the insulation at roof or wall. 5. To install the insulation or partition between his material, pipe, machine, tools, for his protection.
2 marks	1. To set the air condition or electrical fan system for the enough ventilation. 2. To protect the wind from the fan blow to the worker.
1 mark	- To provide the natural ventilation with the widow of door.

Process Indicator	The practice for dust, gas and chemical
4 marks	1. To install or improve the specific ventilation system in dust, gas and chemical source. 2. To separate or cover the dust machine and some part of material in working area.
3 marks	1. There are the toxic, chemical protection with first aid information for the chemical user and the concern person. 2. There are the chemical washers such as the shower for emergency chemical working area. 3. To use the less dangerous chemical instead of the high dangerous chemical for washing such as using the soap instead of lubricants.
2 marks	- There are the labels for not eat or smoke in the chemical working area.
1 mark	- To wash hand with soap after worker with chemical should wash hand before eating or drinking specially.

Process Indicator	The practice for material handing improvement
4 marks	1. To set the responsibility and controlling the material lifting, transferring and transportation with workers. 2. To always check the equipment and lift system for material handling.
3 marks	1. To set the safety rule for material lifting transferring and transportation with worker. 2. To provide the safety training for the right in heavy material lifting is to lift the material with front body slowly without bend or rotation back and lifting the heavy material in flat with pushing or pulling the material instead of lifting.
2 marks	1. To use the pallet for place and material handling, goods and product. 2. To install the wheel at shelf of material, tray worktable and other that often need to move. 3. To use the mobile push – cart, tray, crane, material tray or the other mechanic for material handling. 4. To decrease the material handling with worker by using conveyer belt, pulley and the mechanical equipment for transferring. 5.To provide the handle for package. 6. To put the material shelf near working area to decrease material handling with working
1 mark	1. To use the rope for machine movement during transferring. 2. To put the lifting, material handling near the body. 3. To separate the heavy material in the smaller box, tray or package and lower weight.

Process Indicator	The practice for working area improvement
4 marks	1. Shift working instead of routine working. 2. To set the short break after doing continuously the same job. 3. The workers should corporate in the improvement decide for their section.
3 marks	1. To use clips, pen, tong, the other equipment for holding the material during working. 2. to adjust the high of tools or design the control push, machine to be appropriate with working , not lower higher. 3. To change the machine structure and material or tools position to avoid in ergonomics such as bending body, rotation body, sit – bend knee.
2 marks	1. To use the chain to be the standard of material place, not to high level. 2. To provide the strong shelf for tools, raw material, product and part storage. 3. To provide the documents and tools, shelf clearly. 4. To provide the suitable high of work table to be appropriate with the high of chair for sitting. 5. To set the level of chair to be appropriate and strong the back of seat. 6. The edge of worktable or machine that close to working area have to be smooth and not sharp or the edge can touch the close or could make the wound to employee. 7.To provide the place for sitting for work requiring exactly or checking the details of part and place for standing for work requiring movement and using more power. 8. To provide the working area at least 3 a square meter / worker one person. 9. To provide the label for dangerous working area identification. 10. To attach the photos of member in family of workers in sections to remind and recognizable in safety.

Process Indicator	The practice for working area improvement
1 mark	1. To take of all unused things away from working area. 2. To keep the material which not use to the right place. 3. To keep the separated material in shelf. 4. To place the material, tools and the control equipment the often use and reach easily. 5. To provide the material basket or tray to be enough and made of the suitable material. 6. To move the unused material or benefit away from working room.

Process Indicator	The practice for working area and pathway improvement
4 marks	1. The pathway should have enough why at least 80 centimeter that appropriate with traffic and to way transferring. 2. To provide the slide not more than 5 – 8 % instead of the floor with the different high or small stair in work. 3. The pathway is higher from 1.5 meter up should have the strong barrier.
3 marks	- To paint the line for isolation between the production process and pathway.
2 marks	- To provide the smooth surface, not slide and not obstruct for material handling.
1 mark	-To provide the empty pathway for material handling.

