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KNOWLEDGE, ATTITUDE AND PERCEPTION OF RISK MANAGEMENT OF STEAM BOILER AMONG WORKERS IN PALM OIL MILLS

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BY

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ABSTRACT

KNOWLEDGE, ATTITUDE AND PERCEPTION OF RISK MANAGEMENT OF STEAM BOILER AMONG WORKERS IN PALM OIL MILLS

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Background: Workers in the steam boiler of palm oil mill are typically prone to accidents in the event of failure on the boiler operation. **Objectives:** To determine the knowledge, attitude and perception (KAP) of risk management of steam boiler among workers in palm oil mills. **Methodology:** This cross sectional study design was conducted at palm oil mills in Perak and Negeri Sembilan. A total of 50 workers who are working with steam boiler and management of steam boiler operation were purposively sampled. Self-administrated questionnaires were distributed consists of 4 main parts including occupational information, knowledge, attitude and perception of risk management of steam boiler. For data analysis, descriptive analysis was used to determine the percentage, frequency, mean and standard deviation for the knowledge, attitude and perception. Chi square test was used to determine the association between KAP and accidents. **Result:** This study found that the 56% of boiler workers had good level of knowledge, 74% had good attitude toward risk and 64% had good perception of risk. The prevalence of accidents and near miss were 16% and 24% respectively. Carelessness were the most common (80%) cause of the accidents among the respondents. There was a significant association between attitude and accidents (χ^2=6.56; p=0.010) but not for knowledge and perception. **Conclusion:** This study found that the workers had good knowledge, good perception and good attitude of risk management of steam boiler in palm oil mills. Even though the level of KAP was high, but the employers need to revise the training of the worker to make them aware of the risk regularly due to the frequency of training was seldom among workers.

Keywords: Palm oil mills, steam boiler, accidents, knowledge, attitude, perception, workers

ABSTRAK

MENGKAJI TAHAP PENGETAHUAN, SIKAP DAN PERSEPSI TERHADAP PENGURUSAN RISIKO DANDANG STIM DI KALANGAN PEKERJA DI KILANG KEPALA SAWIT

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Pengenalan: Pekerja-pekerja dalam dandang stim kilang kelapa sawit biasanya terdedah kepada kemalangan sekiranya berlaku kegagalan operasi dandang. **Objektif:** Ini adalah satu kajian untuk menentukan tahap pengetahuan, sikap dan persepsi (KAP) pengurusan risiko dandang stim di kalangan pekerja di kilang kelapa sawit. **Kaedah**: Satu kajian silang rentas telah dijalankan di kilang kelapa sawit di Perak dan Negeri Sembilan. Seramai 50 pekerja yang bekerja dengan dandang stim dan pengurusan operasi dandang stim telah dipilih. Soal selidik telah diedarkan terdiri daripada 4 bahagian utama termasuk maklumat diri dan pekerjaan, pengetahuan, sikap dan persepsi terhadap pengurusan risiko dandang stim. Untuk analisis data, analisis deskriptif telah digunakan untuk menentukan peratusan, kekerapan, sisihan min dan standard untuk pengetahuan, sikap dan persepsi. Ujian persegi Chi telah digunakan untuk menentukan hubungan antara KAP dan kemalangan. **Keputusan:** Kajian ini mendapati bahawa 56% pekerja dandang mempunyai tahap baik pengetahuan sikap 74% baik terhadap risiko dan 64% persepsi baik risiko. Prevalens kemalangan adalah 16% dan sedangkan kes nyaris adalah 24%. Kecuaian adalah punca kemalangan yang paling biasa (80%) di kalangan responden. Terdapat hubungan yang signifikan antara sikap dan kemalangan ($\chi 2 = 6.56$; $p = 0.010$) tetapi bukan untuk pengetahuan dan persepsi.**Kesimpulan:** Kajian ini mendapati bahawa pekerja mempunyai pengetahuan yang baik, persepsi yang baik dan sikap yang baik terhadap pengurusan risiko dandang stim di kilang-kilang kelapa sawit. Walaupun tahap KAP adalah tinggi, tetapi majikan perlu menyemak semula latihan pekerja untuk memaklumkan kepada mereka mengenai risiko dengan lebih kerap berikutan dengan kekerapan latihan yang jarang dilakukan.

