THE PERSPECTIVES OF INTO-PLANE FUELLING STAFF ON ACCIDENT CAUSATION AND EFFECTIVE FACTOR OF ACCIDENT REDUCTION : A CASE STUDY OF BANGKOK AVIATION FUEL SERVICES PUBLIC COMPANY LIMITED

By
MISS Punorn CHATCHAWANPUN

A Master's Report Submitted in Partial Fulfillment of the Requirements
for Master of Business Administration (INTERNATIONAL BUSINESS)
INTERNATIONAL PROGRAM
Graduate School, Silpakorn University
Academic Year 2017

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โดย
นางสาวพันธ์อร ชัชวาลย์พันธ์

การค้นคว้าอิสระนี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรบริหารธุรกิจมหาบัณฑิต
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MISS PUNORN CHATCHAWANPUN : THE PERSPECTIVES OF INTO-PLANE FUELLING STAFF ON ACCIDENT CAUSATION AND EFFECTIVE FACTOR OF ACCIDENT REDUCTION : A CASE STUDY OF BANGKOK AVIATION FUEL SERVICES PUBLIC COMPANY LIMITED THESIS ADVISOR : NARITPHOL BOONYAKIAT, Ph.D.

As the accident affects the organization's loss, particularly economic loss, including reputation damage, the organization attempts and seeks the method of accident reduction or prevention. However, the organization is currently facing with accident problems in workplace. This leads to the conduct of this study of 255 respondents at Bangkok Aviation Fuel Services Public Company Limited with

The purposes of this study

(1) identifying whether there is the different perspective on causal factors of accident between all groups of Into-Plane Fuelling workers by lengths of service

(2) exploring the contrastive viewpoint on effective factors of accident reduction between all groups of Into-Plane Fuelling workers by lengths of service and

(3) providing some suggestions about safety enhancement

This study uses quantitative research and the result is discovered through ANOVA analysis, there is no different view on accident causation in regard to the organization and environment factor, although there are some different perspectives on two items of human factor, that is, inadequate skills or experiences and younger worker that are more concerned by adult staff than young staff. Finally, this study explores that all groups of Into-Plane Fuelling workers have the same viewpoint on the opportunity for workers to participate in risk managing of their own work tasks and the motivation of safe behavior, however they have different perspective on safety awareness, that is, adult staff more concerns than young staff. For the effective factor of accident reduction in relation to the organization, all groups of Into-Plane Fuelling workers have the same opinion on the rule restriction, Concept of Fact Finding, regular training courses, training of new equipment. However, they opine in different way, that is, more adult workers than young workers advise that the most effective factors of reducing accident in workplace are a training course of unexpected problem solving and the Opened and Respected Communication. Meanwhile, more young workers than adult workers view that the most effective factors of mitigating accident are Concept of Non- Punishment, the regular safety activity and update and easiness of procedures.

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CHAPTER 1

Introduction

1.1 Background of the study

Bangkok Aviation Fuel Services Public Company Limited or BAFS was established to provide aviation fuel (Jet A-1) depot, and into-plane refuelling services for five airports which are: Suvarnabhumi Airport, Don Mueang Airport and three regional airports, that is, Samui Airport, Sukhothai Airport and Trat Airport. At the beginning stage, most of BAFS's shareholders were foreign oil companies that extremely concerned about safety standards for workplace, therefore the said standards were promoted or shifted to the BAFS's working processes (Bangkok Aviation Fuel Services Plc., 2016).

In other words, BAFS strictly complies with "the oil companies' guideline announced by the Joint Inspection Group (JIG) and endorsed by International Air Transport Association (IATA), 'Guideline for Aviation Fuel Quality Control and Operating Procedures'" in order to maintain the highest international standards. In addition, BAFS has been certified by the International Standards Organization with the Quality Management Systems (ISO 9001:2015) and the Occupational Health and Safety Assessment Series (OHSAS 18001:2007) (Bangkok Aviation Fuel Services Plc., 2016).

Accordingly, to ensure that whether BAFS complies with the said international standard, BAFS has vision, mission and core value; as follows (Bangkok Aviation Fuel Services Plc., 2016).

- **Vision** : Sustainable Development in Energy Services with Awareness of Quality Safety and Environment
- **Mission** : To focus on Quality and Safety according to International Standard for creating customers satisfaction
- **Core Value** : Awareness of Safety Quality and Environment

However, BAFS still faces with occupational accidents causing property damages every year. The aviation accident can produce a massive impact on the global stakeholder, such as airlines, passengers and can be cross broader conflict or disputes. Importantly, it is highly likely that the aviation accident can produce negative impacts on BAFS, whether credible or economic lost. Therefore, the control of occupational accident is a vital element of reducing such impact for people and the organization, whereas the control of occupational accident can produce economic benefits to organization, such as, reduce insurance cost, enhancing product image, increasing the organization's credibility, decreasing capital cost and being able to enter into a new market easily, including overseas market (Chelius, 1974) (Smith & Carayon, 2009).

1.2 Objectives of the Study

To prevent future accident, it is necessary to identify the different view of Into-Plane Fuelling workers on accident causation and effective ways to reduce the accident because worker characteristic, such as lengths of service of workers, has the influence on their behaviors and then to seek for the appropriate way to enhance the benefit to both the company and workers (Takahashi & Miura, 2016). Hence, the objectives of this study are:

1) To identify whether there is the different perspective on causal factors of accident between all groups of Into-Plane Fuelling workers by lengths of service
2) To identify whether there is the contrastive viewpoint on effective factors of accident reduction between all groups of Into-Plane Fuelling workers by lengths of service
3) To provide some suggestions about safety enhancement for the company.

1.3 Research Questions

After revision of the previous literatures, the research questions have been designed to discover, as follows;

- Research Question 1: whether there is the different view on causal factors of accident between all groups of Into-Plane Fuelling workers by lengths of service

- Research Question 2: whether there is the contrastive viewpoint on effective factors of accident reduction between all groups of Into-Plane Fuelling workers by lengths of service

The period of survey has been commenced from January 2018 to April 2018, A survey questionnaire was administered to 255 Into-Plane Fuelling workers, comprising of 155 workers who are based in Suvarnabhumi Airport and 100 workers who are based in Don Mueang Airport. This study is finding (1) the different viewpoint between young, adult and old Into-Plane Fuelling staff on the causal factors of accident and (2) the different perspective between young, adult and old Into-Plane Fuelling staff on the effective factors to reduce the future occupational accident.

1.4 Structure of the Study

This paper is consisted of five chapters. Chapter one refers to the existing situation and problems about accident of BAFS, objectives of the study and research questions. Chapter two will describe literature reviews about factors of accident causation and effective factor of accident reduction and hypotheses which are developed from the said literature review and the theoretical frameworks. Chapter three will stipulate the research methodology which will be applied to this study. Chapter four will present result of analysis by using descriptive analysis of study variables, Reliability analysis ANOVA analysis. Chapter five will provide with discussion, recommendation, implication and limitation for further research.

CHAPTER 2

Literature Review

2.1 Factors of Accident Causation

There are many factors of accident causation in relation to occupation, however only three main factors of accident occurrence can be extracted from several previous researches , that is, human, organization and environment.

(1) **Human Factor :** Based on Domino Theory which was developed by Heinrich, the accident can result from a person's fault (Asyikin Mahat, Ismail, & Aina Syed Alwee, 2014), that is,

Unsafe behaviors or Negligence: Although human behavior was not be classified as a factor of accident causation in the past year, the said behavior is served as the present goal of safety model because almost all accidents are caused by human errors (Dejoy, 1988). In other words unsafe acts or behaviors are supposed as cause of motivational problems or carelessness among employees (Cohen & Colligan, 2003). This is because although employee will work under the organization's direction, they are a center of the work system, that is, a focal point of control of hazards (Smith & Carayon, 2009). Human error is a failure of human action (Rigby, 1970) resulting from both unintentional and intentional action, whether it will be negligent in conduct or willful misconduct (Froggatt & Smiley, 1964; Smith & Carayon, 2009), employees may perform an unsafe act without knowing or planning, instead of believing it to be safe or superior manner. Moreover, human error may result from (1) omission occurring in the event that employees have a failure of performing some action and (2) commission occurring in the event that action is performed incorrectly (Swain, 1963). Commission is comprised of "selection, sequence, time, and qualitative errors," (Dejoy, 1988) such as rash circumstance (Froggatt & Smiley, 1964). This

factor will be applied carefully to identify error, particularly the specific situations or operations. Also, it should be determined in accordance with probability and consequences. (Smith & Carayon, 2009).

Unfollowed procedures or instructions: The important accident causation can be triggered by faulty work performance as a result of unfollowed rules and procedures of workers (Hansson, 2004). In short, the company's policies and procedures, i.e. the safety management policy (GYEKYE & SIMO , 2009) are not followed by staff (Haney, 2003), particularly young staff who tends to show not only more negative work attitudes than old staff (GYEKYE & SIMO , 2009) but also more inappropriate work methods than old workers. This is supported by the theorists of personality trait (Costa & McCrae, 1988) that "extroversion, neuroticism, and openness to experience decline with age so that younger workers have been more active, more anxious, and launch onto new experiences than their older counterparts." (Jesu, Rubio-Romero, Onieva, & pez-Arquillos, 2016) In addition, in the literature of risk-taking and accident found that it is a high possible that young staff is more engage inappropriate work behaviors and activities than old staff (Boyce & Geller, 2002). However, it was assumed that the older worker is likely to suffer from age-impaired activities. To extend this, generally, there are four categories of occupational activities that having connection between accident frequency and the staff's age that is, "age-impaired, age-counteracted, age-neutral, and age-enhanced" (Laflamme & Menckel, 1995). The age-related risk of occupational accidents will differ among industries and accident types. A large number of studies discovers that "the relationship between occupational accidents and workers' age commonly divided workers' ages into several age categories and compared each characteristic" (Takahashi & Miura, 2016) i.e., perceptions, beliefs, values, attitudes, etc.) among those categories.

Lack of skill and experience: A high accident rate tends to be a result of low education (Kusukami & Ikeda, 1989) and experience workers (Carrillo-Castrillo, Rubio-Romero, Onieva, & Lopez-Arquillos, 2016), this is evidenced by the study of Simonds & Shafai-Sahrai (1977) shows that the most likely cause of accidents results from younger and less experienced on the job or inadequate qualification, especially new employees (Burt, 2015). One vital reason is that the new workers are unfamiliar

with the job, equipment, and working procedures (Smith & Carayon, 2009). As a consequence, job tasks are performed with improper qualification or less experience or "using inappropriate work method," and "misunderstanding the instructions" (Carrillo-Castrillo et al., 2016). Additionally, low experience workers tend to have low level of skill to control over a machine and the working process and in decision making (Smith & Carayon, 2009). To put it another way, high experience workers have a strong professional skills therefore, the said workers are able to improve strategies for danger avoidance easier than low experience workers (Takahashi & Miura, 2016). However, high experience workers may also be a cause of accident because of their lesser physical strength. Moreover, "it is possible that the qualified workers can lead to a number of accident when they work with non-manual tasks, they seem to perform improper experience or non-routine tasks performing" (Carrillo-Castrillo et al., 2016) or sometime, they really intent to perform higherthan the requirments of procedures (Hansson, 2004), meaning that their peformance is not made in accordance with procedures.