Process Indicator	The practice for Fork lift during improvement
4 marks	1. To check the safety in fork lift using. 2. In repair have to shut down the engine and tag out 'Do not start' or 'during repairing' hang on steering – wheel every time. 3. To immediately check after unusually happened.
3 marks	1. To provide the training course fork lift driver. 2. To immediately report to supervisor when found something damage or requiring repairing.
2 marks	1. To provide the warning tag in fork lift way. 2. To install the mirror at the turning way for accident prevention.
1 mark	1. To protect the accident, the material for lifting should not higher than two meters. 2. The speed should not more than 4 kilometer / hour in factory and for outside should not more than 10 kilometer / hour. 3. To adjust the suitable seat for driver before starting. 4. To provide the Fork-lift way at least equal the size of material plus 3 foots for one way but for two way should wide more than two times of one way. 5. Before Forklift using have to least 20 centimeter from the floor and tall flat the forks to the back. 6. The light, the signal light and horn have to be in the same condition. 7. Do not drive Fork lift during wet hand or lubricant exposure. 8. During material lifting should lift the forks to be high and should not slide to the front. 9. To avoid immediately break. 10. Should not use the rope or tie sling for lifting. 11. To avoid lifting too heavy material. 12. Do not stop Fork lift in flammable area.

Process Indicator	The practice for Fork lift during improvement
1 mark(cont.)	13. Should not overdrive in the dangerous area or in clearly and area. 14. To get the tools or parts on the foot place or on the seat off before using. 15. Do not kidding during driving, 16. Should decrease speed and use the horn in the junction area or in clearly area.

Section 4th Tools, machine, electrical dangerous control

Process Indicator	The practice for tools, machine dangerous control improvement
4 marks	1. To right the practice fore tools, machine dangerous control improvement for consideration of the concern person to purchase the tools and machine. 2. To provide the preventive maintenance for machine for safety including follow up the plan. 3. To set the method and practice for tools, machine condition checking before and after working 4. To always check the fire alarm to make sure the fire alarm can use all the time. 5. To always check and maintain the equipment and repair the broken part. 6. To always the tool to avoid using the broken tools. 7. To install the safety equipment or fire alarm to stop machine during the organ of worker get into the dangerous part. 8. To install the fire alarm that can stop the machine in case of the hand of worker near the dangerous part of machine 9. To always check the fire alarm .

Process Indicator	The practice for tools, machine dangerous control improvement
3 marks	1. To set the regulation for employee dressed in the suitable suit during working with machine, should keep the hair and not wear decorations. 2. To recommend the step in using machine and attach rear working area. 3. To provide the training course for employee about safety working with machine, the basic of machine repairing and machine maintenance.
2 marks	1. The machine on cover for the operator get into the machine have to have the strong mechanic, not loose and the cover come out by itself. 2. To have the barrier or the line of danger in machine area. 3. To paint the line for pathway and the machine area to be clearly. 4. To provide the safeguard of conveyer, rotation of machine. 5. Choose of the tag at equipment, gear, chain to show the machine is working. 6. To provide the machine pump with foot using and have the press for putting foot and the cover to protect pushing without willing. 7. To set the control system in case of machine is working without willing such as two pushes in the same time. 8. To stop machine during repairing or improvement and should have the tag for repairing machine to protect the danger between repairing or cleaning machine. 9. To attach the identification arrow at the pipes for direction, working. 10. to install the safety glass for checking machine working and have to more thick to protect some part of material get outside or broken. 11. To install the light signal and noise for identification the working machine and have to be not the same as the fire alarm.

Process Indicator	The practice for tools, machine dangerous control improvement
1 mark	1. Knives, sharps, scissors have to have the good condition. 2. Use the equipment for pushing; shovel the material get in the machine to avoid danger. 3. To improve the equipment or tools lock for decrease using hand. 4. To keep the equipment in the place with tag when not using. 5. To use the equipment hang type for the tools the often use and in the same place. 6. To provide the support for hand when using machine and requiring exactly working. 7. To choose the tool to decrease the power when using.

Process Indicator	The practice for the electrical controlling improvement
4 marks	1. To provide the preventive maintenance for the electrical system to be safe including following the plan. 2. To install the fuse and circuit breakers for workers protection during working with electrical. 3. Checking the wire and electrical equipment including document providing for checking.
3 marks	1. The electrical equipment room have to have the door and lock for the other person not entry. 2. To design the specific electrical equipment for using or installation in the hazardous area. 3. To have the cover for control panel, if not must have a fence around the area.

