AN APPLICATION OF BEHAVIOR BASED SAFETY (BBS) PROCESS IN DEVELOPING SAFE BEHAVIOR FOR FORKLIFT DRIVER A CASE STUDY IN CP-MEIJI CO., LTD

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ABSTRACT

The aim of this study was to apply a behavior based safety process (BBS) to improve the behavior of forklift's drivers in the cold storage warehouse of the CP-Meiji Co., LTD. and to reduce forklift accidents and the number of near miss report from risk behaviors in forklift's drivers. Sixty male forklift's drivers participated in this program. The majority of the forklift's drivers had demonstrated educational levels from junior high school (30.00 %) and high school (21.67%). Most of them (41.67%) were older than 35 years old. The majority (50%) had work experience of more than 5 years. An inventory of risk behaviors was complied with forklift accident records of the year 2011-2013. The BBS was implemented for 3 months. This study focused on 10 safe target behaviors initiated by drivers. Supervisors were trained to observe the safe target behaviors and immediately gave recommendations or constructive advice as appropriate to the forklift drivers.

It found that at the end of BBS process, all safe target behaviors were achieved. The forklift accidents frequency rate was reduced from 7.45 cases per 20,000 forklift's driver working hours to 2.51 cases per 20,000 forklift's driver working hours and the number of near miss reports from the risk behaviors of forklift's drivers were reduced from 4 cases to 2 cases (50 %)

This study indicates that BBS has a great effect on accident prevention and BBS is a promising tool for safe working behavior development.

KEY WORDS: SAFE BEHAVIOR / RISK BEHAVIOR/BEHAVIOR BASED SAFETY (BBS)/ SAFETY AWARENESS / FORKLIFT

89 pages

การประยุกต์ใช้กระบวนการปรับเปลี่ยนพฤติกรรมเพื่อความปลอดภัย (Behavior Based Safety (BBS)) ในการพัฒนาพฤติกรรมการขับรถโฟล์คลิฟท์อย่างปลอดภัย กรณีศึกษาในบริษัท ซีพี – เมจิ จำกัด

AN APPLICATION OF BEHAVIOR BASED SAFETY (BBS) PROCESS IN DEVELOPING SAFE BEHAVIOR FOR FORKLIFT DRIVER A CASE STUDY IN CP-MEIJI CO.,LTD

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บทคัดย่อ

การศึกษานี้มีวัตถุประสงค์เพื่อพัฒนาพฤติกรรมที่ปลอดภัยของพนักงานขับรถโฟล์คลิฟท์ และลดอุบัติเหตุจากพฤติกรรมที่ไม่ปลอดภัยในการใช้รถโฟล์คลิฟท์ โดยการประยุกต์ใช้กระบวนการปรับเปลี่ยนพฤติกรรมเพื่อความปลอดภัย (Behavior Based Safety (BBS) ของพนักงานขับรถโฟล์คลิฟท์ชายจำนวน 60 คนในหน่วยงานคลังสินค้าห้องเย็นของบริษัท ซีพี – เมจิ จำกัด โดยผู้เข้าร่วมโครงการจบการศึกษาในระดับมัธยมศึกษาตอนต้นร้อยละ 30.00 และมัธยมศึกษาตอนปลายร้อยละ 21.67 พนักงานขับรถโฟล์คลิฟท์มีอายุมากกว่า 35 ปี ร้อยละ 41.67 และมีประสบการณ์การทำงานมากกว่า 5 ปี ร้อยละ 50.00 วิธีการศึกษาเริ่มจากการชี้บ่งพฤติกรรมเสี่ยงจากการทบทวนรายงานการสอบสวนอุบัติเหตุจากการใช้รถโฟล์คลิฟท์ในปี 2554 – 2556 และทำการระดมสมองของพนักงานขับรถโฟล์คลิฟท์เพื่อคัดเลือกพฤติกรรมความปลอดภัยเป้าหมายจำนวน 10 พฤติกรรม โดยหัวหน้างานคลังสินค้าห้องเย็นทำหน้าที่สังเกตพฤติกรรมเป้าหมาย และให้คำแนะนำเชิงบวกเมื่อพบพฤติกรรมเสี่ยงจากการใช้รถโฟล์คลิฟท์ทุกสัปดาห์และทุกกะการทำงานเป็นระยะเวลา 3 เดือน

ผลการศึกษาพบว่าพนักงานมีการปฏิบัติตามพฤติกรรมความปลอดภัยได้ครบถ้วน อัตราการเกิดอุบัติเหตุจากการใช้รถโฟล์คลิฟท์ลดลงจาก 7.45 รายต่อ 20,000 ชั่วโมงการทำงานจากการใช้รถโฟล์คลิฟท์ เป็น 2.51 รายต่อ 20,000 ชั่วโมงการทำงานจากการใช้รถโฟล์คลิฟท์ และจำนวนการรายงานเหตุการณ์เกือบเกิดอุบัติเหตุ (Near miss) จากพฤติกรรมเสี่ยงในการใช้รถโฟล์คลิฟท์ลดลงจาก 4 รายเป็น 2 ราย คิดเป็นร้อยละ 50

การศึกษาครั้งนี้สรุปได้ว่ากระบวนการปรับเปลี่ยนพฤติกรรมเพื่อความปลอดภัย (BBS) สามารถพัฒนาพฤติกรรมความปลอดภัยและลดอุบัติเหตุจากการใช้รถโฟล์คลิฟท์ได้ และสามารถลดจำนวนรายงานเหตุการณ์เกือบเกิดอุบัติเหตุ (Near miss) จากพฤติกรรมเสี่ยงการใช้รถโฟล์คลิฟท์ได้อีกด้วย

89 หน้า

CONTENTS

CONTENTS (cont.)

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

Abbreviations or symbol	Term
BBS	Behavior Based Safety
OHSAS	Occupational Health and Safety Assessment Series is an international occupational health and safety management system by British
ISO	International Organization of Standardization
TIS	Thai Industrial Standards
IFR	Injury Frequency Rate
ISR	Injury Severity Rate
WI	Work Instruction is a working step
TIS	Thai Industrial Standards
OJT	On the job training is a form of training taking place in a normal working situation by professional, individually guide by focusing on practical training
KYT	Kiken Yoshi Training is a safety activity to analysis the risk in workplace
CBI	The critical behavior inventory is a form to observe safe behavior and risk behavior in workplace
LPG	Liquid Petroleum Gas
USA	United States of American
A.D.	Anno Domini
OHS	Occupational Health and Safety
JSA	Job Safety Analysis
UK	United Kingdom

LIST OF ABBREVIATIONS (cont.)

Abbreviations or symbol	Term
PPE	Personal Protective Equipment
ABC	Activate-Behavior-Consequence
	Activate to give guideline or instruction to operation in safe behavior
	Behavior to showed the behavior after receive activate
	Consequences to practice the safe behavior
SORA	Specific On time Real Appropriate is the basic rule for the activate safe behavior
SI	Safety Index
SMEs	Small Medium Enterprises
OBBSIP	Outcome and Behavior Based Safety Incentive Program
WACC	The last worker accident compensation claim
%	Percentage

CHAPTER I
INTRODUCTION

1.1 Background and Significant

CP-Meiji co., Ltd. established since February 1st, 1989 which the joint venture of Charoen Pokphand group and Meiji milk products co., Ltd. of Japan. It is situated at 2/9 Moo 4 paholyothin road Tumbon Nong nak , Ampur Nong khae , Saraburi province, began operation on June 1 ,1990. CP-Meiji receives raw milk about 300 tons/day from 26 Thai cooperatives to produce fresh milk, drinking yoghurt, soft yoghurt and set yogurt. CP-Meiji 's products are sold both at domestic and overseas such as Singapore , Hong Kong .

The Safety and Environmental Management has also been developed such that at present CP-Meiji receives many certification. These include the environmental management system (ISO 14001) in 2008 . Certified occupational health and safety management systems (OHSAS 18001/TIS 18001) and participated in the establishment of Social Affairs and Employment from Ministry of labor since 2007 to present. However, the results from the accidents are likely to occur continuously every year. This accident statistics is shown in Table 1-1. To shows that all kinds of accidents have occurred every year and increasing the number of take-off working days. Trend of IFR are increased every year but ISR decreased in 2013.

Table 1-1 Statistic shown number and percentage of accident, Injury Frequency Rate (IFR) and Injury Severity Rate (ISR) of accident at CP-Meiji Co., Ltd. from 2011- 2013

Year	Serious accident (Cases)		Minor accidents (Cases)	Property damage accident (Cases)	Take off working (days)	IFR	ISR
	> 3 days	1-3 days					
2011	6 (16.67%)	8 (22.22%)	7 (19.44%)	15 (41.67%)	138	3.52	13.48
2012	11 (16.18%)	4 (5.88%)	30 (41.12%)	23 (33.82%)	186	6.15	16.83
2013	6 (7.50%)	5 (6.25%)	13 (16.25%)	56 (70.00%)	76	10.59	6.36

Remark: IFR , ISR to calculation accident cases per 200,000 working- hours

Data from Table 1-2 shown that the accident from forklift from 2011-2013 is highest types of accidents and increased in every year was 12 (33.33 %) , 22(32.35%) and 47 (65.28%) cases respectively.

Table 1-2 Statistic shown type of accident and percentage the number of accidents at CP-Meiji Co., Ltd. from 2011- 2013

Type of accident	Number (Cases) and percentage of accidents		
	2011	**2012**	**2013**
Forklift	12 (33.33%)	22 (32.35%)	47 (65.28%)
Against or crash	3 (8.33 %)	4 (5.89%)	5 (6.94%)
Nipping by machine	1 (2.78 %)	1 (1.47%)	4 (5.56%)
Contact steam or hot water	1 (2.78 %)	8 (11.76%)	4 (5.56%)
Object to falling	2 (5.56 %)	4 (5.89%)	2 (2.78%)
Contact chemical	2 (5.56 %)	5 (7.35%)	3 (4.16%)
Lifting by people	4 (11.11%)	0 (0.00%)	0 (0.00%)
Falling from height level	1 (2.78 %)	1 (1.47%)	0 (0.00%)

Table 1-2 Statistic shown type of accident and percentage the number of accidents at CP-Meiji Co., Ltd. from 2011- 2013(cont.)

Type of accident	Number (Cases) and percentage of accidents		
	2011	**2012**	**2013**
Hand lift or Cart	5 (13.88%)	5 (7.35%)	0 (0.00%)
Cutting by sharp	4 (11.11%)	8 (11.76%)	3 (4.16%)
Other	1 (2.78 %)	10 (14.71%)	4 (5.56%)
Total	**36**	**68**	**72**

The Injury Frequency Rate (IFR) of forklift accident from 2011-2013 has increased in every year was 2.52, 4.07 and 7.77 per 20,000 forklift working hours respectively is shown in Table 1-3.

Table 1-3 Statistic shown Injury Frequency Rate of forklift accident (IFR) at CP-Meiji Co., Ltd. from 2011- 2013

Item	year		
	2011	**2012**	**2013**
Injury Frequency Rate of forklift accident (IFR)	2.52	4.07	7.77

The forklift accident to occurred at the cold storage warehouse, package ware house ,raw material warehouse and crate stock and return warehouse and the highest of forklift accident to occurred at cold storage warehouse was 11 , 20 and 42 cases is shown in Table 1-4.

Table 1-4 Statistic shown the number of forklift accident in department at CP-Meiji Co., Ltd from 2011- 2013

Department	**Number of forklift accident (Cases)**		
	2011	**2012**	**2013**
Cold storage warehouse	11	20	42
Package warehouse	0	1	1
Raw material warehouse	1	1	0
Crate stock and return	0	0	4
Total	**12**	**22**	**47**

The causes of forklift accident to identified has two types which unsafe action and unsafe condition is shown in Table 1-5.

Table 1-5 Statistic shown causes of forklift accident in Cold storage warehouse department at CP-Meiji Co., Ltd from 2011- 2013

Causes of forklift accidents	**Number of forklift accidents (Cases)**			
	2011	**2012**	**2013**	**Total**
Unsafe Action				
- Driving faster than as allowed	1	5	10	16
- Not checking the working area and product	3	3	6	12
- The edge of fork to lift pallet's product	2	1	7	10
- Not put the fork on platform	0	3	5	8
- Not reduce step of fork or adjust the edge of fork	1	4	1	6
- Missing control handle				
- Forwarding when high product on pallet	0	0	5	5
- Body out of forklift	2	3	0	5
- Driving overtake	1	0	1	2
- Driving to limited area	0	0	1	1
- Using fork to push other pallet	0	0	1	1
- Using break immediately	0	0	1	1
- Working no duty	0	0	1	1
- Fatigued	0	0	1	1
	1	0	2	3
Total (Cases)	**11**	**19**	**42**	**72**
Unsafe Condition				
- Working area	0	1	4	5
- Machine , equipment	1	2	1	4
Total (Cases)	**1**	**3**	**5**	**9**

From the data in Table 1-5 to found that forklift accident has causes from unsafe action 88% (72 cases) and unsafe conditions 12% (9 cases). The caused from unsafe action from failure to follow work instruction (WI) 73% , which is based on the H.W. Heinrich theory[1], who said that the main causes of the accidents are caused by unsafe action (Unsafe act) about 85% of all accidents and unsafe condition is a secondary reason about 15% of all accidents.

From the all data to make sure that the forklift accident occurred at cold storage warehouse mainly caused from unsafe action or unsafe behavior, then the target of safety not achieve with Safety, Occupational health and Environment policy.

Since 2012 the company to set Safety, Occupational health and Environment management system to reduce forklift accident. To set the reduce forklift accident's committee from

1. The working area to use forklift : cold storage , package , raw material and crate stock and return department
2. Engineer department
3. Safety , Occupational Health and Environmental department
4. Human resources department
5. Specialist from Charoen Pokphand Group

The reduce forklift accident's committee to responsibility for review the safety rules for using forklift and inform to forklift's driver. Follow the safety rules for using forklift by supervisor and manager of department. Set the safety for forklift driver course to training forklift's driver and supervisor to on the job training (OJT) to all forklift's driver to know about step to driving the forklift or work instruction. When forklift accident or near miss occurred to make one point KYT and Safety Talk and near miss report and investigate the forklift accident. The supervisor to audit in working area for Safety , Occupational Health and Environmental .To risk identification and assessment in workplace and then make Occupational Health and Safety Management Systems to reduce risk with TIS 18001 or OHSAS 18001. Other that to improvement the condition in working area such as installation for flow rack to put the pallet overlap 2 layer , set the traffic one way for forklift , expansion the working area and repair the damaged floor . However the forklift accident from unsafe action causes in cold storage warehouse is trend to increase continuously.

The researcher interested to study the Safety, Occupational Health and Environmental Management System Model to focus human factor because of the most forklift accident to occur from risk behavior of forklift's driver. To using Behavior Based Safety (BBS) process to change risk behavior of forklift's driver in cold storage warehouse to safe behavior for reduce forklift accident or near miss in CP- Meiji Co., Ltd.

1.2 Objectives

1. To change risk behavior of forklift's driver in cold storage warehouse to safe behavior.
2. To reduce forklift accident from risk behavior of forklift's drivers in cold storage warehouse.
3. To reduce near miss from risk behavior of forklift's drivers in cold storage warehouse.
4. To improvement Behavior Based Safety (BBS) manual to training forklift's drivers in cold storage warehouse.

1.3 Hypothesis

The ratio of forklift accident of forklift's driver in cold storage warehouse at CP-Meiji Co., Ltd from unsafe risk behavior or unsafe action before and after change behavior by using Behavior Based Safety (BBS) process to reduce significant.

1.4 Variables

1. Dependent Variables: Risk behavior of forklift's driver from accident in cold storage warehouse.
2. Independent Variables :
    2.1 Personal factors (Age , Education level , working experience)
    2.2 Process to change Behavior Based Safety (BBS) to increase safe behavior by

- Training Behavior Based Safety (BBS) process to forklift driver and supervisor
- Selected risk behavior or unsafe behavior form forklift accident
- Observe the forklift's driver when working and positive recommend when found risk behavior
- Motivation the safe behavior of forklift's driver

1.5 Scope of study

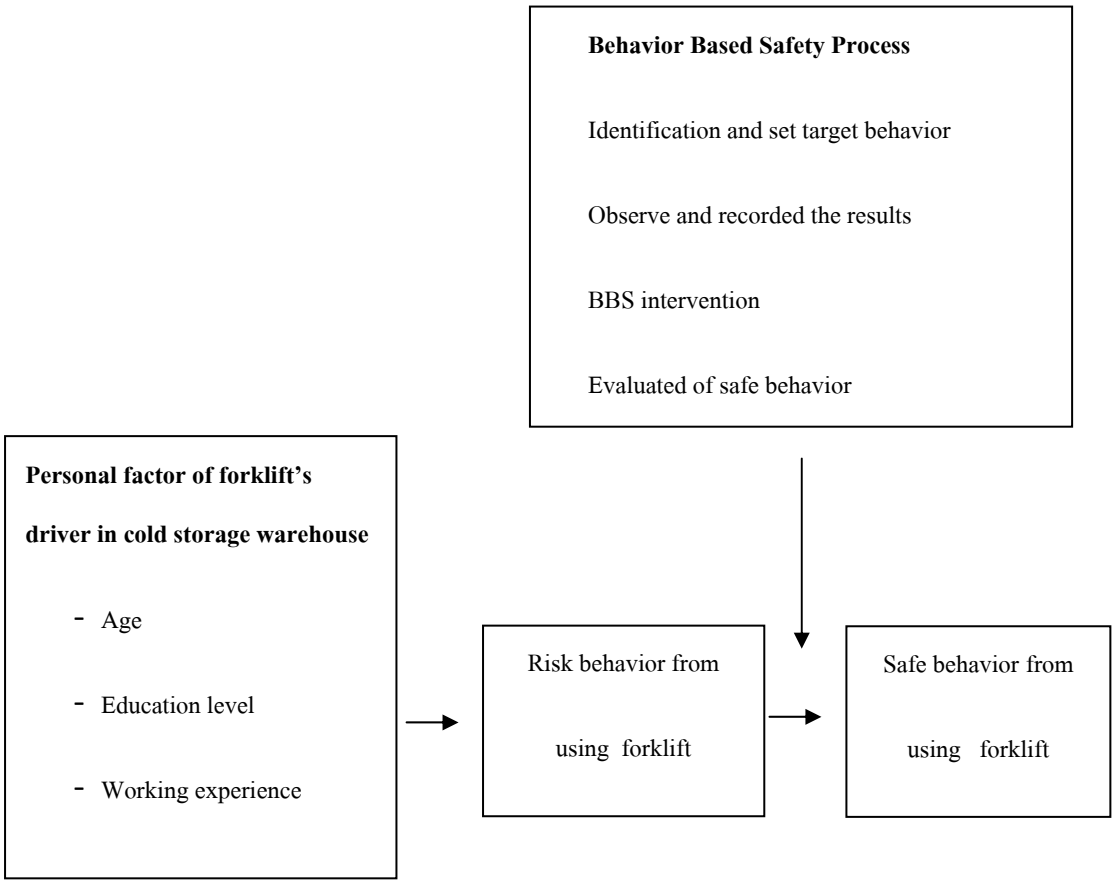
This study to application of BBS process to change unsafe behavior or risk behavior of forklift's driver in cold storage warehouse at CP-Meiji Co., Ltd. as follow :

1. Wearing Personal Protective Equipment (PPE): Safety helmet with chin strap and safety shoes
2. Checking the working area and pallet's product
3. Not using the edge of fork to lift pallet's product
4. Put the fork on platform when move pallet's product
5. Reduce step of fork when move pallet's product
6. Adjust the edge of fork when move pallet's product
7. Using the correctly control handle
8. Back-warding when high product on pallet
9. Reduce speed as limit 8 km/hr.
10. Not reach the body out of forklift when driving

1.6 Limitation

1. BBS process to application only forklift's driver in cold storage at CP-Meiji Co., Ltd.
2. In this study the risk behavior from last forklift accident has an investigate accident report and identify the safe behavior by brainstorming with forklift's driver in cold storage warehouse. Results of study from observation by supervisor or section manager and change risk behavior with positive feedback

1.7 Research of framework



1.8 Operational Definition

1. Accident An undesired event that results to injury , disability, death or property damage.

2. Injury Frequency Rate (IFR)

2.1 Injury accident in person

2.1.1 The calculation accident cases in person which the number of accidents by total working- hours x 200,000

IFR = (the number of accidents in person/total working- hours) x 200,000

2.2 Forklift accident

2.2.1 The calculation forklift accident cases which the number of forklift accidents by total working- hours of forklift drivers x 20,000

IFR = (the number of forklift accidents / total working- hours of forklift drivers) x 20,000

3. Injury Severity Rate (ISR)

3.1 Injury accident in person

3.1.1 The calculation serious accident cases in person which the number of days to take off working by total working- hours x 200,000

ISR = (the number of days to take off working/ total working- hours) x 200,000

3.2 Forklift accident

3.2.1 The calculation serious forklift accident cases which the number of days to take off working from forklift accidents by total working- hours of forklift drivers x 20,000

ISR = (the number of days to take off working from forklift accidents / total working- hours of forklift drivers) x 20,000

4. **Safety** The event without danger, injuries and illnesses from working

5. **Forklift driver** An employee from cold storage warehouse at CP-Meiji Co., Ltd. who is responsible for driving a forklift to move goods, raw materials, package, containers, etc.