(2) Organization Factor: Based on the Swiss Cheese Model, James Ramon develops this Model which suggests that the organization can be a factor causation of accident, if the organization has failure in (Asyikin Mahat el al., 2014):

Non - effectiveness and Non - enforcement: One main cause of accident is non – effectiveness of policy enforcement meaning that although the company issues rule and procedure for both safety and work, those rules and procedures are not implemented effectively (Hansson, 2004) because the company may produce not only poor or inappropriate procedures but also non – disclosure of essential information in relation to the relevant procedures or the risks in association with related accidents for staff, consequently the correct instruction will not performed by workers. Moreover, the company may announce a large number of working instructions or safety rules that having a conflict between each other. Additionally, the company has poor process of inspection or lack of conducting regular safety audit. The possible outcome of this is that the company is unable to determine whether its safety program is effective or not. The poor safety audit can represent the low

effectiveness of safety management in promoting safety activity in the company. This may be because that the company has inadequate financial resource to implement safety procedures (Soltanzadeh, Mohammadfam, Moghimbeygi, & Ghiasvand, 2017).

Poor Training: Poor safety training can produce an industrial accident because when the workers lack the necessary knowledge and abilities to not only identify hazardous conditions but also apply the effective strategy for solving their problems (Cohen & Colligan, 2003). The undeniable reason of this is that the company inadequately provides safety or working training courses, including refresher training for workers. In this regard, although the company will provide workers with training courses, the workers remains obtaining the poor safety training courses because those courses are communicated with language comprehension, therefore it is difficult to understand for workers, they cannot apply correctly to their jobs(Kusukami & Ikeda, 1989). In addition, if those training courses are not required to feedback, the company cannot evaluate the quality or effectiveness of its training (Soltanzadeh et al., 2017). Furthermore, if the training courses are not fully or relevantly given for workers, they are unable to apply knowledge to their job tasks correctly. Accordingly, the company will face with unsafe behavior of workers (Cohen & Colligan, 2003). Evidently, the study of Edwards and Hahn (1980) discovered the relationship between accidents and inadequate training. Similarly, a survey of Cohen and Colligan (1998) found that inadequate training had the most relationship with accident compensation.

Lack of supportor: One likely cause of accident in workplace is a poor teamwork (Richter, McAlearney, & Pennell, 2015). This may result from non – support of supervisors, meaning that a degree of supervisors to consider and respond on unsafety events to their subordinates is slow (Oliver et al., 2002). Another supporting source is co-worker's response or consideration (Blau, 1960). According to the study of Iverson & Erwin, (1997), if the workers have inharmonic relationship with their supervisors and co-workers, they will receive non – support to perform their job tasks or may fail in communication (Cohen & Colligan, 2003). This will produce safety risk arising from non - compliance with organizational procedures. In respect of supervisors, due to the fact that supervisors is deemed as a representative of employer or the company, meaning that they are like a middle person who

communicates on safety program between the company and workers. Under this circumstance, when supervisors have negative attitudes or perceptions towards the company's safety policy, the message relating to safety policy may contradict with the reality. Consequently, the worker will receive information about safety procedures with negative attitudes or perceptions from their supervisors (Huang, Chen, Krauss, & Rogers, 2004), in particular among new employees (Blau, 1960). Under this circumstance, it is very dangerous for the company because both the existing or new staff who is operators or subordinates will perform their job tasks with incorrect perception about safety policy, even though those supervisors will give supporting (Huang et al., 2004). Importantly, the new employees will start their working life with wrong perception of organizational policies (Blau, 1960).

Equipment Problems: A person-machine communication can produce a massive number of the accident hazards in the workplace, meaning that when the interaction between employees and their tools is error, the accident will be triggered (Dejoy, 1988). The first reason is that the equipment is improperly designed to conform with principles of engineering and human factors to dictate the machine. Consequently, when the equipment is designed with unfriendly usage, it is difficult and complicated to use for workers (Smith & Carayon, 2009). The second of reason is that the equipment is not regularly inspected before usage (Carrillo-Castrillo et al., 2016), thus the standard or quality of equipment will not be accorded with safety guidelines. Accordingly, the equipment is not entered into the technical preventive programs, thus the defection or maintenance of equipment will not be found and repaired in the early stage. The third reason is the inadequacy of equipment to provide the service which results from financial problem of the company, this will lead to misusing equipment since the workers will work by using improper equipment instead (Smith & Carayon, 2009).

(3) **Environment Factor:** Based on Multiple Factor Theory which was developed by Gorse, one causal factor of accident was environmental conditions (Asyikin Mahat el al., 2014), meaning that

Many occupational hazards are caused by the relationship between workers and the environment because when physical work environment is unusual, it will negatively impact on worker behaviors (Oliver, Cheyne, Tomas, & Cox, 2002), that is, the abnormal physical work environment will jeopardize levels of safety activity of worker. In other words, the individual health state has the relationship between mental health and work performance (Defares, Brandjes, Naas, & Ploeg, 1984). This is described by the study of Behan & Hirschfeld (1963) that the workers may have psychiatric symptoms, such as, a state of conflict, anxiety and depression (Kusukami & Ikeda, 1989) that result in self-destructive behavior before accident occurrence (Behan & Hirschfeld, 1963). This is accorded to a research of Schulzinger (1956) discovered that a period of stress from unusual physical environment, personal maladjustment and irresponsibility had a direct relationship with accident circumstance. Particularly, when the worker is under the circumstance of time pressure or the change of temperature or weather conditions during job operation, they are implily required to make a decision to carry out their jobs (Hansson, 2004). This will lead to a trouble situation if there is an immediate change of plans or schedules or unexpected work during bad weather, it is easy to produce the accident (Kusukami & Ikeda, 1989).

From the above factors of accident causation, the accident is seldom produced by single causation, mostly the accident is happened by multiple causation among human, organization and environment factor (Asyikin Mahat el al., 2014).

2.2 Effective Factors of Reducing Accident

Two most important factors of accident reduction are mostly illustrated by many previous researchers, as follows,

(1) Human Factor

As the workers have a crucial role in the control of risk hazard in workplace because they are a center of work system in workplace by implementing the organizational policy (Smith & Carayon, 2009). Therefore, if the workers get involving in working process, their awareness of accident hazard will be developed

and finally the accident rate will be reduced. This is accorded with the Behavior-Based Safety principle or so called “BBS” which focuses on a process of change in order to improve human safe behavior (Haney, 2003). In respect of safety behavior, the BBS principle is consistent with three clauses of OHSAS 18001:2001, that is, an international standard of occupational health and safety for management systems of occupational health and safety, as follows;

> “4.4.3.2 Participation and consultation;
> 4.3.1 Planning hazard identification, risk assessment, and determining controls; and
> 4.4.2 Competence, training, and awareness” (KAILA , 2010).

To amplify the OHSAS 18001, the above clauses stipulate that procedures are established, implemented and maintained by the organization while the identification of hazard, assessment of risk and determination of control are involved and participated by workers. These procedures considers “human behavior, capabilities, and other human factors and make workers aware of the actual or potential health and safety consequences of their work activities and behavior, as well as the health and safety benefits of improved personal performance” (KAILA, 2010).

To extend the BBS principle, it focuses on workers who are facilitated to participate in the identification of hazard, assessment of risk and the determination of controls (Haney, 2003) because basically workers are the expert source of behavioral change in terms of observation and correction (Kaila, 2009). The consequence of this is that the control of reducing hazards’ potential will be replaced, and gap which contains the risk behavior of human (Haney, 2003) will be found. As a result, the workers are developed to aware of their unsafe and safe behaviors and regularly maintain the consideration of these behaviors. In other words, the BBS principle is an employee-driven tool with the management promotion (Kaila, 2009). In view of this, unsafe behavior can be removed by the application of the BBS principle.

In respect of the worker’s participation, the workers are encouraged to participate in their own work tasks for managing the risks or identifying hazards that are a temporary circumstance upon “the tasks, technology and environment” (Smith &

Carayon, 2009). For instance, the workers are involved in design of facility, the purchasing and suppling of equipment, materials and the redesigning some element of their work systems because they really know their work process, job tasks context, therefore their designs of task can take over the potential risks (Smith & Carayon, 2009).

According to the worker's participation, they will pay attention and the participation will motivate them to react with risk properly. Accordingly, the risk can be mitigated quickly (Smith & Carayon, 2009). Evidence from the study of Simonds and Shafai-Sahrai (1977) shown that low rate of accident was related with involvement of top management in promoting safety, better systems of injury keeping - record, cleanness and space availability of workspace, the existing programs of employee recreation and good relations among supervisor-employee.

(2) **Organization Factor**

The company has been found to be an important aspect of accident reduction, such as a commitment and involvement of the management. This can be represented by a good safety culture of the company. The concept of safety culture was referred in the OECD Nuclear Energy Agency's report (1987) on the disaster causation of the Chernobyl and was subsequently connected with the occurrences of other major safety disasters during the 1980s. The International Atomic Energy Agency describes safety culture as "an amalgamation of values, standards, morals and behavior aimed at maintaining a self-disciplined approach to the enhancement of safety beyond legislative and regulatory requirements. Therefore, safety culture has to be inherent in the thoughts and actions of all the individuals at every level in an organization." (Zhu, Fan, Fu, & Clissold, 2010) Similarly, the Confederation of British Industry defines the culture of an organization as "the mix of shared values, attitudes and patterns of behavior that give the organization its particular character" (Executive , 2018). In brief, "it is 'the way we do things round here'" (Executive, 2018). Their advice of safety culture is "the ideas and beliefs that all members of the organization share about risk, accidents and ill health" (Executive, 2018) which will reflect on perception of each worker (Zhu et al., 2010).