Process Indicator	The practice for the electrical controlling improvement
2 marks	1. To set the lay out for electrical system, wire of electrical equipment must be in the good condition. 2. To look after the ground of electrical equipment and insulator must not connect for temporary but must connect for permanent. 3. Some part of control panel with metal, iron structure or the metal concern that there are possibly current, must connect the ground.
1 mark	1. There are completely ground connections of electrical machine and equipment or setting of leak electrical protection. 2.To always check and maintain the electrical equipment and tools. 3.The plugs of the electrical tools must be suitable for working and place.

Section 5th Personal Protective Equipment

process Indication	The practice for personal protective environment management
4 marks	1. To control and look after the workers in PPE wearing to be appropriate for working types and be completely. 2. To assess the present PPE efficiency from check up of workers if it is not effective should change the new one
3 marks	1. To always check PPE when found the broken PPE should not repair by yourself and should send it to the concern unit. 2. To train the PPE using, wearing, cleaning and maintenance for workers.

process Indication	The practice for personal protective environment management
2 marks	1. To provide the suitable PPE storage. 2. To attach the label or sign to show clearly in the working area requiring PPE wearing. 3.The workers should cooperate in identification the PPE type or characteristic requirement. 4. To choose the PPE that be fit for wearing and easy maintenance if necessary for PPE using.
1 mark	- To provide the suitable PPE and make sure for the hazardous prevention.

Section 6th Welfare Health Providing

process Indication	The practices for health and treatment improvement
4 marks	1. To set the first aid room and basic first aid equipment. 2. To provide the medical officers or the first aid and rescue trainees. 3. To provide the emergency car with basic first aid equipment stand by in workplace for referring to hospital. 4. To revive the employee health after getting occupational disease and check the completion of workers before working. 5. To check the concern training course of health officer and studying in Health and Safety or not 6.To always have a meeting between the executive and health officer for Health Project Evaluation.

process Indication	The practices for health and treatment improvement
3 marks	1. To check up the workers before working especially occupational disease protection. 2. To check up for general checking during working or yearly checking or especially occupational disease protection. 3. To report the checks up for employee acknowledge. 4. To provide the personal report or company report for check up. 5. There are the General Health or Occupational Disease Trainings. 6. There are Occupational Health and Safety and Working Environment Training for workers before working.
2 marks	1. Health Officer reports the suitable method for employee health to the executive. 2. First Aid and Rescue Training providing for workers.
1 mark	1. To provide the sport equipment for workers. 2. To provide the facilities for relax and separate form the hazardous area. 3. To provide the Health and Mind Promotion Activities such as yearly sport game, exercise before working and Karaoke contest.

Process Indicator	The practice for personal effect room, toilet, dining room and disposal improvement.
4 marks	1. To always dispose the garbage, waste or unused material with hygiene. 2. To separate the hazardous waste and provide the suitable container with classification.
3 marks	1. In case of working together should have the personal effect storage such as rice box, clothes, umbrella, powder, comb or others. 2. To provide the cold and clean drinking water in workplace. 3. To provide the drinking water container with clean cover. 4. To provide the drinking water with mineral salt in heat working area. 5. To provide glasses and be enough for workers or always clean them.
2 marks	1. To always clean the toilet floor to protect sliding. 2. To provide the other equipment such as soap and tissue. 3. To provide the drinking room with hygiene and separate from working area. 4. To provide the suitable, strong table and chair for eating-sitting. 5. To always clean the dining room.
1 mark	1. To provide the clean bathroom and toilet and enough for requirement. 2. In case of working both male and female should separate the toilet.

APPENDIX G

Working environmental testing matrix

Table G1 Oven section of benchmarking factory (x 1.02)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	34	34.68	25.50	26.01	75	
2.	6	6.12	6	6.12	100	
3.	18	8.16	13	13.26	72.22	
4.	20	20.40	11.50	11.73	57.5*	
5.	110	10.20	5.50	5.61	55*	
6.	20	20.40	5	5.10	25*	
total	98	100	66.57	68		80

Table G2 Sweet section of benchmarking factory (x 0.84)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	46	38.64	33.63	28.25	36.96*	
2.	6	5.04	5	4.20	83.33	
3.	20	16.80	10.8	9.07	54*	
4.	17	14.28	16	13.44	94.12	
5.	10	8.40	10	8.40	100	
6.	20	16.8	6.87	5.77	34.35*	
total	119	100	82.30	69		40