6. Electric forklift A mobile machine has 2 fork which is made of steel and use source energy from battery. Used for lifting very heavy things up or down and moves things in working area.

7. **Kiken Yoshi Training (KYT)** Reminding of risk or danger before the employee's work to increased awareness and warning. To make KYT every day and every shift before working.

8. Safety talk and morning talk The safety activity to talking about safety or accident and near miss in department before working

9. Behavior The Act of a human to showing for feeling , thinking from knowing , learning ,decisions or motivation which may be expressed by thoughtfully

or possible without a conscious. All that can be observed and experiment with tools that have been created and includes things that cannot be observed.

- Internal behavior (Covert Behavior) Behavior which is feeling , recognize , thinking or decision that is in the mind of each person.

- External behavior (Overt Behavior) Behavior that is the action from others people can observe such as talking walking crying or repair the machine etc.

1**0. Risk behaviors** An action or symptom showing with muscle , thinking and feeling that indicate to harmful conditions, such as driving faster than as allowed , not checking the working area and pallet's product , the edge of fork to lift pallet's product , not put the fork on platform , not reduce step of fork or adjust the edge of fork , missing control handle , forwarding when high product on pallet, etc.

11. Safe Behavior An action or symptom showing with muscle , thinking and feeling that indicate to without harmful conditions , injuries or loss when have such as driving allowed speed rate , reverse when high production on pallet etc.

12. **Behavior Based Safety (BBS)** The management process to increase safe behavior by defined risk behavior and change risk behavior to safe behavior . To evaluate by observe working and test behavior

13. **Specific On time Real Appropriate (SORA)** is the basic rule for the activate safe behavior to recommend immediately when found safe behavior

14. Activate-Behavior-Consequence (ABC model) The positive motivation to change internal behavior to external behavior in BBS process

15. **Behavior Based Safety card observation** (BBS card observation) The card to report when observer found the safe behavior or risk behavior by greet , talk , appreciate or positive feedback and forklift driver to replied or responsed action.

16. Safety Awareness and /or safety attitudes The thinking from internal behavior with feeling in danger or forecast event . To recognition in harmful , such as driving a car with fast feel the danger , not wearing a helmet with chin strap while driving forklift feel the danger etc.

CHAPTER I
INTRODUCTION

1.1 Background and Significant

CP-Meiji co., Ltd. established since February 1st, 1989 which the joint venture of Charoen Pokphand group and Meiji milk products co., Ltd. of Japan. It is situated at 2/9 Moo 4 paholyothin road Tumbon Nong nak , Ampur Nong khae , Saraburi province, began operation on June 1 ,1990. CP-Meiji receives raw milk about 300 tons/day from 26 Thai cooperatives to produce fresh milk, drinking yoghurt, soft yoghurt and set yogurt. CP-Meiji 's products are sold both at domestic and overseas such as Singapore , Hong Kong .

The Safety and Environmental Management has also been developed such that at present CP-Meiji receives many certification. These include the environmental management system (ISO 14001) in 2008 . Certified occupational health and safety management systems (OHSAS 18001/TIS 18001) and participated in the establishment of Social Affairs and Employment from Ministry of labor since 2007 to present. However, the results from the accidents are likely to occur continuously every year. This accident statistics is shown in Table 1-1. To shows that all kinds of accidents have occurred every year and increasing the number of take-off working days. Trend of IFR are increased every year but ISR decreased in 2013.

Table 1-1 Statistic shown number and percentage of accident, Injury Frequency Rate (IFR) and Injury Severity Rate (ISR) of accident at CP-Meiji Co., Ltd. from 2011- 2013

Year	Serious accident (Cases)		Minor accidents (Cases)	Property damage accident (Cases)	Take off working (days)	IFR	ISR
	> 3 days	1-3 days					
2011	6 (16.67%)	8 (22.22%)	7 (19.44%)	15 (41.67%)	138	3.52	13.48
2012	11 (16.18%)	4 (5.88%)	30 (41.12%)	23 (33.82%)	186	6.15	16.83
2013	6 (7.50%)	5 (6.25%)	13 (16.25%)	56 (70.00%)	76	10.59	6.36

Remark: IFR , ISR to calculation accident cases per 200,000 working- hours

Data from Table 1-2 shown that the accident from forklift from 2011-2013 is highest types of accidents and increased in every year was 12 (33.33 %) , 22(32.35%) and 47 (65.28%) cases respectively.

Table 1-2 Statistic shown type of accident and percentage the number of accidents at CP-Meiji Co., Ltd. from 2011- 2013

Type of accident	Number (Cases) and percentage of accidents		
	2011	**2012**	**2013**
Forklift	12 (33.33%)	22 (32.35%)	47 (65.28%)
Against or crash	3 (8.33 %)	4 (5.89%)	5 (6.94%)
Nipping by machine	1 (2.78 %)	1 (1.47%)	4 (5.56%)
Contact steam or hot water	1 (2.78 %)	8 (11.76%)	4 (5.56%)
Object to falling	2 (5.56 %)	4 (5.89%)	2 (2.78%)
Contact chemical	2 (5.56 %)	5 (7.35%)	3 (4.16%)
Lifting by people	4 (11.11%)	0 (0.00%)	0 (0.00%)
Falling from height level	1 (2.78 %)	1 (1.47%)	0 (0.00%)

Table 1-2 Statistic shown type of accident and percentage the number of accidents at CP-Meiji Co., Ltd. from 2011- 2013(cont.)

Type of accident	Number (Cases) and percentage of accidents		
	2011	**2012**	**2013**
Hand lift or Cart	5 (13.88%)	5 (7.35%)	0 (0.00%)
Cutting by sharp	4 (11.11%)	8 (11.76%)	3 (4.16%)
Other	1 (2.78 %)	10 (14.71%)	4 (5.56%)
Total	**36**	**68**	**72**

The Injury Frequency Rate (IFR) of forklift accident from 2011-2013 has increased in every year was 2.52, 4.07 and 7.77 per 20,000 forklift working hours respectively is shown in Table 1-3.

Table 1-3 Statistic shown Injury Frequency Rate of forklift accident (IFR) at CP-Meiji Co., Ltd. from 2011- 2013

Item	year		
	2011	**2012**	**2013**
Injury Frequency Rate of forklift accident (IFR)	2.52	4.07	7.77

The forklift accident to occurred at the cold storage warehouse, package ware house ,raw material warehouse and crate stock and return warehouse and the highest of forklift accident to occurred at cold storage warehouse was 11 , 20 and 42 cases is shown in Table 1-4.

Table 1-4 Statistic shown the number of forklift accident in department at CP-Meiji Co., Ltd from 2011- 2013

Department	**Number of forklift accident (Cases)**		
	2011	**2012**	**2013**
Cold storage warehouse	11	20	42
Package warehouse	0	1	1
Raw material warehouse	1	1	0
Crate stock and return	0	0	4
Total	**12**	**22**	**47**

The causes of forklift accident to identified has two types which unsafe action and unsafe condition is shown in Table 1-5.

Table 1-5 Statistic shown causes of forklift accident in Cold storage warehouse department at CP-Meiji Co., Ltd from 2011- 2013

Causes of forklift accidents	**Number of forklift accidents (Cases)**			
	2011	**2012**	**2013**	**Total**
Unsafe Action				
- Driving faster than as allowed	1	5	10	16
- Not checking the working area and product	3	3	6	12
- The edge of fork to lift pallet's product	2	1	7	10
- Not put the fork on platform	0	3	5	8
- Not reduce step of fork or adjust the edge of fork	1	4	1	6
- Missing control handle				
- Forwarding when high product on pallet	0	0	5	5
- Body out of forklift	2	3	0	5
- Driving overtake	1	0	1	2
- Driving to limited area	0	0	1	1
- Using fork to push other pallet	0	0	1	1
- Using break immediately	0	0	1	1
- Working no duty	0	0	1	1
- Fatigued	0	0	1	1
	1	0	2	3
Total (Cases)	**11**	**19**	**42**	**72**
Unsafe Condition				
- Working area	0	1	4	5
- Machine , equipment	1	2	1	4
Total (Cases)	**1**	**3**	**5**	**9**

From the data in Table 1-5 to found that forklift accident has causes from unsafe action 88% (72 cases) and unsafe conditions 12% (9 cases). The caused from unsafe action from failure to follow work instruction (WI) 73% , which is based on the H.W. Heinrich theory[1], who said that the main causes of the accidents are caused by unsafe action (Unsafe act) about 85% of all accidents and unsafe condition is a secondary reason about 15% of all accidents.

From the all data to make sure that the forklift accident occurred at cold storage warehouse mainly caused from unsafe action or unsafe behavior, then the target of safety not achieve with Safety, Occupational health and Environment policy.

Since 2012 the company to set Safety, Occupational health and Environment management system to reduce forklift accident. To set the reduce forklift accident's committee from

1. The working area to use forklift : cold storage , package , raw material and crate stock and return department
2. Engineer department
3. Safety , Occupational Health and Environmental department
4. Human resources department
5. Specialist from Charoen Pokphand Group

The reduce forklift accident's committee to responsibility for review the safety rules for using forklift and inform to forklift's driver. Follow the safety rules for using forklift by supervisor and manager of department. Set the safety for forklift driver course to training forklift's driver and supervisor to on the job training (OJT) to all forklift's driver to know about step to driving the forklift or work instruction. When forklift accident or near miss occurred to make one point KYT and Safety Talk and near miss report and investigate the forklift accident. The supervisor to audit in working area for Safety , Occupational Health and Environmental .To risk identification and assessment in workplace and then make Occupational Health and Safety Management Systems to reduce risk with TIS 18001 or OHSAS 18001. Other that to improvement the condition in working area such as installation for flow rack to put the pallet overlap 2 layer , set the traffic one way for forklift , expansion the working area and repair the damaged floor . However the forklift accident from unsafe action causes in cold storage warehouse is trend to increase continuously.

The researcher interested to study the Safety, Occupational Health and Environmental Management System Model to focus human factor because of the most forklift accident to occur from risk behavior of forklift's driver. To using Behavior Based Safety (BBS) process to change risk behavior of forklift's driver in cold storage warehouse to safe behavior for reduce forklift accident or near miss in CP- Meiji Co., Ltd.

1.2 Objectives

1. To change risk behavior of forklift's driver in cold storage warehouse to safe behavior.
2. To reduce forklift accident from risk behavior of forklift's drivers in cold storage warehouse.
3. To reduce near miss from risk behavior of forklift's drivers in cold storage warehouse.
4. To improvement Behavior Based Safety (BBS) manual to training forklift's drivers in cold storage warehouse.

1.3 Hypothesis

The ratio of forklift accident of forklift's driver in cold storage warehouse at CP-Meiji Co., Ltd from unsafe risk behavior or unsafe action before and after change behavior by using Behavior Based Safety (BBS) process to reduce significant.

1.4 Variables

1. Dependent Variables: Risk behavior of forklift's driver from accident in cold storage warehouse.
2. Independent Variables :
    2.1 Personal factors (Age , Education level , working experience)
    2.2 Process to change Behavior Based Safety (BBS) to increase safe behavior by

- Training Behavior Based Safety (BBS) process to forklift driver and supervisor
- Selected risk behavior or unsafe behavior form forklift accident
- Observe the forklift's driver when working and positive recommend when found risk behavior
- Motivation the safe behavior of forklift's driver

1.5 Scope of study

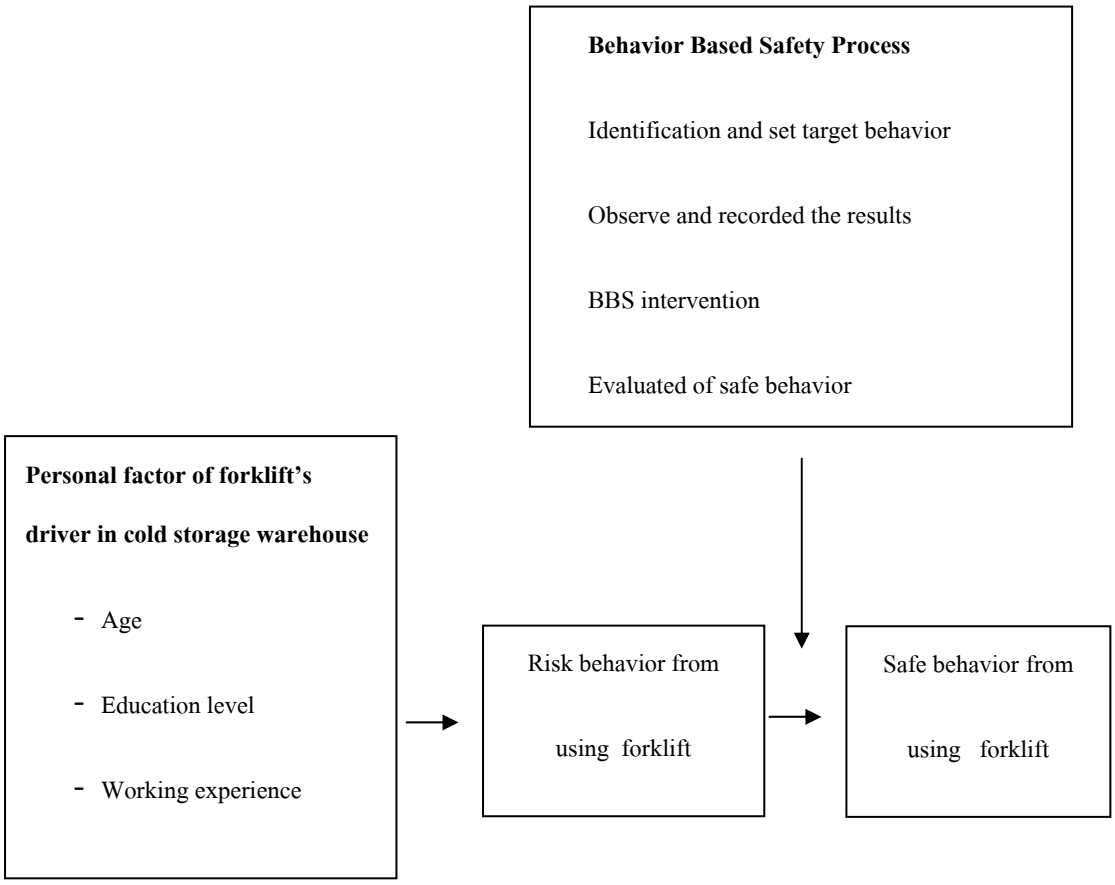
This study to application of BBS process to change unsafe behavior or risk behavior of forklift's driver in cold storage warehouse at CP-Meiji Co., Ltd. as follow :

1. Wearing Personal Protective Equipment (PPE): Safety helmet with chin strap and safety shoes
2. Checking the working area and pallet's product
3. Not using the edge of fork to lift pallet's product
4. Put the fork on platform when move pallet's product
5. Reduce step of fork when move pallet's product
6. Adjust the edge of fork when move pallet's product
7. Using the correctly control handle
8. Back-warding when high product on pallet
9. Reduce speed as limit 8 km/hr.
10. Not reach the body out of forklift when driving

1.6 Limitation

1. BBS process to application only forklift's driver in cold storage at CP-Meiji Co., Ltd.
2. In this study the risk behavior from last forklift accident has an investigate accident report and identify the safe behavior by brainstorming with forklift's driver in cold storage warehouse. Results of study from observation by supervisor or section manager and change risk behavior with positive feedback

1.7 Research of framework



1.8 Operational Definition

1. Accident An undesired event that results to injury , disability, death or property damage.

2. Injury Frequency Rate (IFR)

2.1 Injury accident in person

2.1.1 The calculation accident cases in person which the number of accidents by total working- hours x 200,000

IFR = (the number of accidents in person/total working- hours) x 200,000

2.2 Forklift accident

2.2.1 The calculation forklift accident cases which the number of forklift accidents by total working- hours of forklift drivers x 20,000

IFR = (the number of forklift accidents / total working- hours of forklift drivers) x 20,000

3. Injury Severity Rate (ISR)

3.1 Injury accident in person

3.1.1 The calculation serious accident cases in person which the number of days to take off working by total working- hours x 200,000

ISR = (the number of days to take off working/ total working- hours) x 200,000

3.2 Forklift accident

3.2.1 The calculation serious forklift accident cases which the number of days to take off working from forklift accidents by total working- hours of forklift drivers x 20,000

ISR = (the number of days to take off working from forklift accidents / total working- hours of forklift drivers) x 20,000

4. **Safety** The event without danger, injuries and illnesses from working

5. **Forklift driver** An employee from cold storage warehouse at CP-Meiji Co., Ltd. who is responsible for driving a forklift to move goods, raw materials, package, containers, etc.

6. Electric forklift A mobile machine has 2 fork which is made of steel and use source energy from battery. Used for lifting very heavy things up or down and moves things in working area.

7. **Kiken Yoshi Training (KYT)** Reminding of risk or danger before the employee's work to increased awareness and warning. To make KYT every day and every shift before working.

8. Safety talk and morning talk The safety activity to talking about safety or accident and near miss in department before working

9. Behavior The Act of a human to showing for feeling , thinking from knowing , learning ,decisions or motivation which may be expressed by thoughtfully

or possible without a conscious. All that can be observed and experiment with tools that have been created and includes things that cannot be observed.

- Internal behavior (Covert Behavior) Behavior which is feeling , recognize , thinking or decision that is in the mind of each person.

- External behavior (Overt Behavior) Behavior that is the action from others people can observe such as talking walking crying or repair the machine etc.

1**0. Risk behaviors** An action or symptom showing with muscle , thinking and feeling that indicate to harmful conditions, such as driving faster than as allowed , not checking the working area and pallet's product , the edge of fork to lift pallet's product , not put the fork on platform , not reduce step of fork or adjust the edge of fork , missing control handle , forwarding when high product on pallet, etc.