In other words, a good safety culture of the company is a crucial factor to reduce in the number of accident. A good safety culture consists of three mian aspects; as follows;

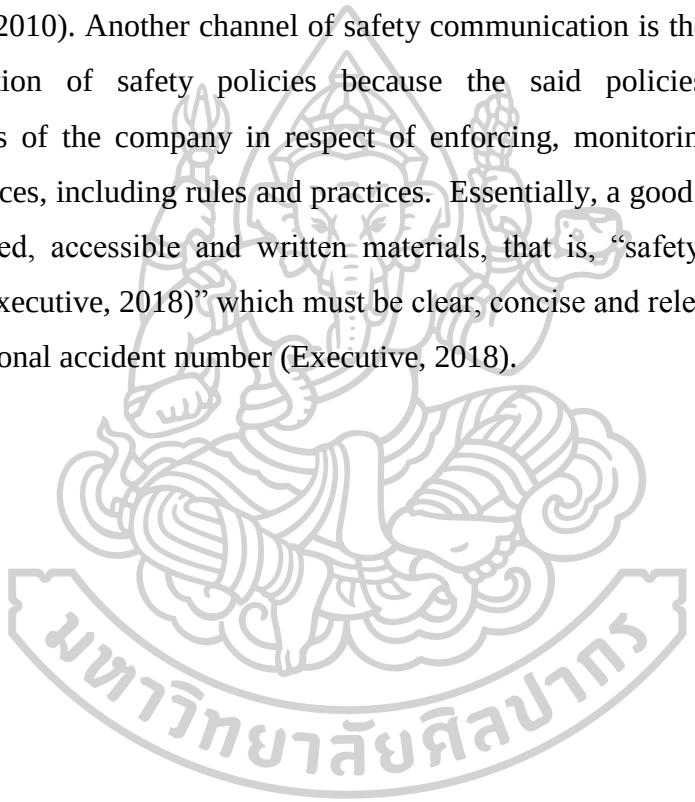
The first aspect is the effectivement of executing the corporate safety policy, that is, the company will not only consult with safety specialist so as to comply with the law but also perform not less than legal requiments. In the latter point, the breach of procedures which adopted legal requriments to be the internal safety rule of the company will be considered as the violation of law, therefore the company strictly prohibits and actively attempts to promote the safety procedure for discouragement of violations. For example, the work will not be planed to make a shoutcut of essential processes to finish in time. Under this circumstance, a motivational tool of behavioural control will be implemented (Executive, 2018), meaning that, when workers perform safely and productively (Zhu et al., 2010), they will obtain rewards or incentive so as to persuade or encorage them to perform safe acts (Executive, 2018). In other words, the investigation wil not be a fault discovery for a punishment (Haney, 2003) but it should be a fact discovery, therefore the workers' names will not be recorded in data system (Kaila, 2009) but the workers will be repeatedly told to correct by coaching and observing of co-workers and report to their supervisors (Kaila, 2009) meanwhile when the worker behaves safe action, they are encouraged (Haney, 2003) by granting a reward. This accords with the BBS principle but it is argued by Smith & Carayon, (2009) that the reward scheme is not always the method to promote safety in workplace because this will lead to non-intention of good safety performance. Moreover, the company will conduct a rountine (internal or external) safety audit so as to determine whether the safety program of the company is effective. This will discharge unsafe actions from the company (Lutness, 2000).

The second aspect is to provide a training course for the workers because it is the enhancement of their ability and knowledge for effective operation of various tasks (Cohen & Colligan, 1998). Importantly, the training will develop the awareness and hazards identification in process and become the skill of the workers and lead to behavior change (Smith & Carayon, 2009). Accordingly the study of Cohen & Colligan (1998), the employee risk is effectively reduced by the safety and health

training. Generally, the company will periodically provide the workers with the training courses of safety and health. Additionally, the company can provide the workers with extra courses to reinforce them " to be alert, aware and knowledgeable on how to respond to hazards"(Cohen & Colligan, 1998). One extra courses is unexpected problem solving course in order to increase the ability of self- control in decision making in the situation of high demand jobs (Huang et al., 2004). For example, when the equipment is repaired or maintained, the workers need to select the proper equipment by their own decision for providing the service or in the event of weather uncertainty (Hansson, 2003), they have to choose whether to follow the procedures to finish their jobs (Haney, 2003) or how to make decision to finish their jobs with safety performance. Another extra course is when the new equipment is launched, the courses of learning how to use the said equipment will be provided for the relevant workers, especially among new workers (Smith & Carayon, 2009) so that they are motivated to have the awareness of hazards and lead to safe actions (Blau, 1960). To this extension, training course of the new technology or technological change in products (Smith & Carayon, 2009) for the workers, hence the said course is designed as the communication between person and machine, it should focus on traditional human factors relating to communication, that is, these three forms will be communicated: (i) Words and (ii) Symbols are represented by "written, verbal, and physical (gestures and movements) communications" (Dejoy, 1988) normally connecting with "information, instructions, and warnings" (Dejoy, 1988). (iii) Displays is the representatives of " the internal state of the machine" (Dejoy, 1988). To increase the effectiveness of training, those courses will assure "that (1) a problem is solvable by training, (2) the training objectives are clearly defined, (3) the learning material and activities appropriately focus on the particular needs and active participation of the trainees, and (4) evaluations are performed to determine whether objectives" (Cohen & Colligan, 1998). In respect of training, a safety activity is one way to educate the workers. The safety activity also is a process to motivate worker to become actively participated in safety promotion because the safety activity is a visible demonstration to the workers about the importance of safety and need to be seriously considered (Smith & Carayon, 2009).

The third aspect is to provide the effective communication about safety issues between the employees and the company which represented by the management team, including supervisor or manager. According to Hofmann & Morgeson (1999), a good safety communication is a cause of low rate of accident. This is because the communication is "the promotion of good communications among all levels of the organization to ensure a knowledgeable workforce" (Smith & Carayon, 2009) and the communication will be a channel to amplify a safety direction or vision and resources. Hence, the safety communication needs to include "awareness of employees' needs and problems, downward organizational communication, awareness of organizational structure, the consistent application of organizational policies, and opportunities for growth and advancement" (Zhu et al., 2010). Importantly, the impact of safety hazards on the workers and the company will be communicated among the workers (Smith & Carayon, 2009). The basic channel of communication about the safety information is a monthly departmental meeting or after finding weak area by routine audit (Lutness, 2000). To be effective communication, it needs to be the communication with two-way information flow in order to ensure that information has timeliness, miscommunication avoidance, accuracy and conciseness because the workers need to be aware of new safety hazard as soon as possible. The first way to increase the effectiveness of communication is that between supervisors and workers need to develop open communication because when the supervisor and operator apply the shared mental models for organizational safety, meaning that a different view or perception of member in the organization is collected as one set of perception (Zhu, et al., 2010), they can share safety attitudes or opinions between supervisor and employees (Prussia, Karen & Willis, 2003). The high likelihood of this model is that the motivation of hazard awareness and hazard report will occur among the workers. As a consequence, the work systems and processes will be actually changed which lead to the elimination of hazards or reduction of potential impact (Smith & Carayon, 2009). This view is consistent with the literature of Richter et al., (2015) that the openness of communication will authorize or comfort all level of employee to have questions of unusual situation. The second way to increase the effectiveness of communication is both supervisor and operator have a good relationship and respect for each other (Smith & Carayon, 2009) since supervisors can provide the support not

only to facilitate or perceive safety practices in workplace but also to increase the commitment of organization and the job satisfaction among operators. According to Wicks (2001), the organizational aspects is transferred by the management attitudes to reflect the expected behavior of its workers, that is, if the commitment of the manager to safety is poor and becomes normal acceptance to practice in the workplace, the safety attitude of operators will be low and the operators will accept occupational risks. As a result, the operators' safety-related behavior is strongly influenced by a manager who has a leadership characteristic of safety commitment (Zhu et al., 2010). Another channel of safety communication is the establishment and implementation of safety policies because the said policies will reflect the effectiveness of the company in respect of enforcing, monitoring and encouraging safety practices, including rules and practices. Essentially, a good safety policy needs to be updated, accessible and written materials, that is, "safety bulletins, posters, guidance (Executive, 2018)" which must be clear, concise and relevant so as to reduce the occupational accident number (Executive, 2018).



CHAPTER 3

Research Methodology

3.1 Research Design

In order to examine the perspective of Into-Plane Fuelling staff on both factors of accident causations and effective factors of accident rates reduction: the case of BAFS, the quantitative survey is designed to collect the required data in order–to answer the objectives of this study. The questionnaires are designed based on the previous researches which have discovered what are the factors of accident causations, that is, human, organization and environment factors meanwhile the effective factors of the accident rate reductions are worker and organization factor. In the literature review previously mentioned for this study, most of them disclosed the information about the causal factors of accident and the effective factors of reducing accident rate, it is only limited to some industry sectors, such as the construction (Soltanzadeh et al., 2017), (Takahashi & Miura, 2016) and (GYEKYE & SIMO, 2009), offshore supply vessels (Hansson, 2004), hospital (Richter et al., 2015), automotive parts (Kaila, 2009) and government agencies (Zhu et al., 2010). There was no previous examinations about effect of length of service of employees on their perceptions of the causal factors of accident and the effective factor of reducing accident numbers in aviation fueling service sector were found. In addition, according to BAFS's accident report found that one causation of BAFS s' accident results from the experienced worker. Additionally, a large number of respondents is the Into-Plane Fuelling staff who has 4- 15 years of service. Therefore, this study is divided into three groups of Into-Plane Fuelling staff; less than 1-3 years of service (young staff), 4-15 years of service (adult staff), 16 - over 30 years of service (old staff) in order to test their perspectives on the factors of accident causation and effective factors of accident mitigation.

3.2 Questionnaire Design

The questionnaires were divided into three parts. The first part were comprised demographic requirements, that is, age, working location, length of service (number of years the respondent has been working) and educational background whereas the information of gender was not required because the qualification of into-plane fueling staff is male. The second part was required about information of causal factors of accident which was categorized as dependent variables of this study. Each variable (human, organization and environment) contained from two to six questions. This second part used a five-point rating, ranging from1 representing Strongly Disagree, 2 representing Disagree, 3 representing Neutral, 4 representing Agree and 5 representing Strongly Agree. The third part questioned about effective factors for reducing the accident rates which were defined as independent variables of this study. Each variable human and organization factor) was contained about two and three questions. This section was measured on three or four point ranging from 1= most effective factors to 3 or 4 (upon number of questions contained in each variables).

3.3 Sample Size, Data Collection, Data Analysis, and Research Instrument

As to this study intends to explore views of Into-Plane Fuelling staff of BAFS, the questionnaires were only distributed in equivalent to a total number of the said staff ; that is, 255 respondents (comprised of 155 staff at Suvarnabhumi Airport and 100 staff at Don Mueang Airport) who is manager and operator and both of them has participated in training courses, whether they will be categorized as permanent and temporary employment of BAFS.

The questionnaires were in English and were translated into Thai. On average, the questionnaires were taken about 10 minutes to complete. In total 255 questionnaires were distributed and collected back with 233 completion which only lost 8.6 % of all distributed questionnaires, it is acceptable number and highly possible to obtain the correct result (Raosoft, 2018).

In order to collect data from Into-Plane Fuelling respondents, a personal computer are not provided for them meanwhile one sharing computer is provided for them.

This is because their functional tasks differs from other workers who are the back officers (such as accounting officers and legal officers) who need to use personal computers for productivity enhancement. For this reason and the best way to follow and collect data, the questionnaires were distributed by hand to each respondent.

Data was analyzed by using SPSS program. Data was measured by using statistic tool, frequency and chart. Also, data was explored by Descriptive Statistics, Mean, Reliability Analysis using Cronbach's Alpha. Additionally, the hypothesis is examined the different viewpoints of three groups of Into-Plane Fuelling staff about accident causation and effective factors of accident reduction by ANOVA analysis (University, 2018).

CHAPTER 4

Data Analysis

4.1 Demographic Information

From Table 1, the demographic profiles of 233 male respondents, comprising of 150 Into-Plane Fuelling staff (64.4%) at Suvarnabhumi Airport and 83 Into-Plane Fuelling staff (35.6%) at Don Mueang Airport.

In respect of age, 84 respondents were aged between 31 and 40 (36.1%), 62 respondents were aged from 21 to 30 (26.6 %), 59 respondents were aged from 41-50 (25.3 %), 26 respondents were aged between 51 and 60 (11.2 %) and 2 respondents were aged 20 or younger (0.9%).