Table G3 Bean Choosing section of benchmarking factory (x 1.099)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	29	31.87	18.78	20.64	64.75*	
2.	6	6.59	4.93	5.09	82.22	
3.	7	7.69	5.8	6.37	82.86	
4.	19	20.88	17.02	18.70	89.58	
5.	10	10.99	9.47	10.41	94.7	
6.	20	21.98	9.57	10.52	59.81*	
total	91	100	65.57	72		0

Table G4 QC. section of benchmarking factory (x 1.198)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	23	27.55	18.20	21.80	79.13	
2.	6	7.19	4.2	5.03	70	
3.	11	13.18	7.80	9.34	71	
4.	13.5	16.17	9.70	11.62	72	
5.	10	11.97	7.30	8.75	73	
6.	20	23.96	9.80	11.74	49*	
total	83.50	100	57	68		0

Table G5 Stock section of benchmarking factory (x 1.063)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	28	29.76	8	8.50	28.57*	
2.	6	6.38	5	5.32	83.33	
3.	20	21.26	9	9.57	45*	
4.	10	10.63	10	10.63	100	
5.	10	10.63	0	0	0*	
6.	20	21.26	11.50	12.22	57.5*	
Total	94	100	43.5	46		33.33

Table G6 Bean Loading section of benchmarking factory (x 0.948)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	42	39.82	20.41	19.35	48.59*	
2.	6	5.69	4.75	4.50	79.16	
3.	15	14.22	9.63	9.13	64.2*	
4.	12.5	11.85	11.31	10.72	90.48	
5.	10	9.48	9.63	9.13	96.3	
6.	20	18.96	11.84	11.22	59.2*	
Total	105.5	100	67.57	64		25

Table G7 Pack Junko section of benchmarking factory (x 0.85)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	37	31.45	19.85	16.87	53.64*	
2.	10	8.5	9.80	8.33	98	
3.	20	17	15.45	13.13	77.25*	
4.	20	17	17.2	14.62	86	
5.	10	8.5	8.6	7.31	86	
6.	20	17	8.75	7.44	43.75*	
total	117	100	79.65	68		10

Table G8 Maintenance section of benchmarking factory (x0.926)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	36	33.34	16	14.81	44.44*	
2.	6	5.56	5	4.63	62.5*	
3.	16	14.82	8	7.40	50*	
4.	20	18.52	11.75	10.88	58.75*	
5.	10	9.26	4.25	3.94	42.5*	
6.	20	18.52	12.63	11.70	63.5*	
Total	108	100	57.63	53		25

Table G9 Working environmental testing matrix of benchmarking factory.

Process	Testing matrix								
	Section 1st			Section 2nd			Section 3rd		
	1	2	3	1	2	3	1	2	3
1. Oven(x1.02)	25.50	26.01	75	6	6.12	100	13	13.26	72.22
2. Sweet(x 0.84)	33.63	28.25	36.96*	5	4.2	83.33	10.8	9.07	54*
3. Bean Choosing (x1.099)	18.78	20.64	64.75*	4.93	5.09	82.22	5.8	6.37	82.86
4. QC.(x 1.198)	18.2	21.8	79.13	4.2	5.03	70	7.8	9.34	71
5. Stock (x 1.063)	8	8.5	28.57*	5	5.32	83.33	9	9.57	45*
6. Bean Loading (x 0.948)	20.41	19.35	48.59*	4.75	4.5	79.16	9.63	9.13	64.2*
7. Pack Junko (x 0.85)	19.85	16.87	53.64*	9.8	8.33	98	15.45	13.13	77.25*
8. Maintenance (x 0.926)	16	14.81	44.44*	5	4.63	62.5*	8	7.4	50*

Table G9 Working environmental testing matrix of benchmarking factory (continued)

Process	Testing matrix								
	Section 4th			Section 5th			Section 6th		
	1	2	3	1	2	3	1	2	3
1. Oven(x1.02)	11.50	11.73	57.5*	5.50	5.61	55*	5	5.10	25*
2. Sweet(x 0.84)	16	13.44	94.12	10	8.4	100	6.87	5.77	34.35*
3. Bean Choosing (x1.099)	17.02	18.7	89.58	9.47	10.41	94.7	9.57	10.52	59.81*
4. QC.(x 1.198)	9.7	11.62	72	7.3	8.75	73	9.8	11.74	49*
5. Stock (x 1.063)	10	10.63	100	0	0	0*	11.5	12.22	57.5*
6. Bean Loading (x 0.948)	11.31	10.72	90.48	9.63	9.13	96.3	11.84	11.22	59.2*
7. Pack Junko (x 0.85)	17.2	14.62	86	8.6	7.31	86	8.75	7.44	43.75*
8. Maintenance (x 0.926)	11.75	10.88	58.75*	4.25	3.94	42.5*	12.63	11.7	63.5*