11. Safe Behavior An action or symptom showing with muscle , thinking and feeling that indicate to without harmful conditions , injuries or loss when have such as driving allowed speed rate , reverse when high production on pallet etc.

12. **Behavior Based Safety (BBS)** The management process to increase safe behavior by defined risk behavior and change risk behavior to safe behavior . To evaluate by observe working and test behavior

13. **Specific On time Real Appropriate (SORA)** is the basic rule for the activate safe behavior to recommend immediately when found safe behavior

14. Activate-Behavior-Consequence (ABC model) The positive motivation to change internal behavior to external behavior in BBS process

15. **Behavior Based Safety card observation** (BBS card observation) The card to report when observer found the safe behavior or risk behavior by greet , talk , appreciate or positive feedback and forklift driver to replied or responsed action.

16. Safety Awareness and /or safety attitudes The thinking from internal behavior with feeling in danger or forecast event . To recognition in harmful , such as driving a car with fast feel the danger , not wearing a helmet with chin strap while driving forklift feel the danger etc.

CHAPTER II
LITERATURE REVIEWS

The study is to develop to improvement safety awareness and safe behavior of forklift's driver of cold storage warehouse in CP-Meiji Co., LTD. The researcher have studied and gathered related research as follows:

1. Accident theories
2. Safety legal for forklift
3. Principles of Behavior Based Safety (BBS)
4. Related research

2.1 Accident theories

2.1.1 Safety pyramid [1]

H.W. Heinrich (1931) theorized that for every major accident there are 29 minor accidents and 300 near miss. Commonly referred to as the safety pyramid in Figure 2-1.

Figure 2-1 Safety Pyramid by H.W. Heinrich (1931)

In 2003, ConocoPhillips Marine[2] conducted a study demonstrating a large difference in the ratio of serious accidents and near miss. The study was built on the original work of H.W. Heinrich back in 1931[1]. The Conoco study found that for every single fatality there are at least 300,000 at-risk behaviors, defined as activities that are not consistent with safety program, training and components on machinery. These behaviors may conclude bypassing safety components on machinery or eliminating a safety step in the production process that slows down the operator. With effective machine safeguarding and training ,at-risk behaviors and near misses can be diminished. This also reduces the chance of the fatality occurring, since there is a lower frequency of at-risk behaviors. Commonly referred to as the safety pyramid in Figure 2-2.

Figure 2-2 Safety Pyramid by ConocoPhillips Marine (2003)

2.1.2 Domino Theory [1]

Heinrich (1959) to searched domino theory stated that an injury and property damage are direct result from accident. An accident are result of unsafe action and unsafe conditions which compare the 5 domino in line when the first domino fall down , also the nearby domino fall down. The 5 domino are:

1. Social Environment or Background such as genetic of family, living standard, education , training , status or family conditions.

2. Defects of person such as lack of careful when working, low safety attitude, carelessly of hazardous or risk

3. Factor of unsafe action and unsafe condition

4. Accident for example fall down from a high level , slide , crash ,cutting , the object fall down and against from object, etc.

5. Injury or damage are directly results from accident.

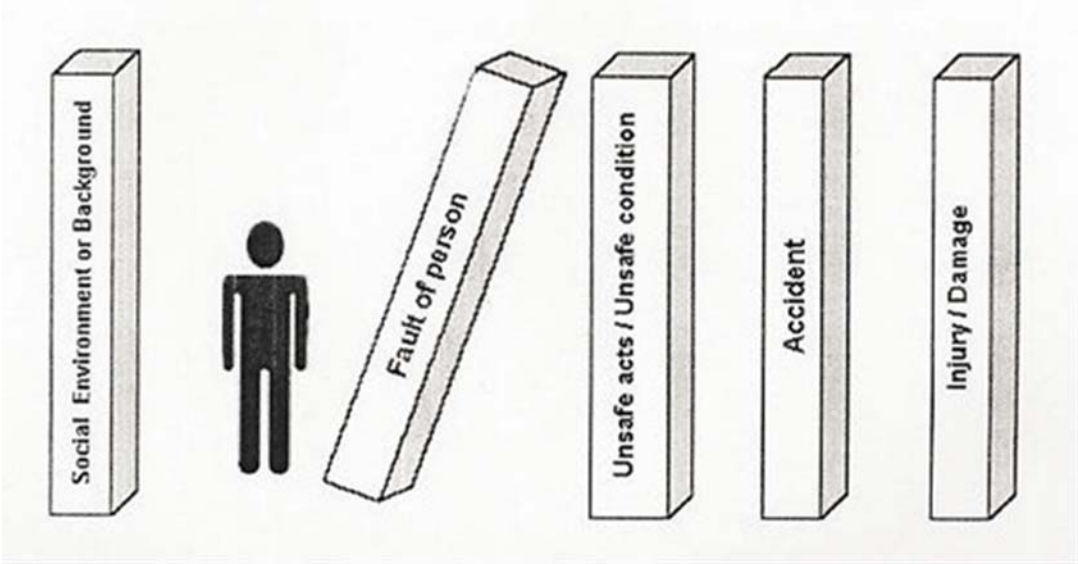


Figure 2-3 Domino theory by Heinrich (1959)

By 2 factors or major causes of an accident from working have unsafe condition and unsafe action with details as follows:

1. Unsafe condition is any physical characteristics that deviates from normal conditions or as a risk condition to accident or property loss in the future

2. Unsafe action is the risk behavior of person to accident, injury or property damage

2.1.3 DuPont theory [3]

DuPont theory (2000) stated that an accident or near miss in plant to compare with iceberg in ocean. Something to appeared in the upper iceberg were first aids cases, medical treatment, Lost time injuries and fatalities but something in lower of the ice berg such as risk behavior or unsafe action and unsafe condition. There were found in plant to shown in figure 2-4. To increase safety awareness and found the causes of accident can prevent an accident or near miss in plant.

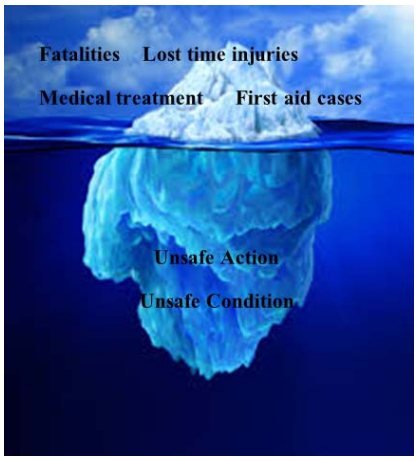


Figure 2-4 Iceberg from DuPont theory (2000)

In addition DuPont(2000) to studied and collect the causes of accident and near miss to found that 96 % of accident and near miss from unsafe action of employees and 4% of accident and near miss from unsafe condition to showed in figure 2-5

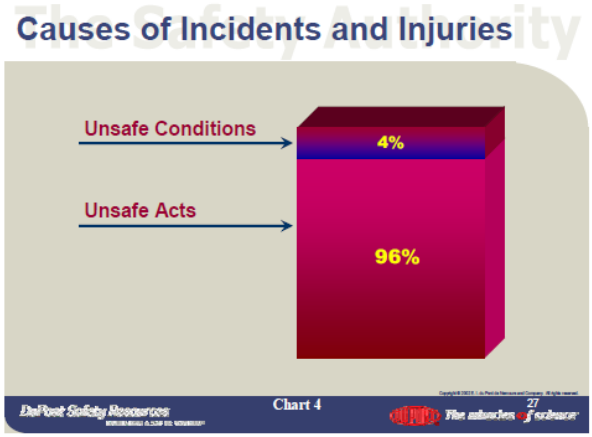


Figure 2-5 Statistic causes of accident and near miss from DuPont theory (2000)

2.1.4 Single factor theory [4]

Single-factor theory assume that there is only one cause of accident when find that already to correct an accidents but restriction to prevent accident

1.5 Multiple factor theory [4]

The cause of the accident occurring from many factors by immediately causes may be unsafe actions of an employee or unsafe conditions. And other factors to support an accident. V.L. Gross has created a theory model of multiple causes by 4M factors:

1. Man such as gender, age, height, skills, work history, training, motivation, etc.

2. Media is concern environmental including weather conditions, temperature, lighting, sound, etc.

3. Management is a model of policy, organization, work instruction or rule etc.

4. Machine is a tool accessory such as size, shape of machine and weight of energy, etc.

Cost of accident [5]

1. Direct cost refers to the directly amount that must be paid to the injured person from an accident or damage that showed such as medical treatment cost, compensated cost form takeoff working, morale cost, funeral cost and life insurance cost.

2. Indirect cost refers to the other cost in addition other the direct costs from accidents follows:

2.1 Loss of working time of injured worker when medical treatment, loss of working time of co-worker and supervisor to help the injured worker sent to hospital, loss time to investigate accident and training newcomer to replacement workers etc.

2.2 Loss of efficiency due to machinery , tools or equipment breakdown

2.3 Cost of repaired machine ,tools and equipment that has been damaged.

2.4 Raw material or product that has been damaged and destroyed or sold as scrap.

2.5 Decreases of product or output from failure or delay production

2.6 The welfare of injured person

2.7 The injured labor wage which continues paid for injured person although no working

2.8 Failure of the opportunity to make profit because of lower product from the interruption in production processes or changes to the demands of the market.

2.9 Rental cost, electricity and water cost although the factory shutdown when accident occur

2.10 Reputation, image loss, moral of workers

Prevention of accidents

1. Engineering is prevention by the engineering such as engineering calculations and engineering design of machine or tool to safety condition for working for example install a guard or cover at dangerous movements machine ,set electrical ,lighting, noise and ventilation standards systems in lay out of factory when construction

2. Enforcement is defined in the regulations based on the law or other requirement such as set safety work instruction and control the worker to operation follow work instruction and rule to avoid unsafe or risk behavior

3. Education is increase knowledge by education, training and recommending employees, supervisor or concerned person to realize the problem and increase safety attitude about preventing accidents and improvement the safety in workplace by focusing on the prevention of accidents in working area

2.2 Safety legal for forklift [6]

2.1 Ministerial Regulation, Ministry of Labor, on the prescribing of standard for administration and management of Occupational Safety , Health and working environment in relation to machinery, crane and boiler (A.D. 2009)

CHAPTER 1 Machinery

Parts 4 Forklift

Clause 31 For the case of an employee to drive forklift. The employer must do the following:

(1) The forklift must has a strong infrastructure, a stable roof can prevent the danger from the objected fall down

(2) Make the signs for lifting capacity and stick to the forklift so that employees could not see clearly.

(3) Safety inspection the forklift before working and keep data record

(4) Install a signal or warning lights in operation depending on the usage

Clause 32 The employer modifications or actions that resulted in the safe operation of the forklift failure.

Clause 33 The employer to set walk way and forklift way in building or the workplace

Clause 34 The employer to install the convex mirror or other materials that have similar features at intersections or curves invisible path forward

Clause 35 The employer to set the strong way for forklift and able to support the loading of the forklift

Clause 36 The employer to training for forklift driver by training center to get certificated from Labor Ministry.

Clause 37 The employer to control the forklift driver not use forklift near electric power line or high voltage equipment closer than the safe distance as defined in the standards from provincial electricity authority .In case not safety distance standard to follow up standard of the engineering institutes of Thailand.

Clause 38 The employer to control no worker to passenger with the forklift when working in workplace.

Clause 39The employer have safety manual for forklift about using, inspection and preventive maintenance for forklift driver to learn and operation follow.

2.2 Forklift legislation in USA [7]

On March 1st 1999 the new rule on forklift operator training became effective. The employer responsibility especially with regard to operator training and refresh as a result of closer monitoring of lower operator performance. December 1st 1999 the employer must to complete training and evaluation of their forklift's driver. This course have 3 factors: formal instruction to introduction of this new legislation

and inform forklift accident in the workplace, practical training and evaluation and re-evaluation of forklift's driver performance must occur at least every three years.

2.3 Forklift regulation in Canada [7]

The Regulation for Industrial Establishments, Regulation 851 and the OHS Act both have relevant clauses that govern the operation of forklift. A specific clauses are directly towards the employer's duty of care for their employees, the supervisor to supply equipment that is in good condition. Other relevant clauses for forklift's driver are appropriately trained and received adequate by supervisor. For an effective systems should be addressed:

1. Hazard Identification
2. Forklift's driver training
3. Provide Effective Supervisor
4. Operation Procedures by Job Safety Analysis (JSA)
5. Maintenance and Repair Procedures
6. Facility Design Compatibility

2.4 Forklift regulation in UK [7]

The Health and Safety at Work Act 1974, the employers are responsible to training forklift's regulation to forklift's driver about usage of forklift, introduced to deal with identified hazard while forklift operation, working at height , the lifting operations and lifting equipment.

2.3 Principles of Behavior Based Safety (BBS)

What of Behavior [8][9]

Behavior is the act of an individual in a natural and intentional act. This may be consciously or unconsciously. And actions that may be observed by using common sense or observation tools. Behavior can be divided into two categories.

1. External behavior (overt behavior) is clearly observable behavior.

1.1 Observable behavior without the use of tools such as speaking, laughing, crying, moving body or heartbeat. The other observed by the sensation

1.2 Behavioral analysis by tool or analysis by science such as changing the chemicals or sugar in the blood, the function of the stomach and intestines which not be observed with the eye or the sensation

2. Internal behavior or mind behavior (covert behavior) is behavior can know by itself. If you do not tell anyone, nobody knows it better expression, such as memory, perception, understanding, hearing, smell , dream , hungry, angry , decisions, attitudes, image. These behavior may cause physical changes such as when thought new idea to using brain or when angry although increase the sugar in the blood. Which is measured by instruments but nobody know of the detail which thought or felling.

Studying of behavior

1. Study directly behavior

1.1 Direct Observation is observed by the observer said to be noticed before. This observation was that some people may not show the actual behavior off it.

1.2 Nature observation is the observation that in a way that made those observations do not know what was observed. And the possibility that the observer does not act as disturbing behavior was observed. To observe this behavior is very real. However, there are limitations to spend so much time observing the behavior you want. The notice must be made many time for observation. The notice must make a note when observing and recording it. Additionally, the notice must be observed without prejudice. The study which will be honest and reliable.

2. Study indirectly behavior. There are several ways

2.1 The interview is how the educational needs information from individuals or groups of individuals. To interview by directly or interpreter was asked to interview people who speak different languages.

2.2 Study for people behavior and who can read and write or ask the person to know the behavioral trends of the future. Another advantage is that

the study was able to provide information about the conceal behavior or refuse behaviors to show to other people. The study which was be confidential and the questionnaire will take the study at any time.

2.3 Experiment is study to be in control according to the study requirements. The true state, the control is done in the laboratory which is the limited. It could be applied in reality condition. However, this method is very useful in the study of the medicine.

2.4 Recording to know the individual behavior by record their behavior. This could be a daily record or study the behavior of each type. Such as eating behavioral, working behavioral, health behavioral, environment behavioral, etc.

Risk behavior of accidents at work

Risk behavior of accidents at work refers to the action or practice of employees while working is likely to unsafe, danger or an accident at work. The risk behavior of accidents at work such as not using personal protective equipment , using of machine or equipment not incorrect and working not follow up the safety regulations in the workplace.

Behavior Based Safety (BBS) [10]

BBS is a principle of behavioral analysis to make an improvement safety continuously by identify and eliminate risk.

Behavior Based Safety Systems (BBS) Process [9]

Changing safety behavior is a management system for safety. It will be measure the interesting behavior and actual actions behavior while the daily practice behavior. Changing safety behavior are as follows:

1. Identification and set target of safe behaviors
2. Observation and record the results
3. Behavior Based Safety intervention and change behavior
4. Evaluated of safe behaviors
5. Reviewed and continuously improvement

The principle BBS of changing behavior follows:

1. People who show behavior on the reward
2. Positive behaviors or reward it will be done again when satisfied
3. Negative behaviors or not reward it will not do more
4. People can do something behavior or not do something behavior, this is a long time to change as an organized culture.

2.4 Related Research

Thomas A. Smith (1999)[11] studied showed that the goal of Behavior Based Safety (BBS) is changing risk behavior in employee to safety behavior used ABC model to change people's behavior by observing the performance of the employees. BBS is associated unsafe action of accident 85-95 percent. Also the safety is necessary to changing the risk behavior of the employee to safety behavior and reduce accidents from unsafe action. BBS will succeed if done voluntarily, not forced to change their behavior or if change the risk behavior to safety behavior must be rewarded or positive results. BBS have to be defined as a practice for everyone to participate in management and to educate all employees to achieve the implementation of management systems in organizations BBS continuous and sustainable.

E. Scott Geller (2005) [12] reviewed Behavior Based Safety (BBS) to managing occupational risk and preventing workplace injuries. Set conceptual model is proposed for matching the awareness and behavior of individual with BBS intervention technics. Using ABC (Activator – Behavior – Consequence) model to develop interventions:

Instructional intervention. Used to improve behavior already in the self-directed stage to get the participants attention and instruct them to change unsafe or risk behavior to safe behavior by education, training, exercise and directive feedback.

Supportive intervention. Person to learn the right way to do something, practice is important so the behavior can become part of natural routine. People need support to reassure them they are doing the right thing and to encourage them to keep going.

Motivational intervention. When people know what to do but don't do it, they require some external encouragement or pressure to change. An incentive or reward program is useful to motivate a certain target behavior.

Lisa H. Harrington (2006) [13] studied to increase productivity of employees in the warehouse. Make the safety manual of materials storage. Training the driver to get the license about operating device or lifting tool and transport materials or goods. And training about maintenance system and inspection of lifting equipment or tools system. Training course should be reviewed as appropriate when observed unsafe action in workplace. A safety culture in the organization should have meeting least a month one time to followed up the progress in the implementation of safety. The case of an accident must be investigated to find out major causes and corrective action. Set to safety inspection in workplace a least once per week. Set safety activities such as observe the driver to lift and transport goods if found to be unsafe such as using a phone while driving must be informed executives in the workplace area to correct. Rewards are presented on the zero serious accident in the workplace area and set of clearly defined areas of operation such as walking routes must be separated from traffic routs . Installation convex mirrors at curves or intersections or corners. If improvement safety continuously to decreased insurance costs and the loss from accidents.

Thitipun (2006) [9] studied on the application of the Behavior Based Safety (BBS) of 118 forklift driver in the warehouse to develop safety and reduce forklift accidents from unsafe behavior. To identified risk behaviors by review accident investigation report. And brainstorming of forklift driver to determine the safety target behavior. The supervisor to observe safety target behavior and positive recommend to changed risks behavior of forklift drivers within six months after the intervention. The end of studied to survey attitude and safe behavior of forklift driver to found that the forklift driver are safety behavior all 20 safety target behavior and forklift accident rates caused by unsafe behavior decreased with statistical significance ($p < 0.001$), with the performance 87.9 percent and analysis of individuals from the questionnaire, including gender, age, education, work experience of forklift driver

with the attitudes and safety behavior that is not correlated to changing safety behavior in forklift driver.

Pathomporn (2008) [8] studied to change unsafe behavior of 11 the service maintenance engineer to be safe behavior by applying the Behavior Based Safety (BBS) for reduce the unsafe action rate .The result found that the service maintenance engineer were increased safe attitude to 100 % after the BBS implemented. The unsafe behavior rate before the BBS implemented in hot work , tools and equipments and reenergized electrical work were 418.14 , 455.03 and 295.15 respectively. After the BBS implemented , the unsafe behavior above that were decreased to 387.39 , 129.13 and 0 respectively.