In respect of lengths of service, 100 staff has worked from 4 to 15 years (42.9 %), 89 staff has worked between 16 and over 30 years (38.2%) and 44 staff had worked less than 1 years to 3 years (18.9 %).

In respect of education, 130 respondents graduated with vocational diploma (55.8 %), 81 respondents graduated with bachelor's degree (34.8 %), 20 respondents graduated with master's degree and 2 respondents graduated with vocational certificate (0.9%).

Table 1: Demographic Information

Item	Detail		
		Frequency	**Percent**
Location	Don Mueang Airport	83	35.6
	Suvarnabhumi Airport	150	64.4
Age	20 or younger	2	.9
	21-30	62	26.6
	31-40	84	36.1
	41-50	59	25.3

Item	Detail		
		Frequency	**Percent**
	51-60	26	11.2
Lengths of service	less than 1-3 (young)	44	18.9
	4-15 (adult)	100	42.9
	16 - over 30 (old)	89	38.2
Education	Vocational Certificate	2	.9
	Vocational Diploma	130	55.8
	Bachelor's degree	81	34.8
	Master's degree	20	8.6

4.2 Reliability Analysis

With regard to the analysis of quantitative data, the variables, three factors (variables) of accident causation were tested for reliability by using Cronbach's Alpha. The reliability score of (i) human factor, (ii) organization factor (enforcement and training) and (iii) environment factor was good or not less than 0.7 and the score of equipment which is one cause of accident by organization was 0.659, however it is entitled to round a value to the nearest 0.5, its score was not less than 0.7, it was acceptance as detailed in the Table 3.

However, the reliability score of enforcement concern was 0.636. To increase reliability, "the poor safety policies" item should be deleted to increase a value of Cronbach's Alpha to 0.823 (Table 3).

In respect of the reliability score of "Lack of Supportor" concern (consisted of lack of coworker support and inadequate worker), although its score was 0.330 or lower than 0.7, the said concern is entitled to be remained because one of item of "Lack of Supportor" concern, that is, inadequate worker is not exploratory test.

Table 2 : Cronbach's alpha of Pre-Test

Variables	**Human Factor**	**Organization Factor**				**Environment Factor**
		Non-Effectiveness or Non-Enforcement	**Poor Training**	**Lack of Suppotor**	**Equipment Problems**	
Cronbach's Alpha	0.598	0.827	0.843	0.662	0.847	0.861
No. of Item	6	3	2	2	3	3

The reliability score of pre-test has been displayed on the above Table 2.

It needs to be noted that Reliability Analysis is measured by Cronbach's alpha which is only analyzed for the first part while it is not analyzed for the second part because the questionnaire of this part is designed with ranking scale.

Table 3 : Cronbach's alpha

Variables	**Human Factor**	**Organization Factor**					**Environment Factor**
		Non-Effectiveness or Non-Enforcement		**Poor Training**	**Lack of Suppotor**	**Equipment Problems**	
		old	**new**				
Cronbach's Alpha	0.725	0.636	0.823	0.717	0.330	0.659	0.876
No. of Item	6	3	2	2	2	3	3

4.3 ANOVA Analysis

Hypothesis 1 : All groups of Into-Plane Fuelling workers have different views on factors of accident causation.

From Table 4, in respect of human factor, the study examined by using ANOVA analysis that there was no significant difference among all groups of respondents on opinion of human as a causal factor of accident. All respondents opined that the accident results from unfollowed instruction or rules (Mean=4.18), negligence (Mean=4.07), health problems (Mean=3.40) and unfamiliar with new equipment (Mean=3.26). However, ANOVA analysis explored that there was a significantly different view on cause of accident arising from lacking skills or experiences of worker (Mean=3.52) (Sig = 0.023) and younger workers (Mean = 2.83) (Sig = 0.011). The ANOVA also analyzed that adult staff had more consideration than young staff that the accident causation resulted from younger workers and inadequate skill or experience.

With regard to organization factor in connection with enforcement, this study demonstrated that there was no statistically significant difference among all groups of respondents in view that the causal factors of accident results from enforcing a conflict of procedures (Mean = 3.20) and providing conflicted procedures and inadequate audit (Mean=3.18). In connection with training, all respondents have no significantly different opinions that the provision of inadequate training (Mean = 2.74) and poor training (Mean = 2.63) was the causal factor of accident. In connection with supportor, there was no significantly different viewpoint between all groups of respondents on a lack of coworker support (Mean = 2.90) and inadequate worker (Mean = 3.99) as the accident causation. In connection with equipment, there was no significantly different perspective between all groups of respondents on the accident causation results from procuring inadequate equipment (Mean = 3.52), impaired equipment (Mean = 3.42) and complicated equipment (Mean = 2.97).

With regard to environment factor, there was none significantly different opinion that the causal factor of accident is the environment due to limited working time (Mean = 4.41), unsafe environment (Mean = 4.06) and work overload (Mean = 4.00).

In overall result of using ANOVA analysis comparing between three groups of Into-Plane Fuelling staff about perspective of accident causation, it was found that although there was none significantly different perspective among all groups of Into-Plane Fuelling workers on factors of accident causation in connection with organization and environment factors, there are two items of human factor that are more concerned by adult staff than young staff, that is, inadequate skills or experiences and younger workers.

Table 4: ANOVA ANALYSIS : Causal Factors of Accident

Causal Factor of Accident	**Item**	**Mean**	**Sig**	**Mean Difference**		
				1 less than – 3 (young)	**4-15 (adult)**	**16-over 30 (old)**
Human	Negligence	4.07	.523			
	Unfollowed instruction / rule	4.18	.081			
	Younger workers	2.83	.011	.405	-.405	
	Lacking skill/experience	3.52	.023	.479	-.479	
	Health problem	3.40	.522			
	Unfamiliar with new equipment	3.26	.793			
Organization: Enforcement	Conflict of procedures	3.20	.370			
	Inadequate audit	3.18	.223			
Organization: Training	Inadequate training	2.74	.208			
	Poor training	2.63	.778			
Organization:	Lack of coworker	2.90	.605			

Causal Factor of Accident	Item	Mean	Sig	Mean Difference		
				1 less than – 3 (young)	4-15 (adult)	16-over 30 (old)
Supportor	support					
	Inadequate worker	3.99	.737			
Organization: Equipment	Complicated equipment	2.97	.443			
	Impaired equipment	3.42	.285	.		
	Inadequate equipment	3.53	.611			
Environment	Work overload	4.00	.108			
	Limited working time	4.41	.092			
	Unsafe environment	4.06	.060			

Remarks : The mean difference is significant at the 0.05 level

Hypothesis 2 : All groups of Into-Plane Fuelling workers have different views on effective factors of accident mitigation.

From Table 5, in respect of human factor, the study demonstrated by using Frequency and ANOVA analysis that Two Hundred and Five respondents (88%) suggested that the safety awareness of staff was the most effective factor of accident reduction. Twenty respondents (8.6 %) saw the motivation of safe behavior was the most effective factor of accident reduction. Eight respondents (3.4 %) opined that giving the opportunity for workers to participate in risk managing of their own work tasks as the most effective factor of reducing occupational accident. There was no

statistically significant difference among all groups of respondents in view that the opportunity to participate in risk managing of their own work tasks (Mean = 2.53) and the motivation of safe behavior (Mean = 2.32). However, there was significant distinction among all groups of respondents on the perspective of safety awareness (Mean=1.15) (Sig = 0.051), that is, adult staff (Mean = 1.07) had more belief in safety awareness as the most effective factor of accident reduction than young staff (Mean = 1.23).

With regard to the organization factor in relation to corporate safety policy, the study found out by using Frequency and ANOVA analysis that One Hundred and Forty respondents (60.1%) considered that the rule restriction was the most effective factor of reducing occupational accident. Sixty-one respondents (26.2%) viewed that the most effective factor of reducing accident was the concept of not find "fault" but find "fact" ("**Concept of Fact Finding**"). Thirty – One respondents (13.7%) suggested that non - punishment for unsafe act but repeated informing to correct/rewards for safe action ("**Concept of Non- Punishment**") as the most effective factor of reducing occupational accident. There was no significantly different perspective between all groups of respondents on restriction of rules (Mean = 1.66) and Concept of Fact Finding (Mean = 1.86) meanwhile there was significantly different viewpoint on Concept of Non-Punishment (Mean = 2.48) (Sig=0.003), meaning that young workers (Mean = 2.16) more considered as the most effective factor of accident mitigation than adult workers (Mean = 2.66).

In relation to training and safety activity, the study discovered by using Frequency and ANOVA analysis that Seventy-Five respondents (32.2 %) opined that the regular training courses was the most effective factor of reducing occupational accident. Seventy-two respondents (30.9 %) believed that the most effective factor of reducing accident was a training course of unexpected problem solving. Fifty-two respondents (22.3%)opined that regular safety activity as the most effective factor of accident mitigation. Thirty - Four respondents (14.6%) viewed training every time of new equipment as the most effective factor of accident reduction. There was no significantly different perspective between all groups of respondents on a regular training courses (Mean = 1.94) and training of new equipment (Mean= 3.06). However, there was significantly different viewpoint on regular safety activity

(Mean=2.73) (Sig = 0.55), that is, more young staff (Mean = 2.52) than adult staff (Mean = 2.63) suggested that the regular safety activity as the effective factor of accident reduction whereas more adult staff (Mean = 2.10) than young staff (Mean = 2.52) recommended that the training course of unexpected problem solving was more effective factor of accident reduction (Mean= 2.27) (Sig = 0.56).

In relation to communication, the study demonstrated by using Frequency and ANOVA analysis that One Hundred and Eight respondents (46.4 %) viewed that the most effective factor of reducing occupational accident was to updated, easy to access and understand procedure. Eighty - four staff (36.1 %) pointed out that the most effective factor of reducing accident was to openly communicate between management & operation, good relationship and respect each other ("**Opened and Respected Communication**"). Thirty-Four respondents (14.6%) suggested that the communication of accident impact on worker and the organization was the most effective factor of accident reduction. There was no significantly different perspective between all groups of respondents on the communication of accident impact on worker and the organization (Mean = 2.30). However, there was significantly different viewpoint on update and easiness of procedure (Mean = 1.74) (Sig = 0.019), that is, young staff (Mean = 1.57) had more suggestion than adult staff (Mean = 1.90). In contrast, Opened and Respected Communication (Mean = 1.96) was believed by more adult staff (Mean = 1.80) than young staff (Mean = 2.07) (Sig = 0.035) as the effective factor of accident reduction.

The overall result of the effective factor of accident reduction in relation to human, there was none significantly different perspective among all groups of Into-Plane Fuelling workers on the opportunity for workers to participate in risk managing of their own work tasks and the motivation of safe behavior, however there was significant difference of their perspective on safety awareness, that is more adult staff than young staff. For the effective factor of accident reduction, there was no statistically significant difference among all groups of respondents in view of the rule restriction, Concept of Fact Finding, regular training courses and training of new equipment. Nonetheless, there was significant difference of their perspective, that is, more adult workers than young workers advise that the most effective factors of reducing accident in workplace were Opened and Respected Communication, a

training of unexpected problem solving course and communication of impact on staff and the organization. Conversely, more young workers than adult workers support that the most effective factors of mitigating accident were Concept of Non-Punishment, the regular safety activity and update and easiness of procedures.