Remark: 1 = Score, 2 = Score weights, 3 = Percentage

Table G10 PVC Injection section of self evaluation factory (x 0.847)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	48	40.66	32.56	27.58	67.83*	
2.	6	5.08	5	4.24	83.33	
3.	15	12.71	12.07	10.22	80.47	
4.	19	16.09	15.93	13.49	83.84	
5.	10	8.47	7.11	6.02	71.10	
6.	20	16.94	16.93	14.34	84.65	
total	118	100	89.60	75.89		0

Table G11 Sheet Cutting section of self evaluation factory (x1.081)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	22	23.78	10	10.81	45.45*	
2.	6	6.49	3	3.24	50*	
3.	16	17.30	11	11.89	68.75*	
4.	18.50	20	16.50	17.84	89.19	
5.	10	10.81	9	9.73	90	
6.	20	21.62	20	21.62	100	
Total	92.50	100	69.50	75.13		0

Table G12 PVC Tube section of self evaluation factory (x 1.099)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	19	20.88	10.21	11.22	53.74*	
2.	6	6.59	4	4.40	66.67*	
3.	17	18.68	13.11	14.41	77.12	
4.	19	20.88	15.21	16.72	80.05	
5.	10	10.99	6.07	6.67	60.70*	
6.	20	21.98	18.71	20.56	93.55	
Total	91	100	67.31	73.98		0

Table G13 Grain section of self evaluation factory (x 1.047)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	25	26.18	18.64	19.52	74.56	
2.	6	6.28	4.29	4.49	69*	
3.	16	16.75	12.14	12.71	75.88	
4.	18.50	19.37	18.36	19.22	99.24	
5.	10	10.47	9.71	10.17	97.10	
6.	20	20.94	19.64	20.56	98.20	
Total	95.50	100	82.78	86.67		28.57

Table G14 Package section of self evaluation factory (x 1.130)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	19	21.47	15.09	17.05	79.42	
2.	6	6.78	4.73	5.34	78.83	
3.	15	16.95	9.55	10.79	63.67*	
4.	18.50	20.91	17.86	20.18	96.54	
5.	10	11.30	9.64	10.89	96.40	
6.	20	22.60	19.95	22.54	99.75	
Total	88.50	100	76.82	86.79		9.09

Table G15 Powder Preparation section of self evaluation factory (x 1.026)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	25	25.65	8.79	9.02	35.16*	
2.	6	6.16	5.43	5.57	90.50	
3.	18	18.47	15.86	16.27	88.11*	
4.	18.50	18.981	17.71	18.17	95.73	
5.	10	10.26	9.86	10.12	98.60	
6.	20	20.52	19.29	19.79	96.45	
Total	97.50	100	85.73	87.96		0

Table G16 Case Mill section of self evaluation factory (x1)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	23	23	11.50	11.50	50	
2.	10	10	8.31	8.31	83.10	
3.	18	18	11.81	11.81	65.61*	
4.	19	19	17.88	17.88	94.11	
5.	10	10	8.92	8.92	89.20	
6.	20	20	17.65	17.65	88.25	
Total	100	100	76.07	76.07		7.69

Table G17 Packing section of self evaluation factory (x 0.909)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	33	30	22.76	20.69	68.97*	
2.	10	9.09	8.24	7.49	82.40	
3.	18	16.36	12.94	11.76	71.89	
4.	19	17.27	17.94	16.31	94.42	
5.	10	9.09	9.12	8.29	91.20	
6.	20	18.18	19.03	17.30	95.15	
Total	110	100	90.03	81.84		0

Table G18 Pack Chocolate section of self evaluation factory (x 1.242)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	8	9.94	5.8	7.2	72.5	
2.	6	7.45	4.4	5.46	73.33	
3.	18	22.36	15.2	18.88	84.44	
4.	18.5	22.98	16.6	20.62	89.73	
5.	10	12.42	7.8	9.69	78	
6.	20	24.84	19.15	23.78	95.75	
Total	80.5	100	68.95	85.63		0