Esin Taskan-Karamursel (2010) [14] studied reduce the accident and risk by behavioral and measures to use “Fight the risk” campaign of 991 of the knowledge and experience of the members of the Association of German Safety Engineers (VDSI) by an online questionnaire . The campaign present situation in advertisements in newspaper , newsletters , postcards, magazine , online media and special. More than 60 % of interviewees receive information on the topic safe driving and transportation very often or often by using the internet (70 %) or newspaper and magazines (64%).The results show that the interviewed occupational health and safety experts are already aware of the topic of “safe driving and transportation” ,the need for improvement to separate routes of pedestrians and for forklift and the arrangement for safety loads and regulation in plant transport : speed limits , safe driving training and awareness such as wearing a safety helmet or protective clothing to help improve company safety. The target groups will be made more aware of the need to take on responsibility within the company and the adoption of safety promoting behavior will be supported as well as in plant transport safety.

Norudin Mansor (2011) [15] studied to raise the level of awareness toward safety and health needs at workplace by measured stress and fatigue , unsafe act to accident occur , the machinery or tools , design of workplace and training procedure are directly influence to accident in workplace by using self-administered

questionnaires in 177 samples. The resulted that stress and fatigue are synonym with workers and the one factor of accidents in workplace. To reducing accident in workplace due to stress and fatigue is by motivating them through making them feel comfortable while working and no works to long after usual schedule of working hour. Unsafe act by the workers such as failure to obey safety regulation, unethical behavior at workplace or do not wear Personal Protective Equipment (PPE) will contribute to accident in workplace. Management should be inform policies and procedures to worker and even rewarding certain safe behavior. The old machineries and tools, irregular inspection by workers , insufficient training the worker and failure to immediately report any breakdown are factors that may occur accident in workplaces. The company to make maintenance inspection before start their work, reducing the numbers of old machinery such as forklift, crane or replace them with the new and available. And supervisor able to give knowledge to workers on how handle the machinery and tools correctly. The irregular workplace layout, the absence of safety features, lack of communication of staff are occur accident in workplace. Good design in workplace will help make job easier for the company and workers and avoiding accident in workplace. Training will make worker more competent in doing their jobs and should be more safety talk to give more education for workers about the importance of safety when they understand about the importance of safety in workplace , this will help to reduce accident in workplace.

H.L.Kaila (2011) [16] studied the Behavior Based Safety (BBS) in 1751 executives and 713 worker in 64 organization in India by training BBS principles: concepts , processes and implement. The observers used a checklist of critical unsafe/safe behavior to collect observation data from their respective and feedback when found unsafe/safe behavior. The result of studied found that unsafe behaviors occur ahead of any near miss, injury or fatalities and surprisingly. BBS interventions rise safe behavior and reduce unsafe behavior and BBS training to reducing the number of unsafe condition in the organization. And safety culture created in organization by set awareness program of BBS for management, training about safety awareness to employees , select observer from steering committees, training BBS

observation process to steering committees members and develop safety measures then observers to implement BBS in workplace.

Faridah Ismail et al (2011) [17] studied the Behavior Based Safety (BBS) at three refineries in Malaysia by 40 questionnaire and observe the operation. Found that three of the refinery process optimization BBS used more than three years to reduce accidents and changing risk behavior. And improve the safety in environment and workplace area. It was found that the frequency of minor accidents occurred 64 percent moderate accident occurred 36 percent. When the operations were unsafe acts or the unsafe environment or workplace to repair and improve the safety immediately .Company A ,B and C have taken action 82 percent 100 percent and 84 percent but cannot correct action to stop operations temporary. Company A, B and C to stop working temporary 36 percent, 33 percent and 53 percent. Addition to investigating the accident, eliminate danger or unsafe , cleaning workplace area , refresh safety training and review work instruction or comment from workplace. And to increased safety awareness and on the job training for newcomer.

Edem M. Azila - Gbettor (2012) [18] studied of the person factors and environment factor to effect the accident from working. The study interviewed by 250 questionnaires and found that differences in age and gender influence to driving forklift behavior. The younger forklift driver are high risk of injury than older. And the rate of deaths and injuries of younger forklift driver (less than 20 years) will take over other groups. Male forklift drivers occurred accident more than female forklift drivers. Because of using the high speed and not follow the safety regulation of forklift. The person factors that affect the accidents were fatigue, stress and alcohol. The environmental factors that affect the accidents is loading, the lighting in workplace area (visible) and lay out in workplace.

Dawei Chen et al (2012)[19] studied BBS to prevent accidents from 80 percent of unsafe behavior for the construction projects in China. To training about safety for 1,415 workers (75 %) in project and set BBS checklist about 30-40 items to observe the risk behavior about 30 minutes if found the risk behavior to record data in

BBS checklist immediately. Then to calculate the Safety Index (SI) from {N2/(N1+N2)} * 100 by N2 is time to observe safety behavior and N1+N2 is all time to observe risk behavior and safety behavior. The result found that the first phase (date 1-15) of month is 0.65 and the last phase (date 16-30) is 0.85. The Safety Index to increase 10 percent. In addition to the BBS influence to prevent accident and to increase the Safety index more than 10 percent from baseline.

Yuan Xiongjun (2014) [20] The safety accident occur due to the accidents like low education background in employees , low safety attitude or awareness, weak basic safety management, unsafe condition in workplace, and etc. This research results would have some directly significance to improve the safety management level and reduce the accident rate of SMEs. The organization responsible persons could attach much more importance and take much more actively role in BBS management. Set up safety management idea to prevent accident such as safety is the first priority of work , unsafe behavior and unsafe condition must be corrected, accident or injury must be investigated , encourage the safety behavior and correct the unsafe behavior. The SMEs could finally achieve the objective of full involvement and improve the safety awareness of all employees. Motivation is one of the most importance process of management implement, SMEs should be linked with performance salary and continuously maintain the safe behavior in all employees and continuously correct their unsafe behavior during the work

Paul H.P. Yeow (2014) [21] The study proposed an Outcome and Behavior Based Safety Incentive Program (OBBSIP) in 502 employees at 2 fluid manufacturing plants. The key aspect of this study was to motivate workers to change from risk behavior to safe behavior with two principles in this program. The first principles was the outcome-based were given based on safety performance no accident to get incentive. Incentive setting to 3 levels of achievable incentives with each one harder to attain than previous. The second principle to set of expected safety precaution and safe behavior were attached to this program and team members were encouraged to monitor and discuss regularly on team member’s compliance and provide feedback. The result showed the 2nd and 3rd year data (during the intervention

period) was significantly lower than 1st year data (during base-line period) and the monetary saving from the 75% reduction of the last worker accident compensation claim (WACC) in the 2 year period.

In conclusion from all literature reviews, Behavior Based Safety (BBS) is the process to change risk behavior to safe behavior by identified the safety target behavior and observing the performance of the employees when found the risk behavior to stop working and positive motivation immediately to increase safety attitude of employees and change risk behavior to safe behavior. BBS process is the tool in safety management to reduce accident from unsafe action and building the safety culture in organization finally.

CHAPTER III
MATERIALS AND METHODS

3.1 Study design

A study is the quasi-experimental study to application the Behavior Based Safety (BBS) in forklift drivers at cold storage in CP-Meiji co., Ltd. The aim was changed risk behavior of the forklift driver to safe behavior for reduce accident in workplace.

3.2 Population and sample

The population in this study were forklift drivers at cold storage warehouse in CP-Meiji co., Ltd. about 60 people.

3.3 Materials and Instruments

3.3.1 Evaluated behavior in Critical Behaviors Inventory (CBI) by supervisor or section manager of cold storage warehouse. To observed safe behavior follow 2 section. Personal Protection Equipment (PPE) and safety regulation in forklift driver and record result to analysis of % safe behavior

Percentage of safe behavior = (safe behavior x 100)/(risk behavior + safe behavior)

3.3.2. Calculated the Injury Frequency Rate (IFR) in forklift accidents of 20,000 working hour after using Behavior Based Safety (BBS) process.

IFR = (number of accidents of forklift driver from unsafe behavior x 20,000)/ Total of forklift driver working hour

3.3.3 Near miss report from forklift driver behavior before and after Behavior Based Safety (BBS) process.

3.3.4 Behavior Based Safety (BBS) manual for training the forklift driver and Supervisors at Cold storage warehouse.

3.4 Collecting and gathering data

Behavior Based Safety (BBS) process includes all 4 steps:

3.4.1 Identification and set target behaviors by analyzing the results from statistics of accidents from using forklift at cold storage warehouse in 3 years ago (2011-2013) and brainstorming the forklift drivers at cold storage warehouse to found risk behavior from accidents and defined to safe target behavior 10 Topics :

1. Wearing Personal Protective Equipment (PPE) :safety helmet with chin strap and safety shoes
2. Checking the working area and pallet's product
3. Not using the edge of fork to lift pallet's product
4. Put the fork on platform when move pallet's product
5. Reduce step of fork when move pallet's product
6. Adjust the edge of fork when move pallet's product
7. Using the correctly control handle
8. Back-warding when high product on pallet
9. Reduce speed as limit
10. Not reach the body out of forklift

3.4.2 Observed and recorded the results by:

3.4.2.1 Observation the safety target behaviors 1 time per week in 3 shifts by using the Critical Behaviors Inventory (CBI). To observed safe behavior follow 2 section. Personal Protection Equipment (PPE) and Safety regulation in forklift driver

Table 3-1 The Critical Behaviors Inventory (CBI) form

1. Personal Protective Equipment (PPE)	**Safe behavior**	**Risk behavior**	**Recommend / Correction**
1.1 Safety helmet			
1.2 Chin strap			
1.3 Safety shoes			
2. Safety regulation in forklift driver	**Safe behavior**	**Risk behavior**	**Recommend / Correction**
2.1 Checking the working area and pallet's product			
2.2 Not using the edge of fork to lift pallet's product			
2.3 Put the fork on platform when move pallet's product			
2.4 Reduce step of fork when move pallet's product			
2.5 Adjust the edge of fork when move pallet's product			
2.6 Using the correctly control handle			
2.7 Back-warding when high product on pallet			
2.8 Reduce speed as limit			
2.9 Not reach the body out of forklift			

3.4.2.2 Recorded the safe behavior and unsafe behavior

3.4.2.3 Calculated summary in percentage of safe behavior and make a weekly graph to view trend to correct and inform in Cold storage warehouse

3.4.3 Changed the behavior of forklift driver by using Behavior Based Safety Observation Card (BBS Card Observation) following principles:

3.4.3.1 The positive motivation to change internal behavior to representation to the required external behavior. Based on the ABC principle of stimulation follows:

- Activate give guidelines or instructions to operation in safe behavior

- Behavior to showed the behavior after receive activate

- Consequences to practice the safety behavior

3.4.3.2 The 4 basic rules for the activate safe behavior is Specific On time Real and Appropriate (SORA)

1) Specific to focus on safe behavior that clearly recommend or compliments

2) On time to recommend before the next safe behavior or when taken safety behavior immediately

3) Real to showed sincere and took care

4) Appropriate to recommend with people reasonable and situations

BBS Observation Card

Date ..... Time .....

Area .....

Who .....

BBS ☐ Wearing Personal Protective Equipment (PPE)

☐ Safety regulation in forklift driver

What to see .....

.....

Method ☐ greet ☐ appreciate ☐ remind

Message .....

.....

Response .....

.....

Figure 3-1 Behavior Based Safety Observation Card (BBS Observation Card)

3.4.4 Evaluated of safe behavior

3.4.4.1 Calculated in percentage of the safe behavior from observation the safe behavior and the safe target behavior

3.4.4.2 The number of accidents from risk behavior of forklift driver in a cold storage warehouse

3.4.4.3 The number of near miss report from risk behavior of forklift driver in a cold storage warehouse

3.4.5 Reviewed and continuously improvement

3.3.5.1 Trends of forklift accident from risk behavior and

3.3.5.2 Trends of near miss report from risk behavior

3.3.5.3 Set the other safe target behavior to implement follow up the above step for change the new safe behavior to reduce forklift accident in Cold storage warehouse continuously.

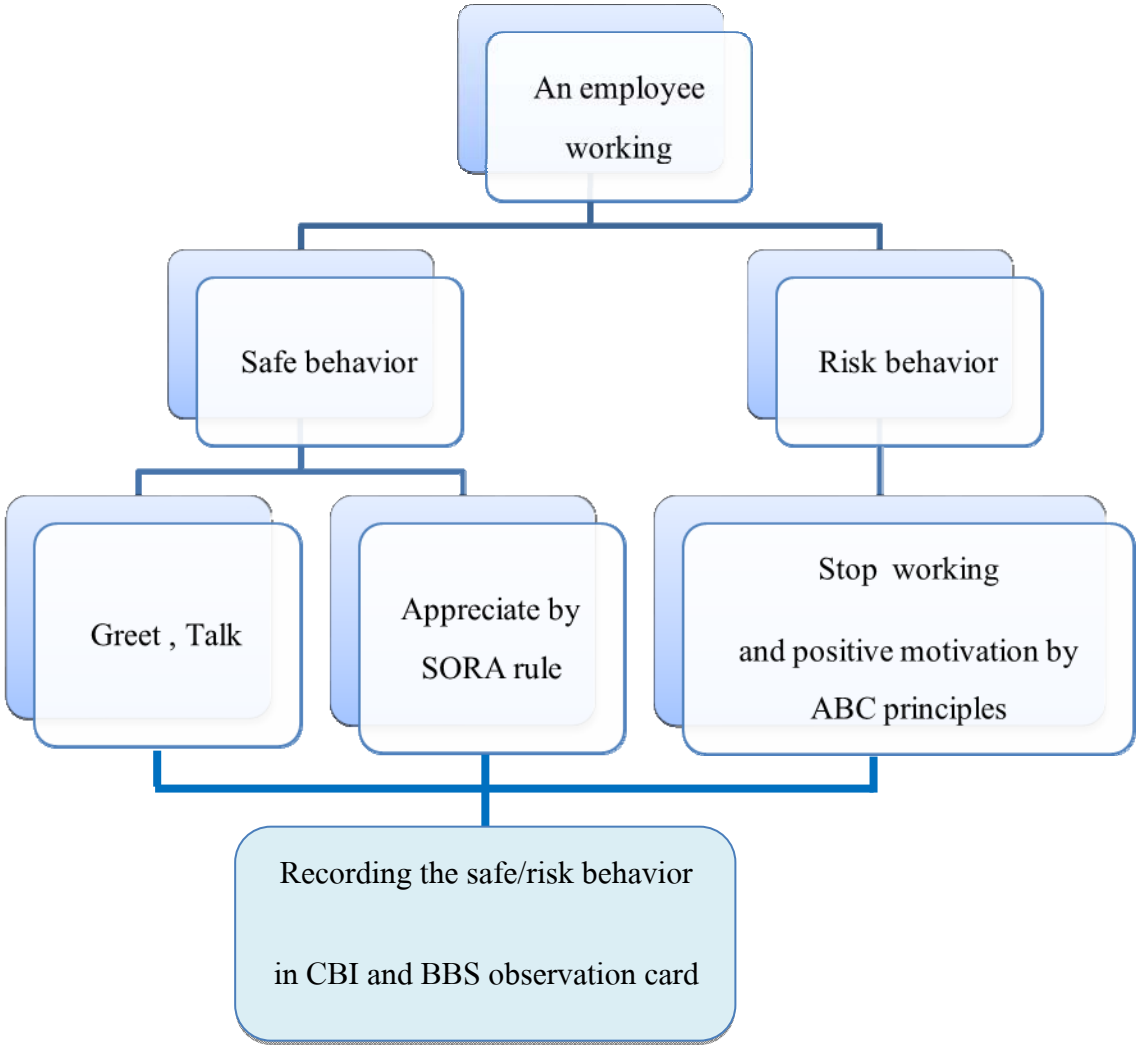


Figure 3-2 Behavior Based Safety process model in CP-Meiji.Co., LTD.

3.5 Evaluated data

3.5.1 Evaluated the safe behavior of forklift driver after applying the Behavior Based Safety (BBS) process by observed the safe behavior and calculated the percent of safety target behavior.

3.5.2 Compared the number of forklift accidents in cold storage warehouse before and after BBS process implemented

3.5.3 Compared the number of near miss report in cold storage warehouse before and after BBS process implemented

3.6 Target areas and period of research

Studies only forklift driver at Cold storage warehouse in CP-Meiji co., Ltd. for a period 3 months from January to March 2015.

3.7 Statistical analysis tools

3.7.1 Using descriptive statistics i.e. frequency percent and the injury or accident frequency rate (IFR) per 20,000 forklift driver working hours

3.7.2 Comparison of the Injury Frequency Rate (IFR) in forklift driver before and after Behavior Based Safety process (BBS) implemented

CHAPTER IV
RESULTS

The study on “An application of Behavior Based Safety process (BBS) in developing safe behavior for forklift drivers in cold storage warehouse (a-case study in CP-Meiij Co., LTD). Using Behavior Based Safety process had the aim of changing risk behavior to safe behavior in forklift drivers. This will be presented according to the step as follows:

1. Information on the studied population of the forklift drivers in cold storage warehouse.
2. Results within each steps of Behavior Based Safety implements phases.
    - 2.1 Identification and set target of safe behaviors
    - 2.2 Observation and record the results
    - 2.3 Behavior Based Safety intervention and change behavior
    - 2.4 Evaluated of safe behaviors

4.1 Information on the studied population of the forklift drivers in cold storage warehouse

The population in this study was 60 males of forklift’s drivers can described follows as:

1. Working hours are 3 shifts : morning shift (time 07.00 – 16.00) , Evening shift (time 15.00 – 24.00) and Night shift (time 23.00 – 08.00)
2. Number of forklift drivers / shift in each cold storage : only 7-8 person
3. Number of observer in each shift : 1 section manager or supervisor

The forklift driver can classify according as follows:

1) Age: A ratio of 10% had age of less than 20 years, 11.67 % between 21-25 years , 8.33% between 26-30 years, 28.33 % between 31-35 years and 41.67 % had the maximum age of higher than 35 years.

2) Education level : Primary school 10 person (16.67%), Junior high school 18 person (30%), High school 13 person (21.67 %), Vocational certificate 11 person (18.33%), High vocational certificate 7 person (11.67%) and Bachelor's degree 1 person (1.66%)

3) Working experience: A ratio of 6.67 % had work experience of less than one year, 28.33 % between 1-3 years, 15.00% between 3-5 years, and 50 % had the maximum work experience of higher than 5 years.