Table 5 : ANOVA ANALYSIS : Effective Factor of Accident Reduction

Effective Factor of Accident Reduction	**Item**	**Mean (Total)**	**Sig**	**Mean**		
				1 less than – 3 (young)	**4-15 (adult)**	**16-over 30 (old)**
Human	Safety awareness	1.15	.051	1.23	1.07	1.19
	Opportunity to participate in risk managing of their own works	2.53	.336	2.50	2.59	2.47
	Motivation of safe behavior	2.32	.837	2.27	2.34	2.33
Organization: Corporate Safety Policy	Not find “fault” but find fact	1.86	.488	1.95	1.86	1.82
	No punishment for unsafe act but repeated informing to correct/rewards for safe act	2.48	.003	2.16	2.60	2.51
	Restriction of Rules	1.66	.082	1.89	1.54	1.67
Organization: Training & Safety activity	Regular training course	1.94	.096	2.07	2.01	1.79
	Training of	2.27	.056	2.52	2.10	2.33

Effective Factor of Accident Reduction	Item	Mean (Total)	Sig	Mean		
				1 less than – 3 (young)	4-15 (adult)	16-over 30 (old)
	unexpected problem solving					
	Training every time of new equipment	3.06	.065	2.89	3.26	2.93
	Regular safety activity	2.73	.055	2.52	2.63	2.96
Organization: Communication	Updated, easy to access & understand procedure	1.74	.019	1.90	1.64	1.74
	Openly communicate between management & operator, good relationship and respect each other	1.96	.035	2.07	1.80	2.09
	Communicate to workers about accidents impact on them & organization	2.30	.796	2.36	2.30	2.27

Remarks : The mean difference is significant at the 0.05 level

CHAPTER 5

Discussion and Conclusion

5.1 Discussion

I. Causal Factor of Accident

Human Factor

In respect of human factor, all respondents opine that the accident results from negligent employee. This is accorded with the research of Froggatt & Smiley (1964) and Smith & Carayon (2009) indicated that the accident was happened by both unintentional and intentional action of workers. They may perform without knowing or planning to breach the safety policies. In contrast, it is likely that employees will breach duty of care in order to finish their job assignment (Hansson, 2004).

Moreover, this study discloses that all respondents view that human is a factor of accident causation due to unfollowed procedures. This is consistent with the previous researches (GYEKYE & SIMO , 2009) and (Hansson, 2004) found that safety policies or procedures are not followed by employee, thus they would perform incorrect actions or failure of performing proper actions as studied by Swain (1963).

In regard with a lack of skill and experience of employees, the preceding study (Simonds & Sahrai, 1977) and (Burt, 2015), explored that the accident causation mostly resulted from new employee. It seems to agree with the staff's viewpoint under this study that the causal factor of BAFS's accident is a lack of skill or experience. Interestingly, this study points out that all group of respondents reluctant to claim that the young worker is the accident causation, although this cause is more considered by adult staff than young staff. Additionally, adult staff (who have a working period of 4 – 15 years) more considered on inadequate skill or experience as factors of accident causation than young staff (who have a working

period between less than 1 year and 3 years). The possible reason is that young staff who has a short length of service may just graduate from a school or university or their working experiences are irrelevant to Into-Plane Fuelling service. Thus, according to Smith & Carayon (2009) and Carrillo-Castrillo et al. (2016), there is a high possibility of unfamiliarity with the instruction of working and equipment. This point is similar to the result of this study shows that all respondents have same perspective on accident causation is unfamiliar with new equipment. Accordingly, the accident is easily produced by young worker who not only are nuevo but also has irrelevant working experience. However, in reality, the BAFS's accident sometimes results from the experienced staff. This may be because that they have too much self-confidence of their experience and skill, they intend to finish their jobs without following work instructions. In other words, their jobs would be finished with negligence.

In respect of health problem, this study shows that all respondents have the same perspective that health problem is a factor of accident causation, particularly among old workers (who have a working period from 16 to over 30 years) This seems to agree with the literature of Takahashi & Miura (2016), explained that high experience workers might be a cause of accident because of their lesser physical strength.

Organization Factor

In respect of enforcement, the study of Soltanzadeh et al., (2017) discovered that the cause of accident can result from the bunch of conflicted working instructions or safety rules and irregular safety audit. Similarly, this study finds that all employees tends to have the same opinion that the accident causation is a conflict of procedures and inadequate audit. For the conflict of procedures, it may lead to the reluctance of workers to apply the correct procedures. For inadequate audit, it is a loophole in safety rule's implementation.

In respect of training, according to Cohen & Colligan (1998), a lack of training is one important cause of the industrial accident due to inadequate necessary knowledge leading to weak abilities to identify hazardous conditions and to apply the

effective strategy for solving problems. This is inconsistent with the result of this study since all groups of respondents tend to not believe that the accident of BAFS is caused by insufficient training and poor training. In this connection, it may be because BAFS regularly provides the necessary training couses higher than legal requirments for its staff and BAFS selects good trainers or facilitors to educate its staff. For this reson, the accidents rate of BAFS is not caused by trainings.

In respect of supportor, Richter et al., (2015) described that the poor teamwork would lead the company to accident risk since workers would not be supported by a coworker, including supervisor which can result in failure of comunication and non-compliance with the organizational procedure causing an increse of accident rate. This is likely to contrast with the result of this study which explores that all groups of relevant staff hesitate to advise on lacking coworker support as the accident causation. The probable reason of this is that Into-Plane Fuelling Department holds meeting everyweek, it can make them spending a lot of time with their supervisor and friends. Regularly, BAFS has an annul walk rally which is created with the purpose of opportunity to join and share feeling, relaxing of participants and enhancing their relationship. Meanwhile, all groups of staff believe that the accident is caused by inadequate number of worker. This may be because nowadays, there are a vast number of flight, even BAFS attempts to monthly recruit new Into-Plane Fuelling staff, it is not sufficient of staff for providing service for customer of BAFS.

In respect of equipment, the literature of Smith & Carayon (2009) and this study found the same result that one crucial cause of accident is insufficient number of equipment which may make workers misusing the equipment because they need to finish their job assignments. To finish job without misuse of equipment, it is important for BAFS that workers can make the decision on choosing the correct equipment to provide the service. Moreover, Smith & Carayon (2009) also indicated the accident causation could be caused by the complexity of equipment. Unlikely, all groups of respondents seemed to not believe that the equipment complexity is a cause of BAFS's accident. This is because BAFS's equipment has good design, meaning that it is designed with friendly usage as a consequence of worker involving in design (Smith & Carayon, 2009). Additionally, Carrillo-Castrillo et al., (2016) pointed out that the accident could be caused by the defect of equipment. This is agreed with the

result of this study that all groups of respondents consider that the impaired equipment is the BAFS's accident causation. In this point, it is to be remarked that although BAFS will have regular audit or inspection or do preventive maintenance program, when some parts of equipment or Aircraft Refuelling Vehicles are broken and need to be replaced, the said part will be imported which have lead time to purchase. This can also be a cause of inadequate equipment.

Environment Factor

The preceding researchers (Behan & Hirschfeld, 1963; Oliver el al., 2002; Kusukami & Ikeda, 1989) explored that the abnormal work affects human behavior, especially uncontrollable circumstances. As a consequence, staff will face with pressure situations which can make them stressful. This is agreed with this study that all groups of respondents view that unexpected environment or situations can negatively impact on worker behaviors, for instance, unplanned job is able to a cause of work overload situation. To this extension, normally, each worker will be allocated job assign in advance but they may obtain ad- hoc job assignment without advanced notice from time to time. This can be a cause of stressfulness because their relaxing or breaking time will be shortened. Additionally, all respondents have the same perspective that the situation of limited working time can be a cause of accident because ground time of some airline is very short, therefore staff needs to finish providing Into-Plane Fuelling service according to airline ground time. This can make them work careless. Moreover, this study has the same result as Hansson (2004) that the accident causation can result from unsafe environment, such as bad weather or temperature. For instance, staff needs to provide Into-Plane Fuelling service while it is raining, thus they may confront with unplanned events and they may need to make decision promptly, it is highly likely such decision will be made without carefulness.

II. Effective Factor of Accident Reduction

Human Factor

In regard of safety awareness, KAILA (2009) described unsafe behavior would be removed by making employees aware the actual or potential unsafe or safe outcome of their work activity. This is similar to the result of this study shows that most of respondents view that the most effective factors of reducing accidents is safety awareness, particularly adult workers rather than young workers. The likely reason of this is that adult workers have more working experience than young workers, adult workers have seen a lot of BAFS's accident and have realized that the accident causation results from inadequate human's safety awareness.

In regard of motivating safety behavior, Smith & Carayon (2009) claimed that the rate of accident would be low, if staff was persuaded to recreated safety program in order to react with risk properly. This accords with this study that the respondents agree that the motivation of safe behavior is the effective factor of accident reduction. The possible reason of this is human nature likes to be motivated whether the negative motivation (such as punishment) or positive motivation (such as rewards or incentives).

In regard of the staff's participation, according to KAILA (2010), the participation of staff would take control over accident risk, particularly the participation of their own risk or identification of their hazards, such as involving in design or purchase of equipment. This contrasts with the result of this study the majority of respondents express opinion that the participation of risk managing of their own work tasks is the lowest effective factor of accident mitigation. This might be because the BAFS's management team normally will consider carefully (a lot of asking and find the best design of equipment and suit with job operation) and often agrees with a proposal of the fuelling operators to design and purchase new equipment. This may opposite to others where the management team sometime disapproves of purchasing equipment which suits for their working as a result of a limited amount of budget.

Organization Factor

In respect of corporate safety policy, Executive (2018) recommended that if the company strictly prohibit and actively attempt to promote the safety procedure so as to prevent the staff from violations of such procedures, the worker behavior must be controlled. This is consistent with the result of this study that the majority of respondents propose the rule restriction is the most effective factor of accident prevention. It may be because that a nature of Thai people is compromising and forgiving (Vongvipanond, 2018), therefore if the company intends to change the worker' behavior or make them having discipline, the company needs to provide the internal safety audit with minimum or above legal requirement (Executive, 2018). Another two items of corporate safety policy, according to a description of Haney (2003) and Kaila (2009) about the BBS principle that both Concept of Fact Finding and Concept of Non-Punishment are greatly relevant to improve the safe behaviors in workplace. This is partially consistent with the result of this study in connection with Concept of Fact Finding, the respondents advise that Concept of Fact Finding is the effective factor of reducing occupational accident whereas the previous literature contrasts with this study that Concept of Non-Punishment has the least effective factor of reducing occupational accident. . In regard of Concept of Non-Punishment, adult workers more belief than young workers that Concept of Non-Punishment has the least effective factor of reducing occupational accident. The possible reason for these two item is that most of workers believe that the human behavior can be changed, if the company investigates the accident with factual discovery in order to seek for future prevention but adult workers believe that when the company find workers who perform unsafe act, they should be punished according to safety policy and incentive is not always provided for workers who perform safe act because the incentive may not really shape their safety behavior, meaning that workers might not perform safe action with real intention (Smith & Carayon, 2009).