Table G19 Mix Chocolate section of self evaluation factory (x 0.935)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	34	31.79	17.67	16.52	51.97*	
2.	6	5.61	4.67	4.37	77.83	
3.	18	16.83	14.67	13.32	81.50	
4.	19	17.77	18.33	17.14	96.47	
5.	10	9.35	10	9.35	100	
6.	20	18.7	20	18.7	100	
Total	107	100	85.34	79.80		0

Table G20 Coating section of self evaluation factory (x 1.031)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	23	23.71	16.83	17.35	73.17	
2.	6	6.19	4	4.12	66.67*	
3.	18	18.56	12.67	13.06	70.39	
4.	20	20.62	20	20.62	100	
5.	10	10.31	9.5	9.79	95	
6.	20	20.62	19.71	19.76	95.85	
Total	97	100	82.17	84.70		50

Table G21 Substance Preparation section of self evaluation factory (x 0.98)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	28	27.44	18.50	18.13	66.07*	
2.	6	5.88	4.86	4.76	81	
3.	18	17.64	14.79	14.49	82.17	
4.	20	19.60	18.71	18.34	93.55	
5.	10	9.80	9.92	9.72	99.20	
6.	20	19.60	19.86	19.46	99.30	
Total	102	100	86.64	84.90		0

Table G22 Technician section of self evaluation factory (x 0.813)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	50	40.65	27.4	22.28	54.8	
2.	6	4.88	5.88	4.72	96.67	
3.	17	13.82	14.7	11.95	86.47	
4.	20	16.26	18.5	15.04	92.50	
5.	10	8.13	9.6	7.8	96	
6.	20	16.26	19.1	15.53	95.50	
Total	123	100	95.1	77.32		0

Table G23 Screen section of self evaluation factory (x 1.299)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	24	31.18	21	27.28	87.5	
2.	6	7.79	6	7.79	100	
3.	16	20.78	14	18.19	87.50	
4.	1	1.30	1	1.30	100	
5.	10	12.99	10	12.99	100	
6.	20	25.98	19.50	25.33	97.50	
Total	77	100	71.5	92.88		0

Table G24 Cover Cut section of self evaluation factory (x 1.471)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	15	22.07	6	8.83	40*	
2.	6	8.83	4	5.88	66.67*	
3.	16	23.54	8.5	12.50	53.13*	
4.	1	1.47	1	1.47	100	
5.	10	14.71	4.5	6.62	45*	
6.	20	29.42	18	26.48	90	
Total	68	100	42	61.78		100

Table G25 Cover Suck PVC section of self evaluation factory (x 0.971)

Item	Total score	Score weight	Scores	Result of score weights	Working environment (%)	Accident (%)
1.	24	25	13.25	13.81	50.00*	
2.	6	6.25	6	6.25	100	
3.	17	17.71	13.50	14.07	79.41	
4.	19	19.80	14.50	15.11	76.32	
5.	10	10.42	3.25	3.39	32.50*	
6.	20	20.84	18.25	19.02	91.25	
Total	96	100	69.75	71.65		0

Table G26 Working environmental testing matrix of self evaluation factory.

Process	Testing matrix								
	Section 1st			Section 2nd			Section 3rd		
	1	2	3	1	2	3	1	2	3
1. PVC Injection (x0.847)	32.56	27.58	67.83*	5	4.24	83.33	12.07	10.22	80.47
2. Sheet Cutter (x1.0 81)	10	10.81	45.45*	3	3.24	50*	11	11.89	68.75*
3. PVC Tube (x1.099)	10.21	11.22	53.74*	4	4.4	66.67*	13.11	14.41	77.12
4. Grain (x 1.047)	18.64	19.52	74.56	4.29	4.49	69*	12.14	12.71	75.88
5. Package (x1.130)	15.09	17.05	79.42	4.73	5.34	78.83	9.55	10.79	63.67*
6. Powder Preparation (x 1.026)	8.79	9.02	35.16*	5.43	5.57	90.5	15.86	16.27	88.11*
7. Case Mill (x 1.000)	11.5	11.5	50*	8.31	8.31	83.1	11.81	11.81	65.61*
8. Packing (x 0.909)	22.76	20.69	68.97*	8.24	7.49	82.4	12.94	11.76	71.89
9.1 Pack Chocolate (x 1.242)	5.8	7.2	72.5	4.4	5.46	73.33	15.2	18.88	84.44
9.2 Mix Chocolate (x 0.935)	17.67	16.52	51.97*	4.67	4.37	77.83	14.67	13.32	81.5
10. Coating (x 1.031)	16.83	17.35	73.17	4	4.12	66.67*	12.67	13.06	70.39
11. Substance Preparation (x 0.980)	18.5	18.13	66.07*	4.86	4.76	81	14.79	14.49	82.17
12. Technician (x0.813)	27.4	22.28	54.8	5.88	4.72	96.67	14.7	11.95	86.47
13. Screen (x1.099)	21	27.28	87.5	6	7.79	100	14	18.19	87.5
14. Cover Cut (x1.471)	6	8.83	40*	4	5.88	66.67*	8.5	12.5	53.13*
15. Cover Suck PVC(x0.971)	13.25	13.81	50.00*	6	6.25	100	13.5	14.07	79.41