Table 4-1 The number and percentage of personal characteristics be age, education and working experience

Personal characteristics	Number	Percentage
1. Age		
< 20 year	6	10.00
21-25 years	7	11.67
26-30 years	5	8.33
31-35 years	17	28.33
> 35 years	25	41.67
(Min = 18 years, Max =50 years)		
2. Education		
Primary school	10	16.67
Junior high school	18	30.00
High school	13	21.67
Vocational certificate	11	18.33
High vocational certificate	7	11.67
Bachelor's degree	1	1.66
3. Working experience		
< 1 year	4	6.67
1-3 years	17	28.33
3-5 years	9	15.00
>5 years	30	50.00
(Min = 10 months, Max= 24 years)		

4.2 Results within each steps of Behavior Based Safety implementation phases

4.2.1 Step 1: Identification and set target of safe behaviors

Set workshop for forklift drivers and supervisor of cold storage warehouse by brainstorm and identified risk behavior from last 3 years accident analysis (2011-2013) and selected the target behavior with the highest accidents. The target safe behaviors were as follows:

1. Wearing Personal Protective Equipment (PPE)
    - 1.1 Safety helmet
    - 1.2 Chin strap
    - 1.3 Safety shoes
2. Safety regulation in forklift driver
    - 2.1 Checking the working area and pallet's product
    - 2.2 Not using the edge of fork to lift pallet's product
    - 2.3 Put the fork on platform when move pallet's product
    - 2.4 Reduce step of fork when move pallet's product
    - 2.5 Adjust the edge of fork when move pallet's product
    - 2.6 Using the correctly control handle
    - 2.7 Back-warding when high product on pallet
    - 2.8 Reduce speed as limit
    - 2.9 Not reach the body out of forklift

This is shown in Figure 4-1 to 4-10

Figure 4-1 Behavior 1: Wearing PPE (Safety helmet with chin strap and safety shoes)

Figure 4-2 Behavior 2: Checking the working area and pallet's product

Figure 4-3 Behavior 3:Not using the edge of fork to lift pallet's product

Figure 4-4 Behavior 4:Put the fork on platform when move pallet's product

Figure 4-5 Behavior 5: Reduce step of fork when move pallet's product

Figure 4-6 Behavior 6:Adjust the edge of fork when move pallet's product

Figure 4-7 Behavior 7:Using the correctly control handle

Figure 4-8 Behavior 8:Back-warding when high product on pallet

Figure 4-9 Behavior 9:Reduce speed as limit

Figure 4-10 Behavior 10:Not reach the body out of forklift

These 10 target behaviors were communicated to all forklift drivers and Superviosr of Cold storage warehouse by training and recommandation , feedbacking as well as reforcing , such that they agreed to participated in the Behavior Based Safety program positively. All forklift drivers and supervisors then knew and relized how risk behaviors affected their own Safety , Occupational Health and Environment .Because of this realization, forklift drivers therefore agreed to set safe behaviors for themselves.

4.2.2 Step 2 : Observation and recording

The supervisors were trained for positive feedback and behavior observation techniques course (2 class : 30 forklift drivers for each , total 60 forklift drivers) before observed their subordinates. After that they were allowed to make a daily observation of forklift drivers and to measure firklift drivers' performance by using the Critical Behaviors Inventory (CBI). Examples of filled observation form are shown in Table 4-2 (Cold storage factory 1) and Table 4-3 (Cold storage factory 2)

Table 4-2 Examples of filled observation form in Cold storage factory 1

Critical Behaviors Inventory (CBI)

Date 24 February 2015 Start time 09.00 am End time 09.30 am

Area Cold storage 1 Observer name Wimol Wisarapot

1. Wearing Personal Protective Equipment (PPE)	**Safe behavior**	**Risk behavior**	**Safe behavior intervention/ Feedback**
1.1 Safety helmet	8	0	Appreciated
1.2 Chin strap	8	0	Appreciated
1.3 Safety shoes	8	0	Appreciated
2. Safety regulation in forklift driver	**Safe behavior**	**Risk behavior**	**Safe behavior intervention/ Feedback**
2.1 Checking the working area and pallet's product	8	0	Appreciated
2.2 Not using the edge of fork to lift pallet's product	8	0	Appreciated
2.3 Put the fork on platform when move pallet's product	7	1	Appreciated / Stop and advised
2.4 Reduce step of fork when move pallet's product	8	0	Appreciated
2.5 Adjust the edge of fork when move pallet's product	8	0	Appreciated
2.6 Using the correctly control handle	8	0	Appreciated
2.7 Back-warding when high product on pallet	8	0	Appreciated
2.8 Reduce speed as limit	8	0	Appreciated
2.9 Not reach the body out of forklift	8	0	Appreciated

$$\% \text{ safe behavior} = \frac{\text{Total safe behaviors} * 100}{\text{Total safe behaviors} + \text{Risk behavior}} = (87*100)/(87+1) = 98.86\ \%$$

Table 4-3 Examples of filled observation form in Cold storage factory 2

Critical Behaviors Inventory (CBI)

Date 10 February 2015 Start time 09.30 am End time 10.00 am

Area Cold storage 2 Observer name Paroon

1. Wearing Personal Protective Equipment (PPE)	**Safe behavior**	**Risk behavior**	**Safe behavior intervention/ Feedback**
1.1 Safety helmet	7	1	Appreciated/ Stop and advised
1.2 Chin strap	7	1	Appreciated / Stop and advised
1.3 Safety shoes	8	0	Appreciated
2. Safety regulation in forklift driver	**Safe behavior**	**Risk behavior**	**Safe behavior intervention/ Feedback**
2.1 Checking the working area and pallet's product	8	0	Appreciated
2.2 Not using the edge of fork to lift pallet's product	8	0	Appreciated
2.3 Put the fork on platform when move pallet's product	7	1	Appreciated / Stop and advised
2.4 Reduce step of fork when move pallet's product	8	0	Appreciated
2.5 Adjust the edge of fork when move pallet's product	8	0	Appreciated
2.6 Using the correctly control handle	8	0	Appreciated
2.7 Back-warding when high product on pallet	8	0	Appreciated
2.8 Reduce speed as limit	8	0	Appreciated
2.9 Not reach the body out of forklift	8	0	Appreciated

% safe behavior = $\frac{\text{Total safe behaviors * 100}}{\text{Total safe behaviors + Risk}}$ = (85*100) /(85+3) = 96.59 %

Using this daily observation indicating the performance of forklift drivers in cold storage 1 and 2 , the performance of all forklift drivers were plotted as a graph to display the overall performance of that daily and was shown as an example in Figure 4-11. After 2 months, it was found that 100 % safe behavior was obtained for all target behaviors.

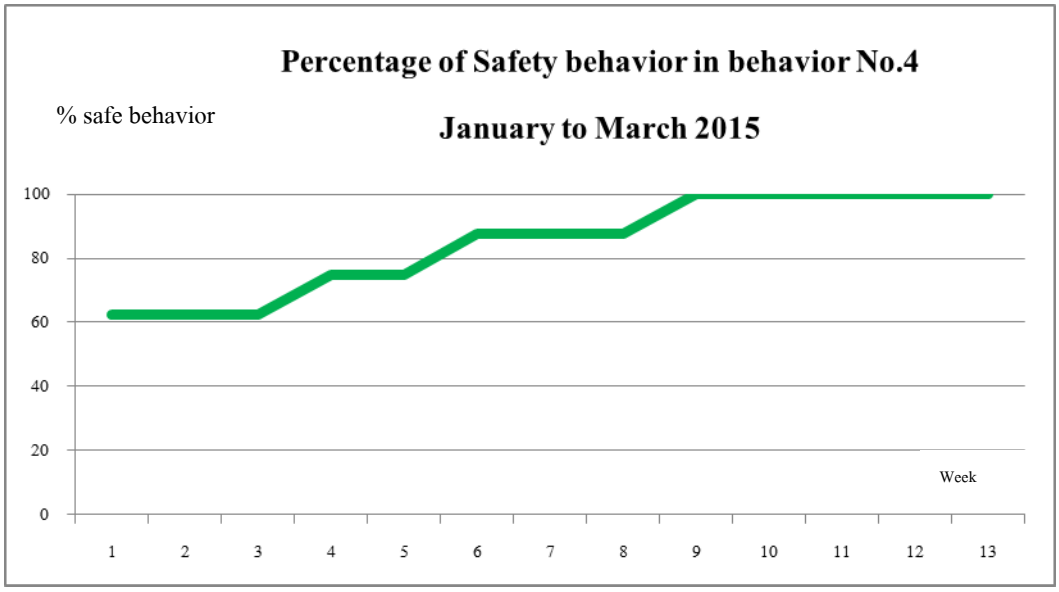


Figure 4-11 An example for weekly safety observation behavior 4 (put the fork on platform when move pallet's product) on January to March 2015 in Cold storage factory 1

Observation during a period of 3 months shown that the forklift drivers had good performance such that 100 % safe behaviors were obtained for all target behaviors. These as shown in Figure 4-11 from January to March 2015. All the behavior observation resulted of each target behaviors were shown in Appendix A (Figure A1 to Figure A20)

An adaption period to Behavior Based Safety program of 3 months after observatoins can be seen from the above results.This was shown in Table 4-4 and 4-5. The resulted in cold storage warehouse 1, safe behavior scores in wearing safety helmet , chin trap and put the fork on plateform when move's pallet product are lower standard (80 %) ,the scores are 67.71 , 70.83 and 67.71 % respectatives and the scores in target behavior of wearing safety shoes , not using the edge of fork to lift

pallet's product, adjust the edge of fork when move pallet's product and using the correctly control handle are increased 100 % in 1 month. In cold storage warehouse 2, safe behavior scores in wearing safety helmet , chin trap, put the fork on plateform when move's pallet product and back-warding when high product on pallet are lower standard (80 %) ,the scores are 70.83 , 68.75, 68.75 and 79.17 % respectatives and the scores in target behavior of checking the working area and pallet's product, not using the edge of fork to lift pallet's product, adjust the edge of fork when move pallet's product and using the correctly control handle are increased 100 % in 1 month.

Table 4-4 Summary of safe behavior observation of each behaviors in cold storage warehouse 1 in 3 shifts

Target behaviors	**Safe behavior scores (%)**			**% Behavior development**
	Jan	**Feb**	**Mar**	
1.Wearing Personal Protective Equipment	67.71	83.33	100	16.15
1.1 Safety helmet	70.83	82.29	100	14.59
1.2 chin strap	86.46	100	100	13.54
1.3 safety shoes	88.54	98.96	100	5.73
2.Checking the working area and pallet's product	89.58	100	100	10.42
3. Not using the edge of fork to lift pallet's product	67.71	88.54	100	16.15
4. Put the fork on platform when move pallet's product	86.46	98.96	100	13.54
5. Reduce step of fork when move pallet's product	90.63	100	100	9.37
6. Adjust the edge of fork when move pallet's product	91.67	100	100	8.33
7. Using the correctly control handle	80.21	96.88	100	9.89
8. Back-warding when high product on pallet	89.58	98.96	100	5.21
9. Not reach the body out of forklift	82.29	98.96	100	8.86
10. Reduce speed as limit				
Total % monthly safe behavior	**82.64**	**95.57**	**100**	**8.68**

Table 4-5 Summary of safe behavior observation of each behaviors in cold storage warehouse 2 in 3 shifts

Target behaviors	Safe behavior scores (%)			% Behavior development
	Jan	Feb	Mar	
1.Wearing Personal Protective Equipment (PPE) such as				
1.1 Safety helmet	70.83	90.63	100	14.59
1.2 chin strap	68.75	87.50	100	15.63
1.3 safety shoes	87.50	87.50	100	12.50
2. Checking the working area and pallet's product	86.64	100	100	13.54
3. Not using the edge of fork to lift pallet's product	86.64	100	100	13.54
4. Put the fork on platform when move pallet's product	68.75	87.50	100	15.63
5. Reduce step of fork when move pallet's product	85.42	96.88	100	7.29
6. Adjust the edge of fork when move pallet's product	86.46	100	100	13.54
7. Using the correctly control handle	87.50	100	100	12.50
8. Back-warding when high product on pallet	79.17	95.83	100	10.42
9. Not reach the body out of forklift	92.71	97.92	100	3.65
10. Reduce speed as limit	83.33	92.71	100	8.34
Total % monthly safe behavior	**81.94**	**95.75**	**100**	**9.03**

Remark: % behavior development calculated from 100% - the percentage of Jan and divied with the number of month less than 100% follow as

% behavior development of safet helmet = (100% -70.83%)/2

= 14.59

4.2.3 Step 3 : Behavior Intervention

3.1 Behavior intervention program

This study utilized the method of daily coaching and observation th changing risk behaviors. Supervisors were asked to observe behaviors as well as positive feedback of each of forklift drivers under his responsibility and to record observation daily. Immediately action was expected as soon as risk behavior were found.Safety talk was organized every morning, together with a graphical display on board. This was done to give feedback to forklift drivers such that forklift drivers knew their performance and change their behaviors

3.2 Behavior encouraging program

Behavior encouraging program was performed by giving reward through motivative activities such as compliant safety competition for outstanding safe forklift drivers, KYT, Morning talk and Safety talk , etc. Photos shown morning activities to change and encourage behavior are shown below.

Figure 4-12 Morning talk activity

All forklift drivers in Cold storage warehouse had a morning talk before start working in every shift as shown in Figure 4-13

Figure 4-13 Safety talk activity by supervisor

Figure 4-13 Supervisors were leaders in Safety activities such as Safety talk , learning accident cases , conclusion of results from yesterday and giving feedback to forklift drivers. And supervisors reported yesterday observation results to forklift drivers and gave compliments to good performance forklift drivers and feedback to risk behavior by positive approach. This was done also by listening to comments from all forklift drivers allowing to present feedback to each other.Therefore forklift drivers took care of each others, accepted safety program and behaved accordingly. And forklift drivers jointed each other and shout “slogan to reduce accident of forklift by using KYT , Zero accident O.K.” to encourage each other to work safety after that they performed their assigned duty. KYT shown in Figure 4-14 KYT activity

Figure 4-14 Kiken Yoshi Training (KYT) activity

Rewards were sorted in to 3 levels :

1. Monthly incentive for forklift drivers no accident of forklift.
2. Every 6 months to selected the best of forklift drivers no accident of forklift , and safe behavior.
3. Every year to selected the best of forklift drivers no accident of forklift and safe behavior and the leader to appriated the other forklift drivers when found the safe behavior and warning when found the risk behavior.

Figure 4-15 shown giving a reward and certicated to outstanding forklift driver

Figure 4-15 shown the Factory Manager and advisor of Safety, Occupational health and Environmental committes giving a reward and certificated to outstanding forklift driver with the highest behavior scores and without any forklift accidents occurred within 6 months and change the safety helmet from white color to yellow. The best forklift drivers of the year to change the safety helmet to green color. This activities would also affect positively toward performance evaluation.

4.2.2 Step 4 : Evaluated of safe behavior

4.1 Results from safe behavior observation of each behaviors

60 forklift drivers in cold storage warehouse whom were observed daily had overall preformance of 100% safe behavior starting from the first week of 3rd month. This 100% safe behavior continued after rewards as shown in Figure 4-16

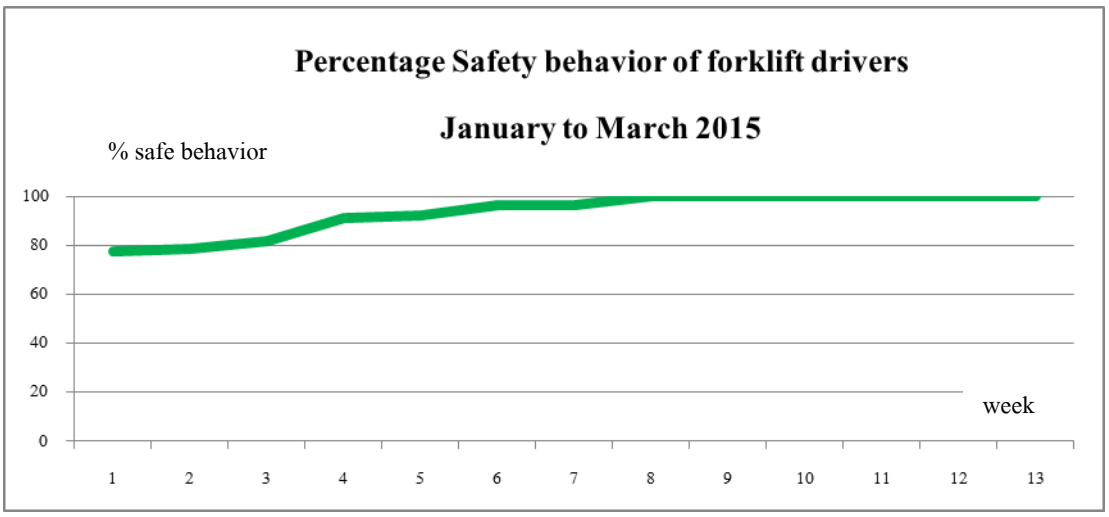


Figure 4-16 shown % safe behavior from January - March 2015

4.2 Accidents frequency rate after implementing Behavior Based Safety process

Behavior Based Safety was used to change risk behavior of forklift drivers into safe behaviors. Results conducted during January to March 2015 the accident rate caused by risk behavior of forklift drivers were continually reduced after implementd Behavior Based Safety

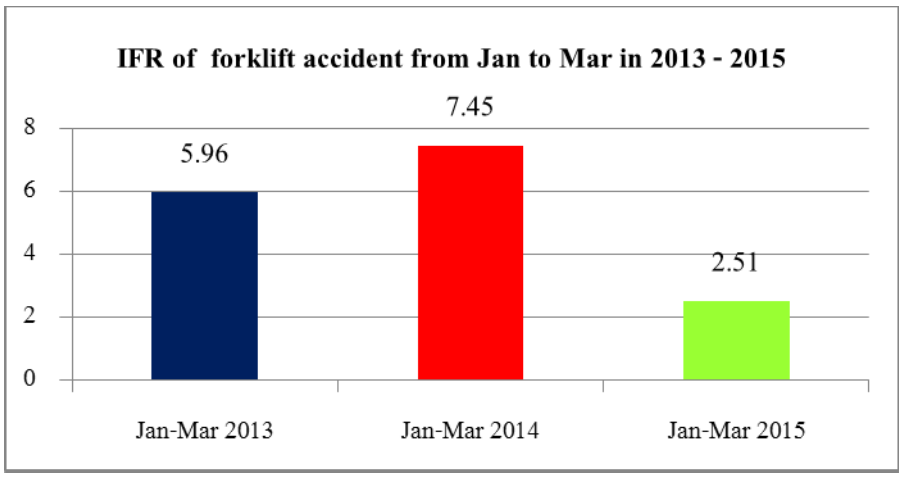


Figure 4-17 shown IFR of forklift accident from Jan 2013 – Mar 2015

Accidents in cold storage warehouse from risk behavior in forklift driver trend to decreased. This Shown in Figure 4-17 and was the measurement of forklift accident case per 20,000 forklift drivers working hours. Before implementing Behavior Based Safety in January to March of 2013 to 2014 accident were 5.96 ,7.45 cases respectively after implement Behavior Based Safety from January to March 2015 , forklift accidents rate reduced to 2.51.

4.3 Near miss report from unsafe action or risk behavior of forklift's drivers

Behavior Based Safety was used to change risk behavior of forklift drivers into safe behaviors. Results conducted during January to March 2015 the number of near miss report were continually reduced after implementd Behavior Based Safety.