In respect of training and safety activity, Cohen & Colligan (2003) explained that the regular training of safety would effectively control on the employee's behavior and finally would result in the elimination of accident risk. This is strongly

agreed with the result of this study that the highest number of respondents see that the regular safety training is the most effective factor of mitigating occupational accidents. This may be because that the regular safety training will enhance worker's ability and knowledge for effective operation of various tasks, including the awareness development and hazards identification in process and become the skill of the workers as a cause of behavior change (Cohen & Colligan, 2003; Smith & Carayon, 2009). According to Huang et al. (2004), the training course of unexpected problem solving could make workers having ability of self- control in decision making in the event of high demand jobs, inadequate number of equipment and uncertainty of outside weather. Similarly, this study explores that the respondents propose that training course of unexpected problem solving is more effective factor of eliminating accident rate, especially adult workers rather than young workers. The likely possibility of this is that adult workers have seen a lot of occupational problems including unexpected problems which can produce accident risk relating to their job assignments. In addition, Smith & Carayon (2009), exlained the safety activity is one way of safety promotion which can motivate worker to safety behavior and finally lead to reduce accident rate of the company. It has a similarity to this study find out the respondents consider that regular safety activity is the effective factor of mitigating occupational accident, particularly young workers rather than adult workers. This might be because young workers have less experience and skill than adult worker, young workers may enjoy participating in safety activity which has the visible demonstration to the workers about the new technology relating to their jobs or the importance of safety which needs to be seriously considered (Smith & Carayon, 2009). The final item of training respect is a training course of new equipment, most of respondents see that training course for every time launching new equipment is the least effective factor of accident reduction because the into-plane fueling equipment of BAFS is highly likely to designed in accordance with the international standard and requirement by relevant employee, therefore although BAFS will purchase new equipment, workers will be familiar with functions of the said equipment.

In respect of communication, Executive (2018) stated that the update and easiness of procedure can reduce the number of occupational accident because the procedure, including safety policies are crucial channel of safety communication

between workers and the company, hence if the company has good enough safety policies to monitor and enforce, the accidents rate could be low. Similarly, the result of this study shows that the majority of respondents opine that update and easiness of BAFS's procedure are the most effective of accident mitigation. The possible reason of this is that the worker's performance will be conducted by the BAFS's procedures which shall be required by international and domestic law (Executive, 2018), therefore if the said procedure is the update and easy to access and understand for workers, it is possible that the operator will apply such procedure for their job assignment and finally their behavior will be shape to safe acts. Moreover, BAFS gives the relevant workers a chance to assist in drafting procedures, hence BAFS's procedures are designed with easiness of understand for their workers, such as preferring photo presentation rather than text or wording presentation. In particular, the update and easiness of procedure is important for young workers who have less Into-Plane Fuelling experience than adult workers. However, personally, adult workers might be a cause of accident because they realize their long experience, therefore they will perform their jobs without carefulness of applying outdated procedure due to unfollowing updated procedure, this can also lead to unsafe act. For Opened and Respected Communication, Smith & Carayon, (2009) and Zhu el at., (2010) and this study found that same result, Opened and Respected Communication can enhance the safety behaviour of workers because it is an effective tool to eliminate accident hazards. It might be because Opened and Respected Communication will be a channel of sharing idea or problems about both personal life and working life between management team, including supervisor and operator, it makes them having a good relationship and easily understanding each other, particulary, adult staff who has woked at BAFS for ten years approximatly, therefore they have seen problems arisisng from a gap of relationship between management and operation staff. For this reason, it can avoid miscommunication and can increase the accuracy of information which can remove the accident rate (Smith & Carayon, 2009). In respect of communication of accident's impact on worker and the organization, Zhu et al., 2010 suggested that the communication with workers about accident's impact on them and organization can direct woker to safety behaviour. This contrasts with the result of this study exploring that most of repondents view

that communication of accident's impact is the least effective factor of reduction accident number, especially young workers. This may be because young staff who has less working experience than adult staff who awares and relaises how the accidents impact on BAFS and their lifes, such as financial impact that can impact on worker's lifes, especailly the reduction of bonus rate.

5.2 Recommendations

In view of the above data analysis, this study will offer with the following suggestions;

Firstly, BAFS should create the method for attracting workers, particular young workers to interest in procedures and training. This may apply technological tool, such as online accessibility is like QR code. Those technological tools will offer flexible time and easiness of procedure accession for workers to review procedures or to receive trainings while such technology may also offer not only convenience for BAFS to update procedure easily and also flexible time to provide training courses for its workers. Moreover, a tool for motivating staff to procedure compliance can be non-monetary reward, such as cap, t-shirt and cup which is created with safety event's name for best reminders. Accordingly, workers may be interested in procedures which can make them to understand and follow the said procedures and finally can develop their awareness (Cohen & Colligan, 1998). In short, it is possible that the technological tool can change the workers' behaviors in a positive way, that is, the human error elimination. To amplify the training course, BAFS should provide extra courses, especially an unexpected problem solving course which will enhance the worker's ability to provide service during abnormal condition, such as a bad weather period.

Secondly, BAFS may recruit a new staff to solve the problem of inadequate number of workers and work overload and limitation of working time. Alternatively, BAFS would be better to invest in technology to reduce consumption of working time which will lead to solve the problems of work overload and limitation of working time.

Thirdly, BAFS may apply the BBS principle in connection with Concept of Fact Finding and Concept of Non-Punishment in accordance with the BBS principle. This may be a tool of improving working carefulness of BAFS's workers because when they perform unsafe acts, they will be repeatedly told to correct without punishment, this is deemed as the appropriate way because it is an elimination of accident root cause. Meanwhile if workers perform safe act, they will be granted a reward, this is one tool of motivating workers to produce safe act, although the rewards scheme is not always the method to promote safety in workplace as a cause of non-intention of good safety performance (Smith & Carayon, 2009).

5.3 Implication and Limitation

This study has focused on a population's viewpoint of Bangkok Aviation Fuel Services Public Company Limited with a limited number and a particular type of staff, that is 255 Into-Plane Fuelling staff who mostly comprising of operators. Therefore, the result of this study may be contributed with error as a consequence of unwillingness of full information disclosure. Because of this, this study might be only fitted with Into-Plane Fuelling service sector where employs eastern employees who love relaxing and compromising among each other. This study may helpfully contribute information to the employers for understanding the employees' perspective by lengths of service on the accident causation and effective factors of reducing accident rate, alternatively this study may be useful for further finding more appropriate methods to prevent future accident. In addition, the future research might concern the management's perspective on Into-Plane Fuelling service sector.

5.4 Conclusion

BAFS where complies with many international standards of quality and safety, particularly, OHSAS, ISO, JIG and IATA. However, BAFS is facing with a risk of accident occurrence. This study identifies that all groups of staff by lengths of service have the same view on accident causation in regard to the organization and

environment factor, although there are different view on two items of human factor, that is, a lack of skills or experiences and younger workers are more concerned by adult staff than young staff. Finally, this study explores that all groups of Into-Plane Fuelling workers have the same viewpoint on the opportunity for workers to participate in risk managing of their own work tasks and the motivation of safe behavior, however they have different perspective on safety awareness, that is, adult staff more concerns than young staff. For the effective factor of accident reduction in relation to organization, all groups of Into-Plane Fuelling workers have the same opinion on the rule restriction, Concept of Fact Finding, the regular training courses, a training of new equipment. However, they opine in different way, that is more adult workers than young workers advise the most effective factors of reducing accident in workplace are Opened and Respected Communication, a training of unexpected problem solving course and communication of impact on them and organization. Conversely, more young workers than adult workers support that the most effective factors of mitigating accident were Concept of Non- Punishment, the regular safety activity and update and easiness of procedures.

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APPENDIX A : Literature Review and Questionnaires

Causal Factor of Accident	No.	Question	Author
Human	1.1	Negligence	Froggatt & Smiley, 1964)
	1.2	Unfollowed instruction / rule	(Hansson, 2004)
	1.3	Younger workers	(GYEKYE & SIMO , 2009)
	1.4	Lacking skill/experience	(Burt,2015)
	1.5	Health problem	(Carrillo-Castrillo et al., 2016)
	1.6	Unfamiliar with new equipment	ZSmith & Carayon, 2009)
Organization: Enforcement	2.1.1	Conflict of procedures	(Soltanzadeh, Mohammadfam, Moghimbeygi, & Ghiasvand, 2017)
	2.1.2	A large number of working instructions having a conflict between each other	(Hansson, 2004)
	2.1.3	Inadequate audit	(Soltanzadeh, Mohammadfam, Moghimbeygi, & Ghiasvand, 2017)
Organization: Training	2.2.1	Inadequate training	(Cohen & Colligan, 2003)
	2.2.2	Poor training	(Kusukami & Ikeda, 1989)
Organization: Supportor	2.3.1	Lack of coworker support	(Richter, McAlearney, & Pennell, 2015)
	2.3.2	Inadequate worker	-
Organization: Equipment	2.4.1	Complicated equipment	(Smith & Carayon, 2009)
	2.4.2	Impaired equipment	(Smith & Carayon, 2009)

Causal Factor of Accident	No.	Question	Author
	2.4.2	Inadequate equipment	(Smith & Carayon, 2009)
Environment	3.1	Work overload	(Schulzinger,1956)
	3.2	Limited working time	(Kusukami & Ikeda, 1989)
	3.3	Unsafe environment	(Hansson, 2004).

APPENDIX B : Questionnaires

Part 1. Demographic information

- Age

□ 20 or younger □ 21 - 30 years □ 31- 40 years

□ 41- 50 years □51-60 years

- Location

□ DMK-Substation □ BKK-Into plane

- Length of service

□ less than 1 years □ 1 – 3 years □ 4 – 10 years □ 11 – 15 years

□ 16 – 20 years □ 21 – 25 years □ 26 - 30 years □ over 30 years

- Educational background

□ Vocational Certificate) □ Vocational Diploma □ Bachelor's degree

□ Master's degree

Part 2. Causal factors of accident

Direction : Please check (✓) and rate yourself honesty what you actually do or think giving the statements using the following scales

1. Strongly disagree

2. Disagree

3. Neutral

4. Agree

5. Strongly agree

Causal factors of accident	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
1. Human					
1.1 Resulting from negligence					
1.2 Resulting from unfollowing working instruction or safety rules / working instruction					
1.3 Resulting from younger workers					
1.4 Resulting from deficiency of skill and experience					
1.5 Resulting from health problems ie., anxiety and depression					
1.6 Resulting from unfamiliar with new equipment					
2 Organization					
2.1 Enforcement					
2.1.1 Resulting from conflict of working procedures					

Causal factors of accident	1 Strongly disagree	2 Disagree	3 Neutral	4 Agree	5 Strongly agree
2.1.2 Resulting from poor safety policies					
2.1.3 Resulting from inadequate audit or supervision					
2.2 Training					
2.2.1 Resulting from inadequate training					
2.2.2 Resulting from poor communication during training, including comprehensive language					
2.3 Human Resources					
2.3.1 Resulting from lack of co-workers' safety support					
2.3.2 Resulting from small number of staff					
2.4 Equipment					
2.4.1 Resulting from complexity of equipment					
2.4.2 Resulting from impaired equipment					
2. 4.3 Resulting from inadequate number of equipment					
2.4.4 Resulting from misuse of equipment as directed					
3 Environment					
3.1 Resulting from work overload					
3.2 Resulting from working time limitation					
3.3 Resulting from unsafe environment i.e., bad weather					

Part 3. Effective factors for accident reduction

1. <u>Human</u>

Please rank each of the following items in order of importance with #1 being the most effective factor to # 3 being the least effective factor

..……..If the worker is aware of safety.