Table G26 Working environmental testing matrix of self evaluation factory (continued)

Process	Testing matrix								
	Section 4th			Section 5th			Section 6th		
	1	2	3	1	2	3	1	2	3
1. PVC Injection (x0.847)	15.93	13.49	83.84	7.11	6.02	71.1	16.93	14.34	84.65
2. Sheet Cutter (x1.0 81)	16.5	17.84	89.19	9	9.73	90	20	21.62	100
3. PVC Tube (x1.099)	15.21	16.72	80.05	6.07	6.67	60.70*	18.71	20.56	93.55
4. Grain (x 1.047)	18.36	19.22	99.24	9.71	10.17	97.1	19.64	20.56	98.2
5. Package (x1.130)	17.86	20.18	96.54	9.64	10.89	96.4	19.95	22.54	99.75
6. Powder Preparation (x 1.026)	17.71	18.17	95.73	9.86	10.12	98.6	19.29	19.79	96.45
7. Case Mill (x 1.000)	17.88	17.88	94.11	8.92	8.92	89.2	17.65	17.65	88.25
8. Packing (x 0.909)	17.94	16.31	94.42	9.12	8.29	91.2	19.03	17.3	95.15
9.1 Pack Chocolate (x 1.242)	16.6	20.62	89.73	7.8	9.69	78	19.15	23.78	95.75
9.2 Mix Chocolate (x 0.935)	18.33	17.14	96.47	10	9.35	100	20	18.7	100
10. Coating (x 1.031)	20	20.62	100	9.5	9.79	95	19.71	19.76	95.85
11. Substance Preparation (x 0.980)	18.71	18.34	93.55	9.92	9.72	99.2	19.86	19.46	99.3
12. Technician (x0.813)	18.5	15.04	92.5	9.6	7.8	96	19.1	15.53	95.5
13. Screen (x1.099)	1	1.3	100	10	12.99	100	19.5	25.33	97.5
14. Cover Cut (x1.471)	1	1.47	100	4.5	6.62	45*	18	26.48	90
15. Cover Suck PVC(x0.971)	14.5	15.11	76.32	3.25	3.39	32.50*	18.25	19.02	91.25

Remark: 1 = Score, 2 = Score weights, 3 = Percentage

APPENDIX H

FIGURES OF ACTIVITIES

H1 Benchmarking factory

Figure H1 Step for filling questionnaire from the production workers in each section.

Figure H2 The trainer described the benchmarking method knowledge

Figure H3 The researcher explained the process of criteria testing matrix that is the tool for benchmarking.

Figure H4 Benchmarking team visited factory on safety at Siam Packaging Co., Ltd.

Figure H5 To hold the meeting for the guideline of working environment improvement regulations.

E2 Self evaluation factory

Figure H6 The researcher is a trainer and gives the knowledge for self and working environment evaluation.

Figure H7 The researcher evaluated the scores of six sections of improvement for working environment.

Figure H8 Members in self-evaluation team hold the meeting to conclude the guideline for working environment improvement regulations.

Figure H9 Safety officer concluded the information of working environment improvement regulations.

BIOGRAPHY

NAME	Ms. Supaporn Suwanpitak
DATE OF BIRTH	March 6, 1977
PLACE OF BIRTH	Chonburi, Thailand
INSTITUTIONS ATTENDED	Burapha University, 1994-1998 Bachelor of Science Program In Environmental Health Mahidol University, 2000-2005 Master of Science (Industrial Hygiene and Safety)
ADDRESS	28/2 Moo 7, T.Chagbog, A.Bankai, Rayong