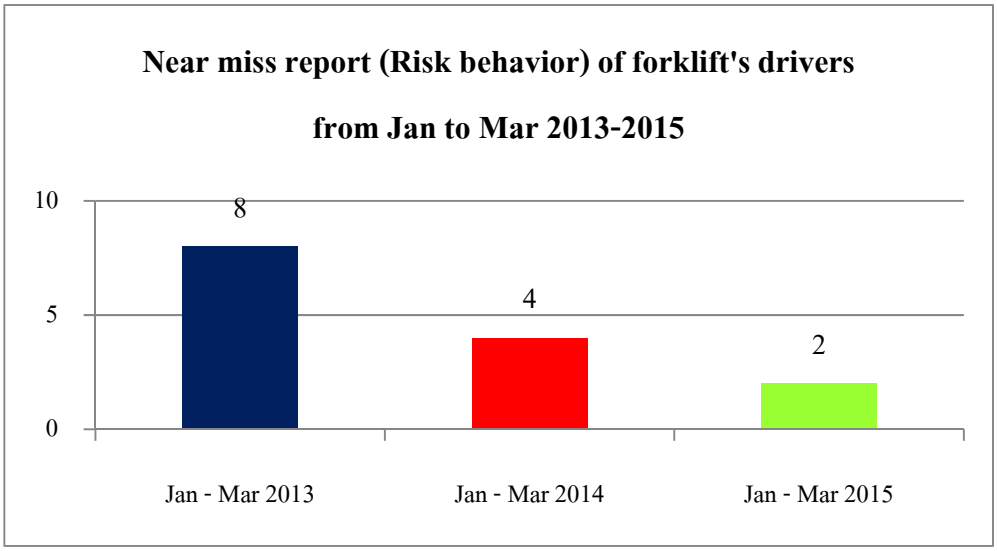


Figure 4-18 shown near miss report from risk behavior of forklift's drivers from Jan 2013 – Mar 2015

Near miss report in Cold storage warehouse from risk behavior in forklift driver trend to decreased. This Shown in Figure 4-18. Before implementing Behavior Based Safety during January to March 0f 2013- 2014 near miss report were 8, 4 cases after implement Behavior Based Safety from January to March 2015 , near miss report reduced to 2 cases.

4.4 Make Behavior Based Safety manual to training the forklift's drivers

The manual is 6 topic follows :

4.4.1 Definition of incident , accident and near miss

4.4.2 Causes and loss of incident , accident and near miss

4.4.3 Workshop of nearmiss to find near miss from unsafe action and unsafe condition ane recording in near miss report

4.4.4 Definition and step of Behavior Based Safety

4.4.5 How to change risk behavior to safe behavior when found employee working in workplace (greeting , talking , appreciate and positive recommand) and example

4.4.6 Workshop BBS to found unsafe action ane record in Critical Behavior Index (CBI) form and BBS card

In conclusion, forklift accidents from risk behaviors of forklift drivers were reduced after implementing Behavior Based Safety process.

CHAPTER V
DISCUSSION

BBS was applied in this study on the development of safe behavior in forklift drivers in cold storage warehouse of CP-Meiji Co., LTD. in order to reduce the number of forklift accidents occurred in the cold storage warehouse department.

5.1 General discussion

5.1.1 Human error due to the observer's not record data in Critical Behavior Based Safety Index (CBI) and the observer's not feedback immediately when found risk behavior. To solved by attend training courses in near miss and Behavior Based Safety process to observer and make BBS manual with an example of safe behavior , risk behavior and positive feedback (greet , talk , appreciate , positive motivation)

5.1.2 Instrument error. The Critical Behavior Based Safety Index (CBI) was created from past forklift accident in cold storage of CP-Meiji Co., LTD. It used only this study. For further study to change safe target behavior of target group.

5.2 Discussion of results

5.2.1 Identification and set safety target behaviors

This was the first step in BBS with the aim of searching risk behaviors to forklift accidents. Risk behaviors inventory based on the forklift accidents record for the last years in cold storage warehouse department. Safe target behaviors selected from highest forklift accidents in the past 10 items. This was done according to step 1 in Chapter III and results are shown in Chapter IV. 10 Safe behaviors were implemented during January to March 2015. All these 10 safe target behaviors were admitted and agreed by all concerned people in Cold storage warehouse department.

5.2.2 Behaviors observation

In this study, behaviors observation according to BBS was performed using a Critical Behavior Index (CBI) to measured weekly safety which based on each behavior. And plotted on a weekly basis. Percentage safe behavior was then calculated and used to evaluated the effectiveness of this program.

It was found from table 4-4, the forklift drivers in cold storage 1 for only 1 month that there were still some safe behaviors. Percentage safe behavior of each behavior in this case was 86.64 – 91.67 % whereas percentage of improvement was mainly 8.33 – 13.54 %. For some case, e.g., the target safe behavior number 1.3 wear safety shoes , 2.2 Not using the edge of fork to lift pallet's product , 2.5 Adjust the edge of fork when move pallet's product and 2.6 using the correctly control handle. The forklift drivers can behave accordingly for as high as 100 % since the end of first month.

And the forklift drivers in cold storage 2. It was found from table 4-5, for only 1 month that there were still some safe behaviors. Percentage safe behavior of each behavior in this case was 86.46 – 87.50 % whereas percentage of improvement was mainly 12.50 – 13.54 %. For some case, e.g., the target safe behavior number 1.3 wear safety shoes , 2.1 checking the working area and pallet's product, 2.2 Not using the edge of fork to lift pallet's product , 2.5 Adjust the edge of fork when move pallet's product and 2.6 using the correctly control handle. The forklift drivers can behave accordingly for as high as 100 % since the end of first month. The number 1.3 , 2.2 , 2.5 and 2.6 were similar safe behavior in cold storage warehouse.

5.2.3 Behavior Intervention

Behavior Intervention, which is done together with behavior observation by supervisor, the observer to modifying the risk behaviors into the safe behaviors. Serveral activities were organized in order to persude forklift drivers to positvely participate in this program and increase the safety attitude and relized in forklift drivers.

Intervention starts since BBS implement. The forklift's drivers in cold storage warehouse 1 and 2 were allowed to identified the risk behavior from last forklift accidents by brainstromming workshop. Behaviors were observed and each target behavior was plotted on weekly basis such that forklift's drivers realized their performance. Intervention will trend to an effective performance for each target behaviors as seen an observation form.

Supervior of cold stroage warehouse were trained how to give feedback when found the risk behavior by positive approach and using the question to increase the safety attitude or relize in risk behaviors. Feedback therefore make forklift's drivers understand the importance of safety working and increase safety awareness into forklift's drivers. Activities were as follows:

5.2.3.1 Morning activity : morning talk , safety talk and inform the summarization of safety observation found yesterday to forklift's drivers. The activity would make the forklift's drivers get safety awareness and would persude them to change the risk behaviors to safe behavior by the other ones when receive compliments from supervisor or colleague. This activity would be encouragement safety awareness in working and increasesd percentage safe behavior to 100 % in finally.

5.2.3.2 Feedback activity: Supervisors would gave feedback to forklift's drivers when found the risk behaviors and suggestion to safe behaviors.The suggestion was given such that forklift's drivers truly understood the effect of risk behavior to injury. The forklift's drivers would like to change the risk behavoir. It is belived in thos study that, whenever forklift's drivers realized the importance of safety , they will behave safely whether there are supervisors obeserve them or not.

5.2.4 Safe behavior development, and forklift accident frequency rate and near miss report results.

According to the study in reducing the number of forklift accident and near miss report in working, results as mentioned in Chapter IV. This discussion as follows:

5.2.4.1 Forklift accidents frequency rate

By observing behavior modification in study from January to March 2015 , percentage in safe behavior attain 100 % in 2 months and there is a trend of decreasining number of forklift accident frequency rate, case per 20,000 forklift drivers working hours of 7.45 cases (before BBS) VS. 2.51 cases (after BBS). Possibly forklift drivers may be in the period of adapting themselves into this program.

5.2.4.2 Near miss report

The number of near miss report from risk behavior in forklift's driver in study are reducing from 8 cases (before BBS) in 2014 VS. 2 cases

(after BBS) in January to March 2015. Possibly the forklift's drivers to change the risk bahavior to safe behavior in study period.

From this study, application of BBS can improve safe behaviors in forklift's drivers and an forklift accident frequency rate rate and the number of near miss report from risk behavior in forklift's drivers is reduced. These results are shown previously in Chapter IV.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

It can be concluded from the results of this study that the application of Behavior Based Safety,BBS confirmed to develop safe behavior in among forklift's driver. Results are demonstrated interm of the improvement of forklift's driver have safe behavior, the forklift accident frequency rate (IFR) of forklift's drivers and the reduction of near miss report of risk behavior in forklift's driver.

The BBS process itselfs also motivated the safety awareness via setting up safe target behaviors. After the implementation of BBS for 3 months, the forklift drivers were able to show safe behavior for 10 safe target behaviors. The behavior observation and positive suggestion can there for adjust risk behaviors to safe behaviors.

It is found that a forklift accident frequency rate was reduce from 7.45 cases per 20,000 forklift drivers working hours to 2.51 cases per 20,000 forklift drivers working hours. It can be identified for risk behaviors, the observing behavior and the effective intervention can reduce a number of forklift accidents.

While, the near miss report from unsafe action of forklift's driver was reduced from 4 cases to 2 cases after the implemaentation of BBS.

6.2 Recommendation for further study

6.2.1 Interm of the sustainability in the improvement of safe behavior, the observational period should be longer ie. 1 year. It should be periodically evaluated program. The evaluation could be planned for every 3 months to collect the profile of safe behaviors.New and safe behaviors might be performed to ensure Zero accident.

6.2.2 In this study the forklift's drivers might notice the observtion by supervisors or section manager. They might not perform their own actual behavior. To

ensure that the forklift's drivers could comply the safety target behavior, the safety rule in forklift and the continuously implementation should be acheived.