……If the worker is provided with opportunities to active or participate in managing the risks of their own work tasks.

……..…If the worker is motivated to behave safe.

2. <u>Organization</u>

2.1 Enforcement

Please rank each of the following items in order of importance with #1 being the most effective factor to # 3 being the least effective factor

..……..If the Organization do not find "fault" but find "fact".

..……..If the workers perform unsafe act, they do not get punishment, instead they are informed repeatedly to correct and if the workers perform safe act, they are granted rewards to encourage.

..……..If the Organization enforces safety rule strictly.

2.2 Training / Activities

Please rank each of the following items in order of importance with #1 being the most effective factor to # 4 being the least effective factor

..…….. If the Organization regularly provides safety training courses.

..…….. If the Organization provides training courses in unplanned solving problems.

..…….. If the Organization provides training every time of new equipment is used for all relevant workers.

……..…If the Organization regularly creates safety activities.

2.3 Communication

Please rank each of the following items in order of importance with #1 being the most effective factor to # 3 being the least effective factor

..……..If the safety or working procedures are updated and easy to access and to understand for workers.

..……..If between management, including manager and operator has open communication, good relationship and respect each other.

..……..If the Organization communicates to workers about impact of accident on both worker's life and organization.

APPENDIX C : Translation of Questionnaires

ส่วนที่ 1. ข้อมูลพื้นฐาน

- อายุ

  ☐ 20 ปี หรือ อ่อนกว่า ☐ 21- 30 ปี ☐ 31- 40 ปี

  ☐ 41- 50 ปี ☐ 51- 60 ปี

- สถานที่ปฏิบัติงาน

  ☐ สถานีบริการเติมน้ำมันอากาศยานดอนเมือง ☐ สถานีบริการเติมน้ำมันอากาศยานสุวรรณภูมิ

- อายุงาน

  ☐น้อยกว่า 1 ปี ☐ 1 – 3 ปี ☐ 4 – 10 ปี ☐ 11 – 15 ปี ☐ 16 – 20 ปี

  ☐ 21 – 25 ปี ☐ 26 – 30 ปี ☐มากกว่า 30 ปี

- การศึกษา

  ☐ ปวช. ☐ ปวส. ☐ ปริญญาตรี ☐ ปริญญาโท)

<u>ส่วนที่ 2 สาเหตุของอุบัติเหตุ</u>

โปรดทำเครื่องหมาย (✓) และให้คะแนนที่ตรงกับความคิดเห็นของท่านและตรงกับความเป็นจริงมากที่สุด โดยให้คะแนนตามระดับคะแนนตามตารางด้านล่างนี้

1 ไม่เห็นด้วยเป็นอย่างยิ่ง

2. ไม่เห็นด้วย

3. ไม่แน่ใจ/เฉยๆ

4. เห็นด้วย

5. เห็นด้วยเป็นอย่างยิ่ง

ท่านคิดว่าสาเหตุของอุบัติเหตุของ BAFS เกิดจาก	1 ไม่เห็นด้วยเป็นอย่างยิ่ง	2 ไม่เห็นด้วย	3 ไม่แน่ใจ/เฉยๆ	4 เห็นด้วย	5 เห็นด้วยเป็นอย่างยิ่ง
2. พนักงาน					
1.1 ประมาทเลินเล่อ					
2.2 ไม่ปฏิบัติคู่มือการปฏิบัติงาน หรือตามกฎระเบียบ ความปลอดภัย					
2.3พนักงานที่มีอายุน้อย					
1.4 ขาดทักษะและประสบการณ์ในงานที่ได้รับมอบหมาย					
1.5 ปัญหาสุขภาพ เช่น ความเครียดและความกังวล เป็นต้น					
1.6 ไม่คุ้นเคยกับอุปกรณ์ใหม่					
2 บริษัท					
2.1 การบังคับใช้					
2.1.1 คู่มือการปฏิบัติมีหลายฉบับ มีความขัดแย้งกันเอง					
2.1.2 ความไม่มีประสิทธิภาพของนโยบายความปลอดภัย					

ท่านคิดว่าสาเหตุของอุบัติเหตุของ BAFS เกิดจาก	1 ไม่เห็นด้วยเป็นอย่างยิ่ง	2 ไม่เห็นด้วย	3 ไม่แน่ใจ/เฉยๆ	4 เห็นด้วย	5 เห็นด้วยเป็นอย่างยิ่ง
2.1.3 ขาดการตรวจสอบหรือกำกับดูแล					
2.2 การอบรม					
2.2.1 ไม่ได้จัดอบรมหลักสูตรที่เกี่ยวกับความปลอดภัยและการปฏิบัติงานให้แก่พนักงาน					
2.2.2 ใช้ภาษาในการอบรมที่เข้าใจยาก					
2.3 บุคลากร					
2.3.1 ขาดการสนับสนุนจากเพื่อนร่วมงาน					
2.3.2 มีจำนวนพนักงานน้อยเกินไป					
2.4 อุปกรณ์					
2.4.1 อุปกรณ์มีความซับซ้อน ใช้งานยาก					
2.4.2 อุปกรณ์มีความบกพร่อง ไม่พร้อมใช้งาน					
2. 4.3 อุปกรณ์มีจำนวนไม่เพียงพอ					
2.4.4 ใช้อุปกรณ์ไม่เหมาะสมกับงาน					
3 สภาพแวดล้อม					
3.1 ปริมาณงานเยอะ					
3.2 ต้องปฏิบัติงานในเวลาที่จำกัด					
3.3 สภาพแวดล้อมที่ไม่ปลอดภัย เช่น ความแปรปรวนของสภาพอากาศ					

ส่วนที่ 3. ปัจจัยที่ทำให้อุบัติเหตุลดลง

1. <u>พนักงาน</u>

ท่านคิดว่าอุบัติเหตุของ BAFS จะลดลงได้อย่างไร โปรดเรียงลำดับ 1, 2,3 ตามลำดับปัจจัยที่ท่านคิดว่ามีประสิทธิภาพมากที่สุดไปน้อยที่สุด

โดยให้ 1 หมายถึง มีประสิทธิภาพมากที่สุด..... และ 3 หมายถึง มีประสิทธิภาพน้อยที่สุด)

.....พนักงานมีความตระหนักในเรื่องความปลอดภัย

..... ถ้าพนักงานได้รับโอกาสในการมีส่วนร่วมในการจัดการเรื่องความเสี่ยงของงานที่ได้รับมอบหมาย

..... ถ้าพนักงานถูกกระตุ้นหรือมีแรงจูงใจมีพฤติกรรมเพื่อความปลอดภัย

2. <u>บริษัท</u>

2.1 การบังคับใช้นโยบายความปลอดภัย

ท่านคิดว่าอุบัติเหตุของ BAFS จะลดลงได้อย่างไร โปรดเรียงลำดับ 1, 2,3 ตามลำดับปัจจัยที่ท่านคิดว่ามีประสิทธิภาพมากที่สุดไปน้อยที่สุด โดยให้ 1 หมายถึง มีประสิทธิภาพมากที่สุด ..... และ 3 หมายถึง มีประสิทธิภาพน้อยที่สุด

..... ถ้าการสอบสวนการเกิดอุบัติเหตุ ไม่ใช่เป็นการสอบสวนเพียงเพื่อหาข้อบกพร่องหรือข้อผิดพลาดแต่เป็นการสอบสวนเพื่อหาข้อเท็จจริง

..... ถ้าพนักงานมีพฤติกรรมที่ไม่ปลอดภัยในการปฏิบัติงาน พวกเขาจะไม่ถูกลงโทษแต่จะถูกบอกซ้ำๆ เพื่อแก้ไขให้ถูกต้อง และถ้าพนักงานปฏิบัติงานได้อย่างปลอดภัย พวกเขาจะได้รับรางวัลเพื่อเป็นการสนับสนุนให้ปฏิบัติงานอย่างปลอดภัยต่อไป

..... ถ้าบริษัทบังคับใช้กฎ ระเบียบ ด้านความปลอดภัยอย่างเคร่งครัด

2.2 การอบรม / กิจกรรม

ท่านคิดว่าอุบัติเหตุของ BAFS จะลดลงได้อย่างไร โปรดเรียงลำดับ 1, 2,.....4 ตามลำดับปัจจัยที่ท่านคิดว่ามีประสิทธิภาพมากที่สุดไปน้อยที่สุด โดยให้ 1 หมายถึง มีประสิทธิภาพมากที่สุด..... และ 4 หมายถึง มีประสิทธิภาพน้อยที่สุด

..... ถ้าบริษัทจัดอบรมด้านความปลอดภัยเป็นประจำ

..... ถ้าบริษัทจัดอบรมหลักสูตรการแก้ปัญหาเฉพาะหน้าให้แก่พนักงาน

..... ทุกครั้งที่มีอุปกรณ์ใหม่ บริษัทจัดอบรมให้แก่พนักงานที่เกี่ยวข้องทุกคน

..... ถ้าบริษัทจัดกิจกรรมด้านความปลอดภัยเป็นประจำ

2.3 การสื่อสาร

ท่านคิดว่าอุบัติเหตุของ BAFS จะลดลงหรือป้องกันได้อย่างไร โปรดเรียงลำดับ 1, 2,3 ตามลำดับปัจจัยที่ท่านคิดว่ามีประสิทธิภาพมากที่สุดไปน้อยที่สุด โดยให้ 1 หมายถึง มีประสิทธิภาพมากที่สุด..... และ 3 หมายถึง มีประสิทธิภาพน้อยที่สุด

..... ถ้าวิธีปฏิบัติงานหรือกฎ ระเบียบด้านความปลอดภัย ได้รับการปรับปรุง ให้เป็นปัจจุบันและ สามารถค้นหาและเข้าถึงได้ง่าย อีกทั้ง สามารถเข้าใจได้ง่าย

.....ถ้าระหว่างผู้บริหาร รวมถึงผู้จัดการ และพนักงานปฏิบัติการ มีการสื่อสารอย่างเปิดกว้าง มีความสัมพันธ์ที่ดี เคารพซึ่งกันและกัน

..... ถ้ามีการสื่อสารให้พนักงานรับรู้ถึงผลกระทบของอุบัติเหตุต่อ ตนเอง และ บริษัท

APPENDIX D : Descriptives : Part 2 (Accident Causation)