6.2.3 The BBS should be implemented in all department with the individual safe behavior.

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APPENDICES

APPENDIX A
RESULTS OF FORKLIFT DRIVER IN 10 TARGET BEHAVIORS

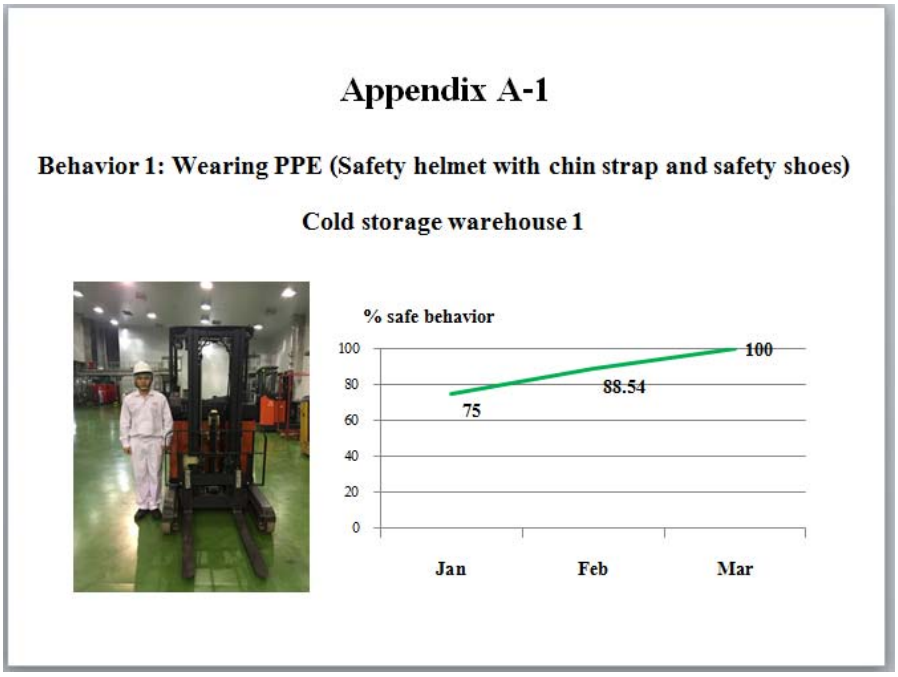


Figure A-1 Behavior 1 –Cold storage warehouse1

Appendix A-2

Behavior 2: Checking the working area and pallet's product

Cold storage warehouse 1

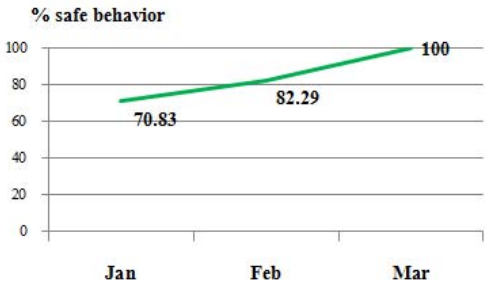


Figure A-2 Behavior 2 –Cold storage warehouse1

Appendix A-3

Behavior 3:Not using the edge of fork to lift pallet's product

Cold storage warehouse 1

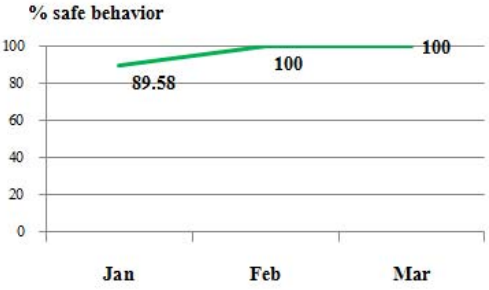


Figure A-3 Behavior 3 –Cold storage warehouse1

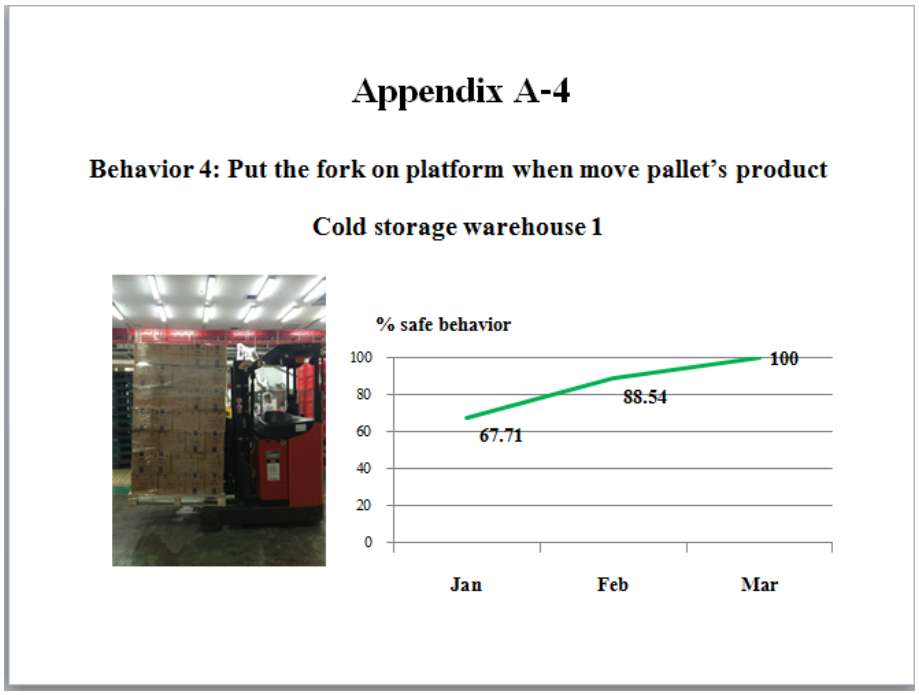


Figure A-4 Behavior 4 –Cold storage warehouse1

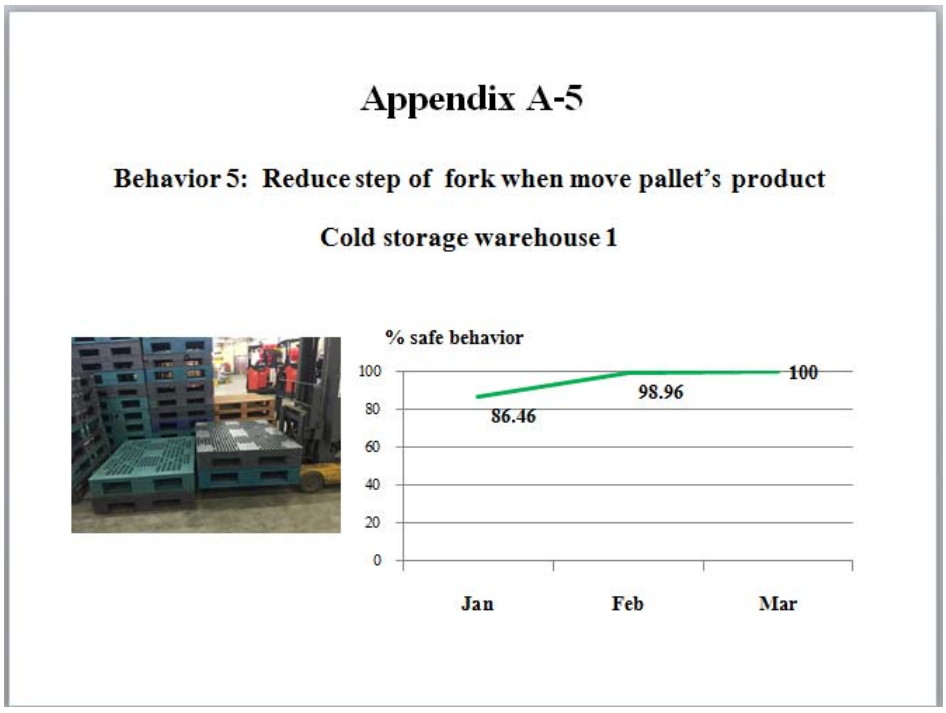


Figure A-5 Behavior 5 –Cold storage warehouse1

Appendix A-6

Behavior 6:Adjust the edge of fork when move pallet's product

Cold storage warehouse 1

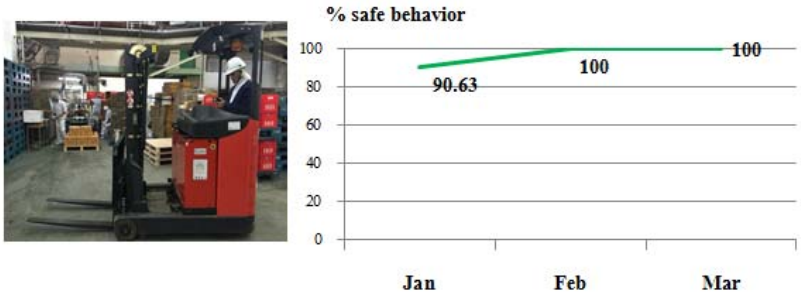


Figure A-6 Behavior 6 –Cold storage warehouse1

Appendix A-7

Behavior 7: Using the correctly control handle

Cold storage warehouse 1

Figure A-7 Behavior 7 –Cold storage warehouse1

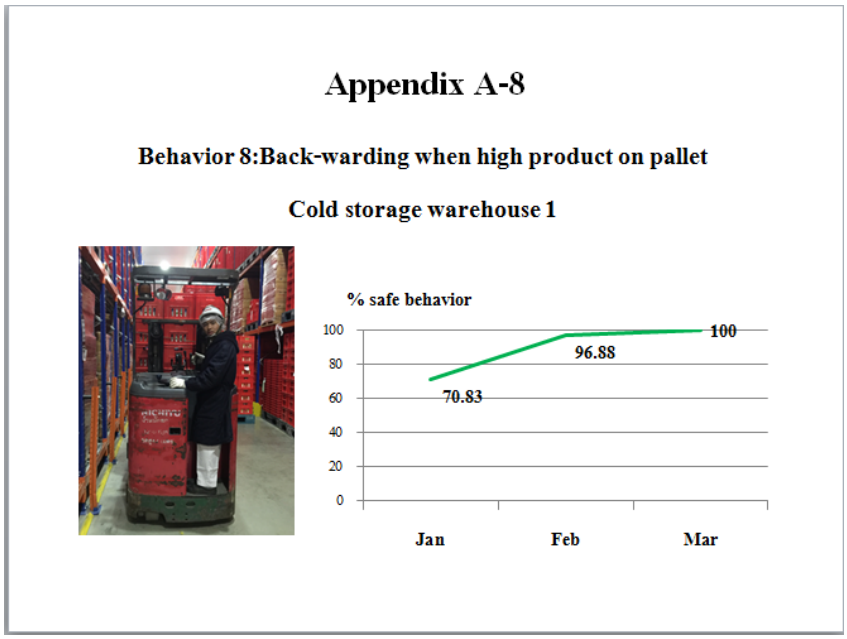


Figure A-8 Behavior 8 –Cold storage warehouse1

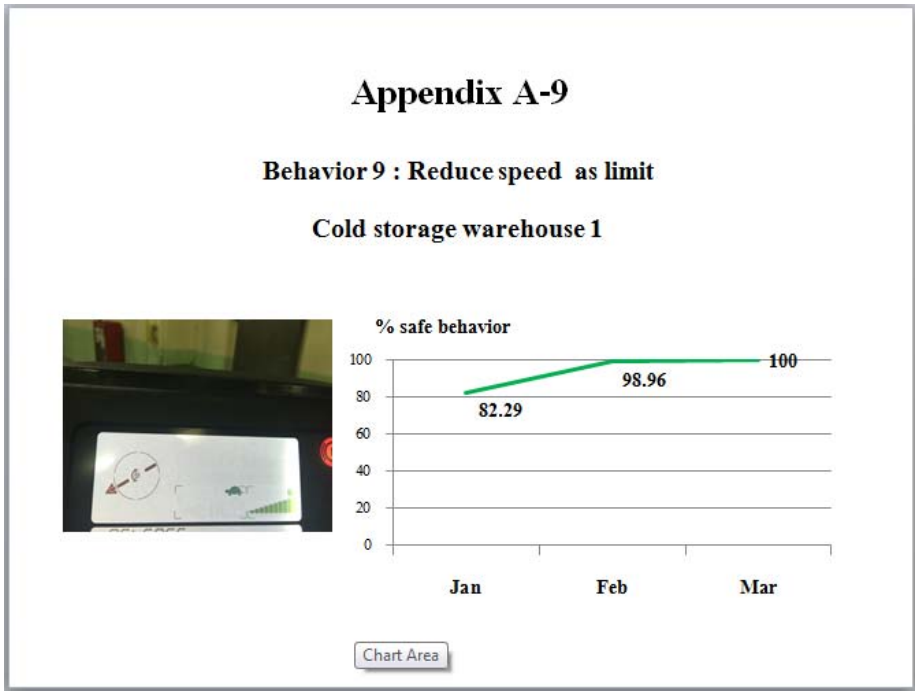


Figure A-9 Behavior 9 –Cold storage warehouse1

Appendix A-10

Behavior 10:Not reach the body out of forklift

Cold storage warehouse 1

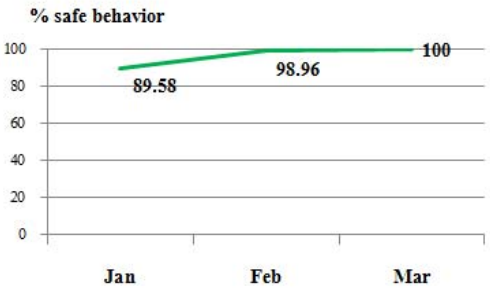


Figure A-10 Behavior 10 –Cold storage warehouse1

Appendix A-11

Behavior 1: Wearing PPE (Safety helmet with chin strap and safety shoes)

Cold storage warehouse 2

Figure A-11 Behavior 1 –Cold storage warehouse2

Appendix A-12

Behavior 2: Checking the working area and pallet's product

Cold storage warehouse 2

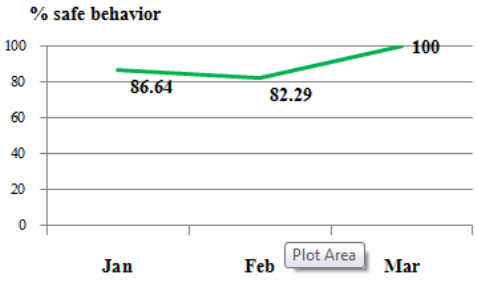


Figure A-12 Behavior 2 –Cold storage warehouse2

Appendix A-13

Behavior 3:Not using the edge of fork to lift pallet's product

Cold storage warehouse 2

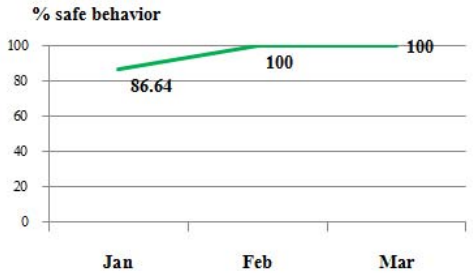


Figure A-13 Behavior 3 –Cold storage warehouse2

Appendix A-14

Behavior 4: Put the fork on platform when move pallet's product

Cold storage warehouse 2

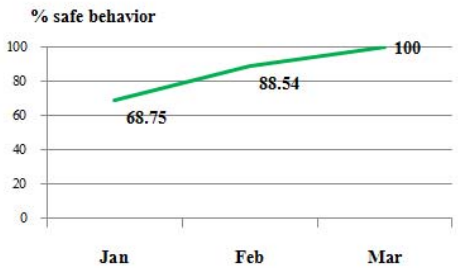


Figure A-14 Behavior 4 –Cold storage warehouse2

Appendix A-15

Behavior 5: Reduce step of fork when move pallet's product

Cold storage warehouse 2

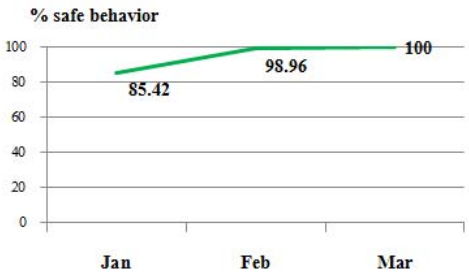


Figure A-15 Behavior 5 –Cold storage warehouse2

Appendix A-16

Behavior 6:Adjust the edge of fork when move pallet's product

Cold storage warehouse 2

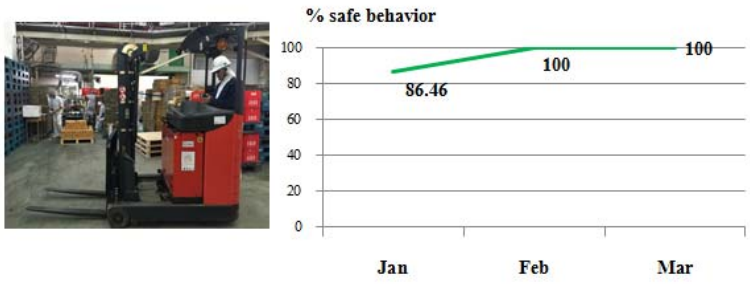


Figure A-16 Behavior 6 –Cold storage warehouse2

Appendix A-17

Behavior 7: Using the correctly control handle

Cold storage warehouse 2

Figure A-17 Behavior 7 –Cold storage warehouse2

Appendix A-18

Behavior 8:Back-warding when high product on pallet

Cold storage warehouse 2

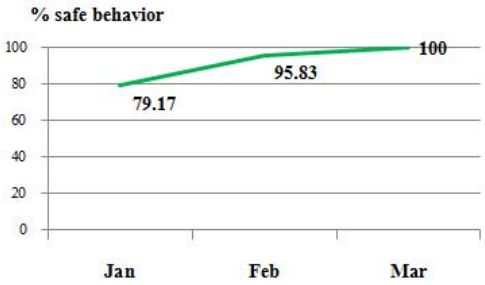
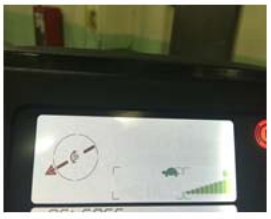


Figure A-18 Behavior 8 –Cold storage warehouse2

Appendix A-19

Behavior 9 : Reduce speed as limit

Cold storage warehouse 2



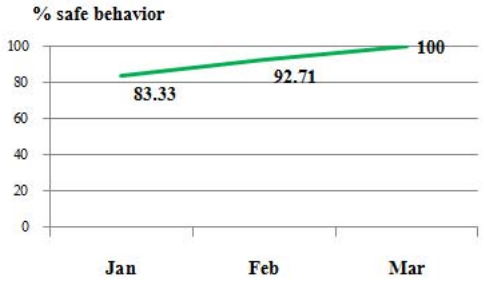


Figure A-19 Behavior 9 –Cold storage warehouse2

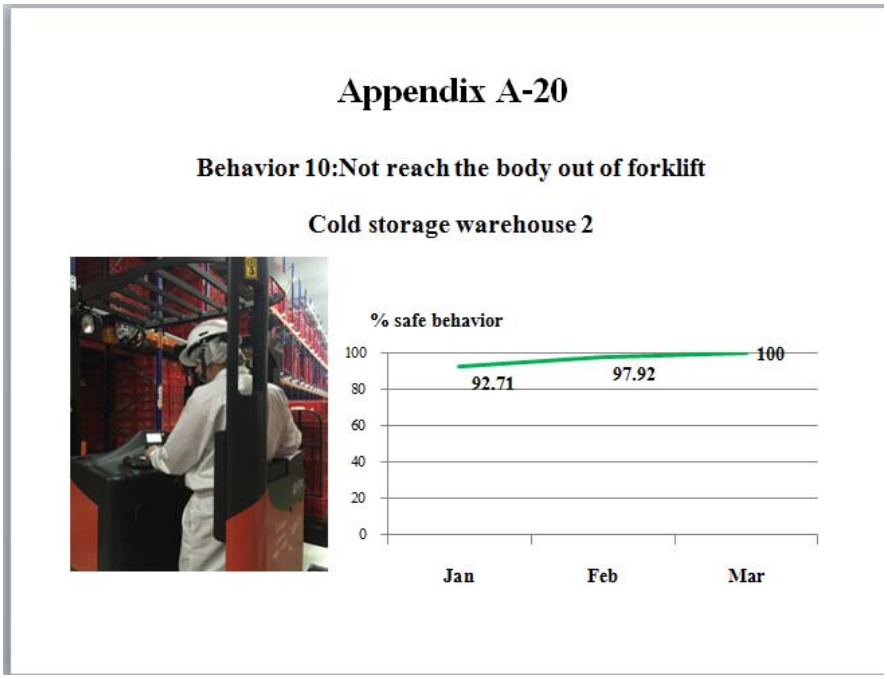


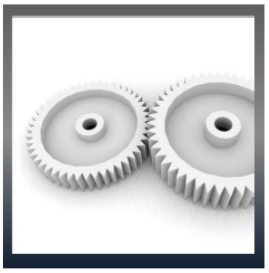
Figure A-20 Behavior 10 –Cold storage warehouse2

APPENDIX B

NEAR MISS & BEHAVIOR BASED SAFETY MANUAL

หัวข้ออบรม

1. นิยามอุบัติการณ์ อุบัติเหตุ เหตุการณ์เกือบเกิดอุบัติเหตุ
2. ความสูญเสียของอุบัติการณ์
3. สาเหตุความสูญเสียจากอุบัติการณ์
4. การรายงานเหตุการณ์เกือบเกิดอุบัติเหตุ (Near miss)
5. Work shop
6. Behavior Based Safety (BBS)
7. การติดตามผลพฤติกรรมเสี่ยงหรือพฤติกรรมที่ไม่ปลอดภัย



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นิยามอุบัติการณ์ (Incident)

อุบัติการณ์หรือเหตุการณ์ผิดปกติ (Incident) หมายถึง เหตุการณ์ที่ไม่พึงประสงค์แต่เมื่อเกิดขึ้นแล้ว***มีผล***ทำให้คนเกิดอุบัติเหตุ (Accident) หรือหมายถึงเหตุการณ์ที่เกือบเกิดอุบัติเหตุ (Near miss)

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นิยามอุบัติเหตุ (Accident)

อุบัติเหตุ (Accident) หมายถึง เหตุการณ์ที่ไม่พึงประสงค์ที่อาจจะเกิดขึ้นโดยบังเอิญ ไม่ได้คาดคิดไว้ล่วงหน้าหรือไม่ทราบล่วงหน้า และหรือขาดการควบคุม แต่เมื่อเกิดขึ้นแล้ว***มีผล*** ทำให้คนเกิดการบาดเจ็บหรือเจ็บป่วยจากการทำงาน พิการ หรือเสียชีวิตจากการทำงาน หรือเกิดความสูญเสียต่อทรัพย์สิน หรือความเสียหายต่อสภาพแวดล้อมหรือต่อสาธารณชน

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นิยามเหตุการณ์เกือบเกิดอุบัติเหตุ (Near miss)

เหตุการณ์เกือบเกิดอุบัติเหตุ หรือเฉียด (Near miss)
หมายถึง เหตุการณ์ที่ไม่พึงประสงค์ที่อาจจะเกิดขึ้นโดยบังเอิญ ไม่ได้คาดคิดไว้ล่วงหน้าหรือไม่ทราบล่วงหน้า และหรือขาดการควบคุม แต่เมื่อเกิดขึ้นแล้ว***ไม่มีผล***ทำให้คนเกิดการบาดเจ็บหรือเจ็บป่วยจากการทำงาน พิการ หรือเสียชีวิตจากการทำงาน หรือเกิดความสูญเสียต่อทรัพย์สิน หรือความเสียหายต่อสภาพแวดล้อมหรือต่อสาธารณชน แต่เหตุการณ์นั้นสามารถนำไปสู่การเกิดอุบัติเหตุ (Accident) ได้

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อัตราส่วนการเกิดอุบัติการณ์

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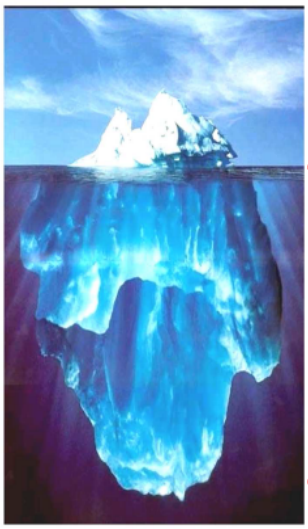
ความสูญเสียของอุบัติการณ์



การสูญเสียทางตรง 10 %

การสูญเสียทางอ้อม 90 %

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ความสูญเสียทางตรง

- ค่ารักษาพยาบาล
- ค่าเงินทดแทน
- ค่าทำขวัญ
- ค่าทำศพ
- ค่าประกันชีวิต

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ความสูญเสียทางอ้อม

- การสูญเสียเวลาทำงานของพนักงานที่บาดเจ็บ เพื่อร่วมงานและหัวหน้างานหรือผู้บังคับบัญชา
- ค่าใช้จ่ายซ่อมแซมเครื่องจักร เครื่องมือ อุปกรณ์ที่ได้รับความเสียหาย
- วัตถุดิบหรือสินค้าที่ได้รับความเสียหาย
- ผลผลิตลดลงเนื่องจากการผลิตหยุดชะงัก
- ค่าสวัสดิการต่าง ๆ ของพนักงานที่ได้รับบาดเจ็บ
- บริษัทสูญเสียชื่อเสียงและภาพพจน์

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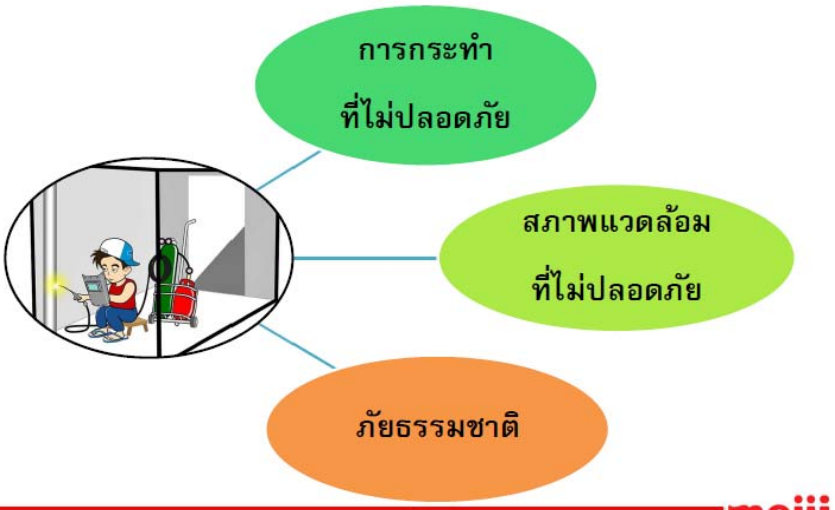
สาเหตุของอุบัติการณ์