Human Factor

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
negligence	less than 1-3 (young)	44	3.93	1.149	.173	3.58	4.28	1	5
	4-15 (adult)	100	4.09	.818	.082	3.93	4.25	1	5
	16 - over 30 (old)	89	4.11	.832	.088	3.94	4.29	2	5
	Total	233	4.07	.893	.058	3.95	4.18	1	5
unfollowed instruction / rule	less than 1-3 (young)	44	3.89	1.262	.190	3.50	4.27	1	5
	4-15 (adult)	100	4.24	.955	.095	4.05	4.43	1	5
	16 - over 30 (old)	89	4.27	.836	.089	4.09	4.45	2	5
	Total	233	4.18	.985	.065	4.06	4.31	1	5
younger workers	less than 1-3 (young)	44	2.45	.926	.140	2.17	2.74	1	5
	4-15 (adult)	100	2.86	.876	.088	2.69	3.03	1	5
	16 - over 30 (old)	89	2.99	1.071	.114	2.76	3.21	1	5
	Total	233	2.83	.979	.064	2.71	2.96	1	5
lacking skill / experience	less than 1-3 (young)	44	3.09	1.326	.200	2.69	3.49	1	5
	4-15 (adult)	100	3.57	1.130	.113	3.35	3.79	1	5
	16 - over 30 (old)	89	3.69	1.174	.124	3.44	3.93	1	5
	Total	233	3.52	1.200	.079	3.37	3.68	1	5
health problems	less than 1-3 (young)	44	3.45	1.088	.164	3.12	3.79	1	5
	4-15 (adult)	100	3.32	.863	.086	3.15	3.49	1	5
	16 - over 30 (old)	89	3.47	1.023	.108	3.26	3.69	1	5
	Total	233	3.40	.970	.064	3.28	3.53	1	5
unfamiliar with new equipment	less than 1-3 (young)	44	3.16	1.160	.175	2.81	3.51	1	5
	4-15 (adult)	100	3.28	.965	.096	3.09	3.47	1	5
	16 - over 30 (old)	89	3.28	1.118	.118	3.05	3.52	1	5
	Total	233	3.26	1.060	.069	3.12	3.39	1	5

Organization Factor

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
conflict of procedures	less than 1-3 (young)	44	3.45	1.266	.191	3.07	3.84	1	5
	4-15 (adult)	100	3.12	1.335	.134	2.86	3.38	1	5
	16 - over 30 (old)	89	3.17	1.375	.146	2.88	3.46	1	5
	Total	233	3.20	1.338	.088	3.03	3.37	1	5
inadequate audit	less than 1-3 (young)	44	3.45	1.130	.170	3.11	3.80	1	5
	4-15 (adult)	100	3.06	1.262	.126	2.81	3.31	1	5
	16 - over 30 (old)	89	3.17	1.308	.139	2.89	3.44	1	5
	Total	233	3.18	1.259	.082	3.01	3.34	1	5

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
inadequate training	less than 1-3 (young)	44	2.61	1.262	.190	2.23	3.00	1	5
	4-15 (adult)	100	2.93	1.539	.154	2.62	3.24	1	5
	16 - over 30 (old)	89	2.58	1.380	.146	2.29	2.87	1	5
	Total	233	2.74	1.434	.094	2.55	2.92	1	5
poor training	less than 1-3 (young)	44	2.68	1.029	.155	2.37	2.99	1	5
	4-15 (adult)	100	2.58	.741	.074	2.43	2.73	1	4
	16 - over 30 (old)	89	2.65	.990	.105	2.44	2.86	1	5
	Total	233	2.63	.897	.059	2.51	2.74	1	5

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
lack of coworker support	less than 1-3 (young)	44	2.82	1.084	.163	2.49	3.15	1	5
	4-15 (adult)	100	2.97	.870	.087	2.80	3.14	1	5
	16 - over 30 (old)	89	2.85	1.050	.111	2.63	3.08	1	5
	Total	233	2.90	.982	.064	2.77	3.02	1	5
inadequate worker	less than 1-3 (young)	44	4.09	1.217	.183	3.72	4.46	1	5
	4-15 (adult)	100	3.99	.959	.096	3.80	4.18	1	5
	16 - over 30 (old)	89	3.93	1.185	.126	3.68	4.18	1	5
	Total	233	3.99	1.097	.072	3.85	4.13	1	5

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
complicated equipment	less than 1-3 (young)	44	2.82	1.244	.188	2.44	3.20	1	5
	4-15 (adult)	100	3.06	1.071	.107	2.85	3.27	1	5
	16 - over 30 (old)	89	2.93	1.031	.109	2.72	3.15	1	5
	Total	233	2.97	1.090	.071	2.82	3.11	1	5
impaired equipment	less than 1-3 (young)	44	3.39	1.125	.170	3.04	3.73	1	5
	4-15 (adult)	100	3.54	.947	.095	3.35	3.73	1	5
	16 - over 30 (old)	89	3.30	1.081	.115	3.08	3.53	1	5
	Total	233	3.42	1.036	.068	3.29	3.55	1	5
inadequate equipment	less than 1-3 (young)	44	3.64	1.313	.198	3.24	4.04	1	5
	4-15 (adult)	100	3.44	1.140	.114	3.21	3.67	1	5
	16 - over 30 (old)	89	3.57	1.260	.134	3.31	3.84	1	5
	Total	233	3.53	1.218	.080	3.37	3.69	1	5

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
work overload	less than 1-3 (young)	44	3.73	1.318	.199	3.33	4.13	1	5
	4-15 (adult)	100	4.12	.832	.083	3.95	4.29	2	5
	16 - over 30 (old)	89	4.00	1.055	.112	3.78	4.22	1	5
	Total	233	4.00	1.030	.067	3.87	4.13	1	5
limited working time	less than 1-3 (young)	44	4.18	1.187	.179	3.82	4.54	1	5
	4-15 (adult)	100	4.55	.857	.086	4.38	4.72	2	5
	16 - over 30 (old)	89	4.36	.956	.101	4.16	4.56	2	5
	Total	233	4.41	.970	.064	4.28	4.53	1	5
unsafe environment	less than 1-3 (young)	44	3.73	1.336	.201	3.32	4.13	1	5
	4-15 (adult)	100	4.14	.817	.082	3.98	4.30	2	5
	16 - over 30 (old)	89	4.12	1.032	.109	3.91	4.34	2	5
	Total	233	4.06	1.022	.067	3.92	4.19	1	5

APPENDIX E : Descriptives : Part 3 (Effective Factor of Accident Reduction)

Human Factor

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
safety awareness	less than 1-3 (young)	44	1.23	.522	.079	1.07	1.39	1	3
	4-15 (adult)	100	1.07	.326	.033	1.01	1.13	1	3
	16 - over 30 (old)	89	1.19	.449	.048	1.10	1.29	1	3
	Total	233	1.15	.421	.028	1.09	1.20	1	3
opportunity to participate in risk managing of their own work ta	less than 1-3 (young)	44	2.50	.699	.105	2.29	2.71	1	3
	4-15 (adult)	100	2.59	.534	.053	2.48	2.70	1	3
	16 - over 30 (old)	89	2.47	.524	.056	2.36	2.58	1	3
	Total	233	2.53	.565	.037	2.45	2.60	1	3
motivation of safe behaviour	less than 1-3 (young)	44	2.27	.585	.088	2.09	2.45	1	3
	4-15 (adult)	100	2.34	.536	.054	2.23	2.45	1	3
	16 - over 30 (old)	89	2.33	.735	.078	2.17	2.48	1	3
	Total	233	2.32	.626	.041	2.24	2.40	1	3

Organization Factor

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
not find "fault" but find "fact"	less than 1-3 (young)	44	1.95	.680	.103	1.75	2.16	1	3
	4-15 (adult)	100	1.86	.513	.051	1.76	1.96	1	3
	16 - over 30 (old)	89	1.82	.667	.071	1.68	1.96	1	3
	Total	233	1.86	.607	.040	1.78	1.94	1	3
no punishment for unsafe act but repeated informing to correct/rewards for safe act	less than 1-3 (young)	44	2.16	.834	.126	1.91	2.41	1	3
	4-15 (adult)	100	2.60	.696	.070	2.46	2.74	1	3
	16 - over 30 (old)	89	2.51	.659	.070	2.37	2.64	1	3
	Total	233	2.48	.726	.048	2.39	2.57	1	3
restriction of rules	less than 1-3 (young)	44	1.89	.920	.139	1.61	2.17	1	3
	4-15 (adult)	100	1.54	.822	.082	1.38	1.70	1	3
	16 - over 30 (old)	89	1.67	.863	.091	1.49	1.86	1	3
	Total	233	1.66	.862	.056	1.55	1.77	1	3

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
regular training courses	less than 1-3 (young)	44	2.07	1.043	.157	1.75	2.39	1	4
	4-15 (adult)	100	2.01	.772	.077	1.86	2.16	1	4
	16 - over 30 (old)	89	1.79	.790	.084	1.62	1.95	1	4
	Total	233	1.94	.841	.055	1.83	2.04	1	4
training of unexpected problem solving	less than 1-3 (young)	44	2.52	1.000	.151	2.22	2.83	1	4
	4-15 (adult)	100	2.10	1.078	.108	1.89	2.31	1	4
	16 - over 30 (old)	89	2.33	.939	.100	2.13	2.52	1	4
	Total	233	2.27	1.020	.067	2.13	2.40	1	4
training every time of new equipment	less than 1-3 (young)	44	2.89	1.125	.170	2.54	3.23	1	4
	4-15 (adult)	100	3.26	1.088	.109	3.04	3.48	1	4
	16 - over 30 (old)	89	2.93	1.116	.118	2.70	3.17	1	4
	Total	233	3.06	1.114	.073	2.92	3.21	1	4
regular safety activity	less than 1-3 (young)	44	2.52	1.191	.180	2.16	2.88	1	4
	4-15 (adult)	100	2.63	1.051	.105	2.42	2.84	1	4
	16 - over 30 (old)	89	2.96	1.167	.124	2.71	3.20	1	4
	Total	233	2.73	1.132	.074	2.59	2.88	1	4

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
updated,easy to access & understand procedure	less than 1-3 (young)	44	1.57	.759	.114	1.34	1.80	1	3
	4-15 (adult)	100	1.90	.732	.073	1.75	2.05	1	3
	16 - over 30 (old)	89	1.64	.801	.085	1.47	1.81	1	3
	Total	233	1.74	.774	.051	1.64	1.84	1	3
openly communicate between management & operator, good relationship and respect each other	less than 1-3 (young)	44	2.07	.873	.132	1.80	2.33	1	3
	4-15 (adult)	100	1.80	.853	.085	1.63	1.97	1	3
	16 - over 30 (old)	89	2.09	.748	.079	1.93	2.25	1	3
	Total	233	1.96	.827	.054	1.85	2.07	1	3
communicate to workers about accident's impact on them & organization	less than 1-3 (young)	44	2.36	.613	.092	2.18	2.55	1	3
	4-15 (adult)	100	2.30	.785	.078	2.14	2.46	1	3
	16 - over 30 (old)	89	2.27	.780	.083	2.11	2.43	1	3
	Total	233	2.30	.751	.049	2.20	2.40	1	3

VITA

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