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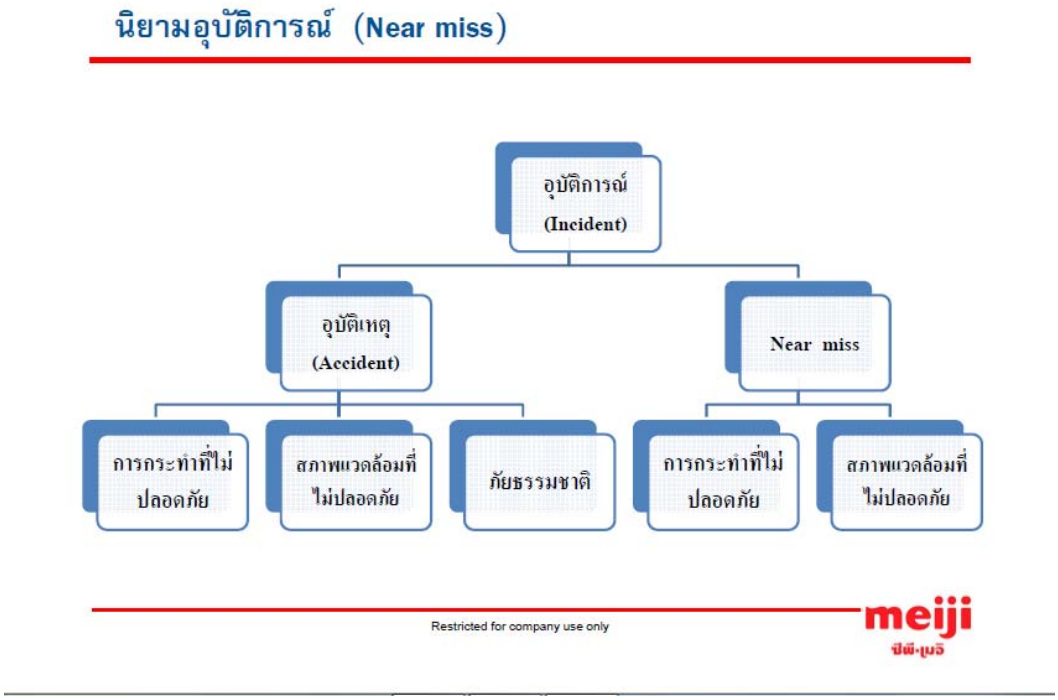
นิยามอุบัติการณ์ (Near miss)
อุบัติการณ์ (Incident)
อุบัติเหตุ (Accident)
Near miss
การกระทำที่ไม่ปลอดภัย
สภาพแวดล้อมที่ไม่ปลอดภัย
ภัยธรรมชาติ
การกระทำที่ไม่ปลอดภัย
สภาพแวดล้อมที่ไม่ปลอดภัย
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การรายงานNear miss
พบสิ่งที่ไม่ปลอดภัย/Near miss
การกระทำที่ไม่ปลอดภัย (Unsafe Action)
สั่งหยุดงานทันทีและสอนวิธีการทำงานที่ถูกต้อง
ทำ One Point Lesson (OPL)
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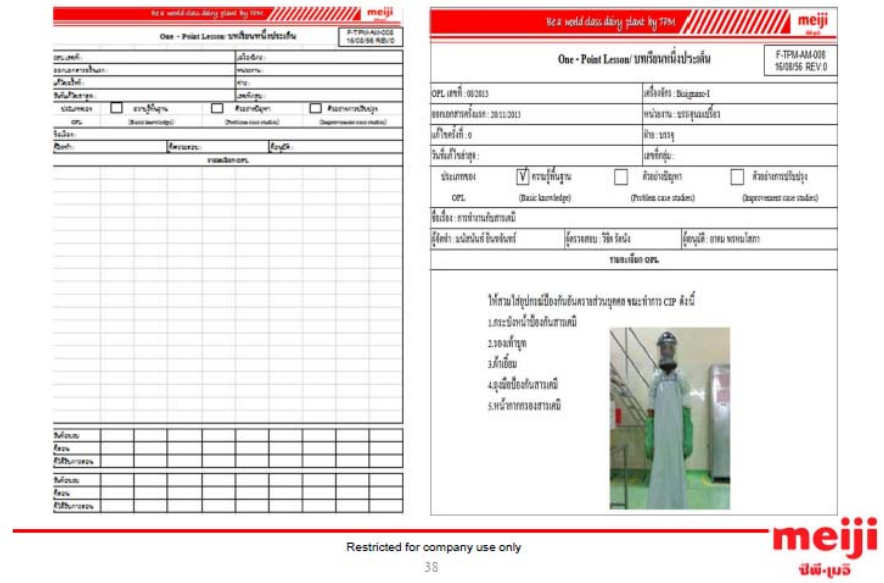
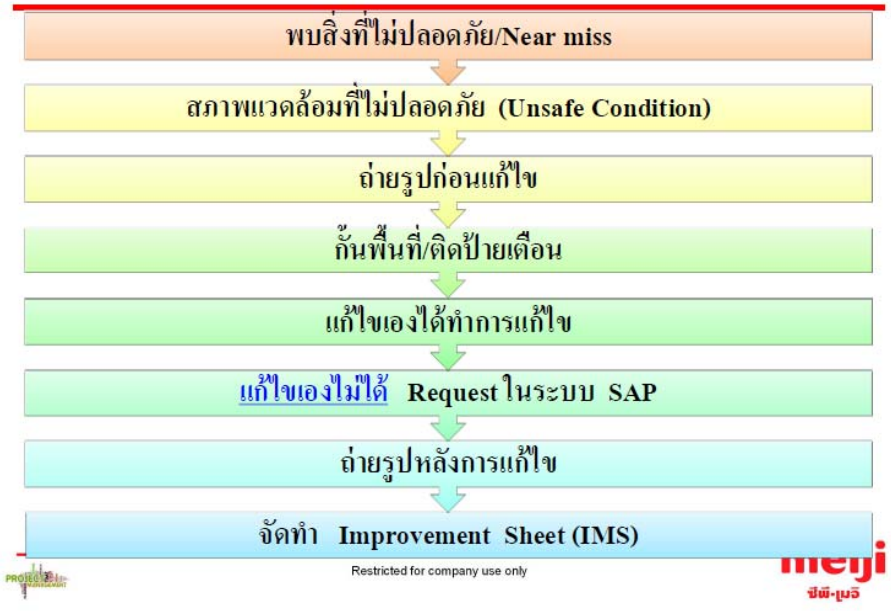
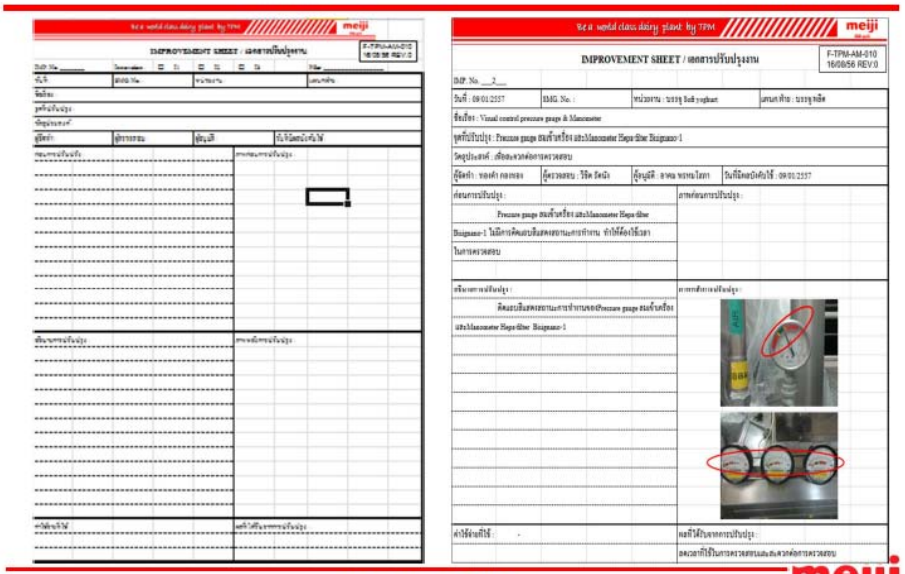
ตัวอย่าง One Point Lesson (OPL)



การตรวจความปลอดภัยโดยหัวหน้างาน



ตัวอย่าง Improvement Sheet (IMS)



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กิจกรรมกลุ่มย่อย (Work Shop)

แบ่งกลุ่มย่อย

หา Near miss ในหน่วยงานอย่างน้อย 2 เรื่อง

แยกประเภทของ Near miss ที่พบ

ทำ One point Lesson (OPL) / ทำ Improvement Sheet (IMS)

นำเสนอผลงาน

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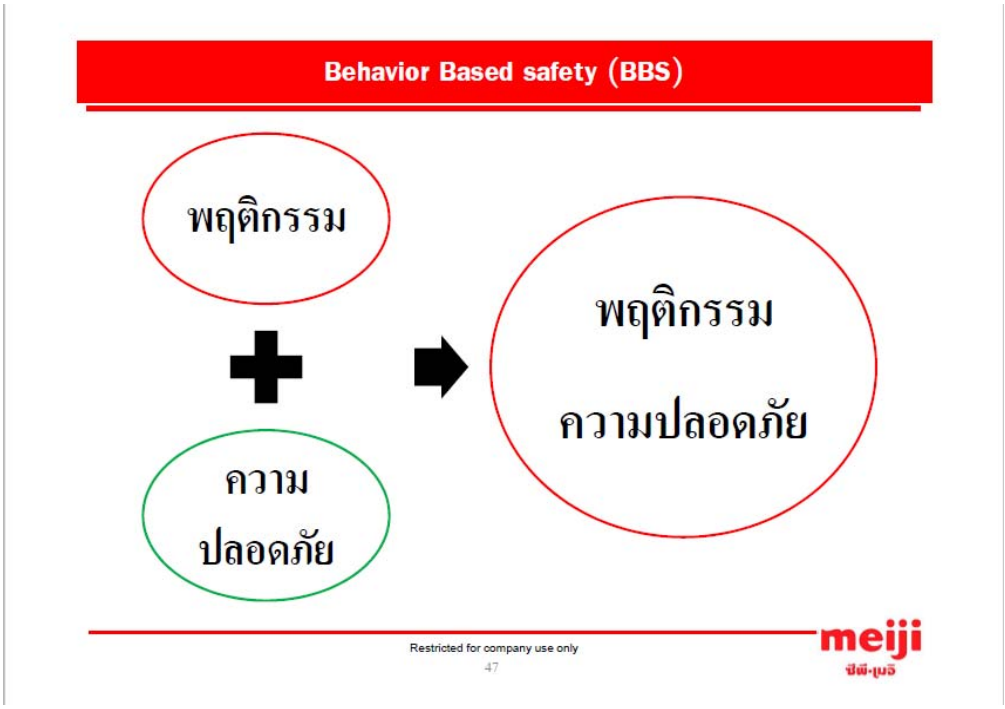
Behavior Based safety
(BBS)


Behavior Based safety (BBS)
พฤติกรรม
ความ
ปลอดภัย
พฤติกรรม
ความปลอดภัย
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การแสดงความห่วงใยเพื่อสร้างพฤติกรรมความปลอดภัย

- เข้าใจและปฏิบัติตามกฎระเบียบความปลอดภัย
- หมั่นสังเกตสิ่งผิดปกติอย่างสม่ำเสมอ/เสนอแนะ/รายงานให้ผู้เกี่ยวข้องทราบเพื่อแก้ไข
- ระมัดระวังในการทำงานให้ปราศจากอุบัติเหตุและโรคภัย
- ไม่ลังเลที่จะ “สั่งหยุดงาน” ถ้าเห็นว่าไม่ปลอดภัย
- จงปฏิบัติงานอย่างปลอดภัย เพื่อกลับไปอยู่กับครอบครัวอย่างมีความสุข

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การแสดงความห่วงใยเพื่อสร้างพฤติกรรมความปลอดภัย

- จงทำงานอย่างปลอดภัย ถ้าเห็นว่าไม่ปลอดภัยอย่าทำ
- ความปลอดภัยไม่สามารถต่อรองโดยอ้างการเพิ่มผลผลิตและ การลดต้นทุนการผลิต
- ต้องปฏิบัติตามขั้นตอนการปฏิบัติงานหรือกฎระเบียบอย่างเคร่งครัดไม่สามารถเลือกปฏิบัติได้
- อุบัติเหตุเป็น “ศูนย์” สามารถทำได้

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คำทักทาย

“ปลอดภัยนะ”

“สวัสดี...ขอให้ปลอดภัย”

“สวัสดี...ปลอดภัย”

“ทำงานให้ปลอดภัยนะ”

“ขอบคุณ...ที่ทำงานอย่างปลอดภัย”

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คำชมเชย

-ดีมาก (ครับ/คะ) ที่.....ตาม.....อย่างนี้

-ทำดีอย่างนี้ตลอดไปนะ.... (ครับ/คะ) เพราะทำให้เราปลอดภัย

-ดี (ครับ/คะ) เป็นตัวอย่างที่ดีสำหรับคนอื่นด้วย

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คำเตือน

-ทำไมไม่ทำตาม.....ล่ะ (ครับ/คะ)

-ตาม.....ต้อง.....ไม่ใช่หรือ (ครับ/คะ)

-เป็นห่วงนะ (ครับ/คะ) ทำอย่างนี้ไม่ปลอดภัย

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การคุย

-ตรงนี้มีการกำหนดวิธีปฏิบัติที่ปลอดภัย (WI) หรือ (ครับ/คะ)

-ดูแล้วมันน่าจะไม่ปลอดภัยนะ(ครับ/คะ) หรือว่าไง..

-ทำอย่างนี้..มันจะไม่.....หรือ (ครับ/คะ)

-ทำอย่างนี้ เคยเกิด.....มั๊ย (ครับ/คะ)

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Critical Behaviors Inventory (CBI)

1.อุปกรณ์คุ้มครองความปลอดภัยส่วนบุคคล *สังเกตเห็นว่ามีอันตราย...น่าจะสวมใส่*	สวมใส่	เป็นWI	ถูกต้อง	การดำเนินการ
1.1 อุปกรณ์คุ้มครองศีรษะ	✗	/	✗	"เตือน" เป็น WI แต่ไม่สวมใส่
				
1.7 อุปกรณ์คุ้มครองเท้า	✗	/	✗	"เตือน" เป็น WI แต่ไม่สวมใส่
1.8 อุปกรณ์ชูชีพ				
1.9 อุปกรณ์คุ้มครองอื่นๆ				

ตัวอย่างการเขียน BBS Observation card

BBS Observation Card

Card เตือน

วันที่ **19 มิถุนายน 2557** เวลา **10.30** น.

บริเวณที่พบเห็นพฤติกรรม **สต๊อคลัง**

ผู้พบเห็น **คุณอรวรรณ ชำนาญพุดซา** ผู้รับฝาก.....

เรื่อง **อุปกรณ์คุ้มครองความปลอดภัยส่วนบุคคล**

พบเห็นอะไร **พี่คะ ขับรถโฟล์คลิฟท์เคลื่อนย้ายลัง โดยไม่สวมใส่หมวกนิรภัยที่มีสายรัดคางและไม่สวมรองเท้า Safety แบบนี้ไม่ปลอดภัยนะ**

วิธีแสดงความห่วงใย **ตักเตือน**

ข้อความ **หนูเป็นห่วงพี่ค่ะใส่หมวกเซฟตี้ที่มีสายรัดคางและสวมรองเท้า Safety ด้วยนะคะ**

การตอบสนอง **ขอบคุณมากครับ ต่อไปขณะขับรถผมจะสวมหมวกนิรภัยที่มีสายรัดคางนะและสวมรองเท้า Safety ครับ**

Critical Behaviors Inventory (CBI)

9.การขับขี่ยานพาหนะ	ใช่	การดำเนินการ
9.1 ใช้เข็มขัดนิรภัย หรือหมวกกันน็อค	/	"ชม" พนักงานสวมหมวกเซฟตี้ที่มีสายรัดคาง
9.2 อัตราความเร็วเหมาะสม	/	"ชม" พนักงานขับรถด้วยความเร็วเหมาะสม
9.3 ระยะห่างระหว่างรถปลอดภัย		
9.4 การเปลี่ยนช่องจราจรปลอดภัย		
9.5 ไม่ทำอย่างอื่นขณะขับรถ	/	"ชม" พนักงานไม่ฟังเพลงหรือใช้โทรศัพท์
10.ข้อสังเกตอื่นๆ - ขับรถถอยหลังให้สัญญาณ - วางสิ่งของที่เคลื่อนย้ายบนแท่น 	/	"ชม"

Critical Behaviors Inventory (CBI)

9.การขับขี่ยานพาหนะ	ใช่	การดำเนินการ
9.1 ใช้เข็มขัดนิรภัย หรือหมวกกันน็อค		
9.2 อัตราความเร็วเหมาะสม		
9.3 ระยะห่างระหว่างรถปลอดภัย		
9.4 การเปลี่ยนช่องจราจรปลอดภัย		
9.5 ไม่ทำอย่างอื่นขณะขับรถ 	X	"เตือน"

ตัวอย่างการเขียน BBS Observation card

BBS Observation Card

Card ฝากเตือน

วันที่ 19 มิถุนายน 2557 เวลา 10.30 น.

บริเวณที่พบเห็นพฤติกรรม Stock ลัง

ผู้พบเห็น คุณอรวรรณ ชำนาญพุดซา ผู้รับฝาก คุณอนัน โชติช่วง

เรื่อง การขับขี่ยานพาหนะ (ไม่ทำอย่างอื่นขณะขับรถ)

พบเห็นอะไร คุณสายชล ทำไมขับรถไปด้วยฟังเพลงไปด้วยล่ะ รู้หรือไม่ว่าตามกฎการขับขี่ปลอดภัย ไม่ให้ทำอย่างอื่นขณะขับรถนะ เป็นห่วงนะคะ

วิธีแสดงความห่วงใย ตักเตือน

ข้อความ เป็นห่วงนะคะ

การตอบสนอง ขอบคุณมากครับพี่ที่ห่วงใยความปลอดภัยของผม ผลจะไม่ทำอย่างอื่นขณะขับรถอีกครับพี่ และยิ้มแสดงความขอบคุณ

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ตัวอย่างการเขียน BBS Observation card

BBS Observation Card

Card ชม

วันที่ 19 มิถุนายน 2557 เวลา 10.30 น.

บริเวณที่พบเห็นพฤติกรรม ห้องหม้อไอน้ำ

ผู้พบเห็น คุณอรวรรณ ชำนาญพุดซา ผู้รับฝาก.....

เรื่อง การตัดแยกระบบและแหล่งพลังงาน

พบเห็นอะไร พี่ภี กำลังทำการล๊อควาล์วเปิดปิด Header Boiler ระหว่างที่มีการซ่อมบำรุง

วิธีแสดงความห่วงใย ชม

ข้อความ พี่ภี เยี่ยมมากเลยค่ะ แบบนี้ปลอดภัยแน่นอนค่ะ

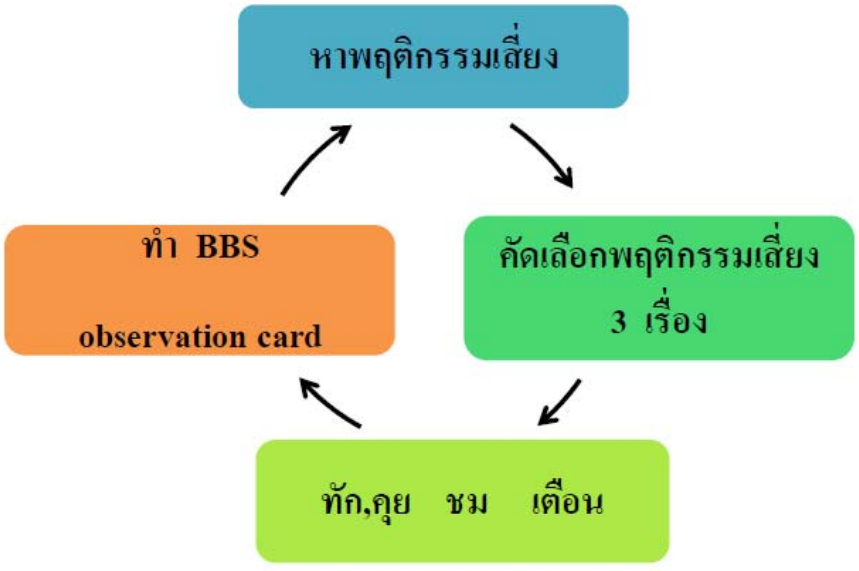
การตอบสนอง คุณคำภียิ้ม แน่นอนครับผมต้องปฏิบัติงานด้วยความปลอดภัยเสมอ

meiji ปีพี·เมจิ

คะแนน BBS (BBS Score)

1. **คะแนนรวม** ไม่น้อยกว่า 20 คะแนนต่อสัปดาห์ต่อคน
2. **ทักทาย** อย่างน้อย 10 คะแนนต่อสัปดาห์ (วันละ 2 ครั้ง)
3. **ชมเชย** อย่างน้อย สัปดาห์ละ 1 ครั้ง
4. **เตือน** อย่างน้อย สัปดาห์ละ 1 ครั้ง
5. **การชม** ไม่สามารถชมคนเดิมได้ในเดือนติดกัน ห่างกันอย่างน้อย 2 เดือน
6. **การเตือน** สามารถเตือนคนเดียวซ้ำกันได้

Work shop BBS



APPENDIX C

DOCUMENTARY PROOF OF ETHICAL CLEARANCE

Certificate of Approval
Ethical Review Committee for Human Research
Faculty of Public Health, Mahidol University

COA. No. MUPH 2014-224

Protocol Title :	AN APPLICATION OF BEHAVIOR BASED SAFETY (BBS) PROCESS IN DEVELOPING SAFE BEHAVIOR FOR FORKLIFT DRIVER (A-CASE STUDY IN CP-MEIJI CO.,LTD)
Protocol No. :	173/2557
Principal Investigator :	Mrs. Orawan Chamnanphudsa
Affiliation :	Master of Science Program in Industrial Hygiene and Safety Faculty of Public Health, Mahidol University
Approval Includes :	1. Project proposal 2. Information sheet 3. Informed consent form 4. Data collection form/Program or Activity plan
Date of Approval :	23 December 2014
Date of Expiration :	22 December 2015

The aforementioned project have been reviewed and approved according to the Declaration of Helsinki by Ethical Review Committee for Human Research, Faculty of Public Health, Mahidol University.

S Nanthan

(Assoc. Prof. Dr. Sutham Nanthamongkolchai)
Chairman of Ethical Review Committee for Human Research

(Assoc. Prof. Dr. Prayoon Fongsatitkul)
Dean of Faculty of Public Health

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BIOGRAPHY

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