Kata Kunci: Kilang kelapa sawit, dandang stim, kemalangan, pengetahuan, sikap, persepsi, pekerja

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LIST OF ABBREVATIONS

DOSH	Department of Occupational Safety and Health
PHA	Process of Hazard Analysis
HAZOP	Hazard and Operability
P&ID	Process and Instrumentation Diagram
FMEA	Fault Modes and Effect Analysis
FTA	Fault Tree Analysis
WHO	World Health Organization
SOP	Safe Operating Procedure
GPS	Global Positioning System
FELCRA	Federal Land Consolidation and Rehabilitation Authority
SPSS	Statistical Packages for Social Science
PPE	Personal Protective Equipment
SOCSO	Social Security Organization

CHAPTER 1

INTRODUCTION

1.0 Background

Palm oil is one of the world's most quickly expanding commodity-based industry. Malaysia is one of the largest oil palm producing countries and exporters of palm oil, accounting for 12% of the world's oil & fat production and 27% of export trade of oils and fats. Malaysian currently produced 39% of world palm oil production and 44% of world export. In the 80s, oleo chemical industry began to flourish as they were sufficient supply of palm and palm kernel oil (Malaysian Palm Oil Council, 2013).

All parts of palm oil tree especially the fruits can be utilized including the waste after several processes. The examples of solid wastes from the palm oil mill processing are empty fruit bunch (EFB), mesocarp fruit fibers (MF) and palm kernel shells (PKS) (Figure 1.1 and 1.2) (Abdullah et al, 2013).

Figure 1.1: Palm Kernel Shell
(Source: http://www.renewableenergypartners.net/service/pks-benefits)

Figure 1.2: Mesocarp Fruit Fiber
(Source: http://www.henghuat.com.my/photo/images/hh_palm2a.jpg)

The solid waste such as fiber and kernel can be used as alternative fuel (Hanafi, Hassim, & Yusuf, 2015) to produce superheated steam for electricity generation for whole mill. Therefore, the most common hazards associated with steam are contact

with heated equipment due to the high temperature, physical exposure to live steam, non-uniform heat transfer and equipment over-pressuring (Hayashi, 2007).

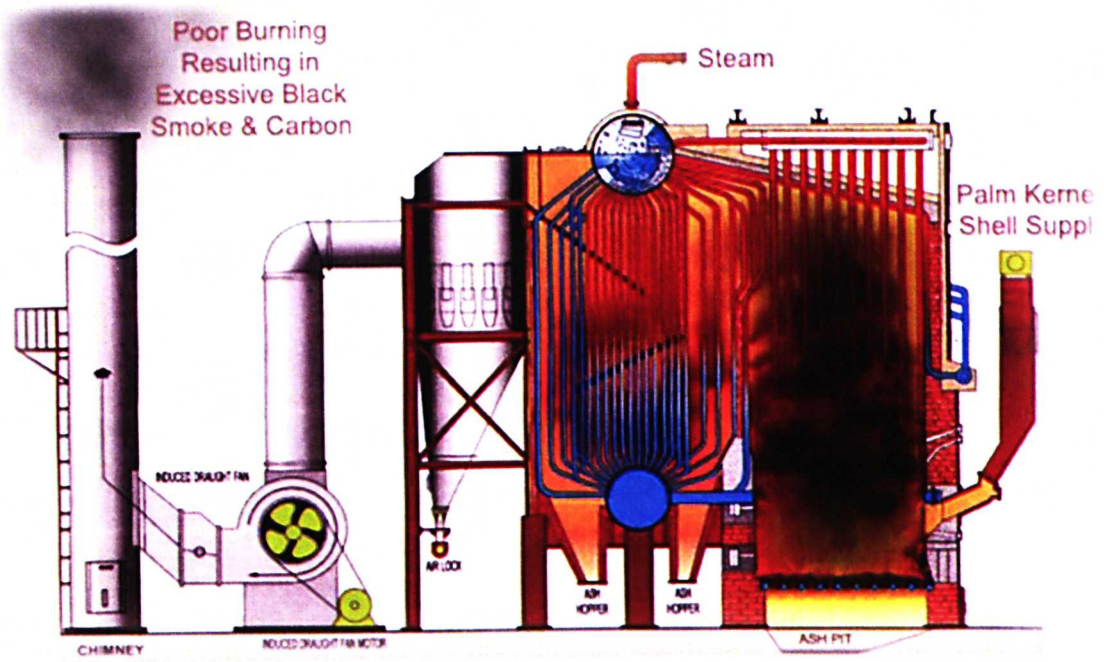

Figure 1.3: Steam Boiler Operation
(Source: http://axisro.com/sentralind/products_biomas.html)

Steam boiler is an enclosed vessel where heat produced will be transferred to water until it becomes steam. In a technical context, the steam boiler includes the whole complex system to provide steam that will be used as a steam turbine (Teir, 2002).

Even though this type of vessel was built with the safety features, it still has the potential to explode. A boiler explosion occurs if steam flow output is prevented or restricted caused by increase of the temperature and pressure of boiler. If the safety device is not provided or inadequate to limit the pressure to a safe value, the boiler will rupture (Speegle, 2013). The mill processes 27000 kg of FFB per hour and leaving

about 6000 kg/h of fibre and shell as boiler fuel. The normal operating temperature for a boiler is 700°C and pressure is 300 psi (Rashid, Chong, Ramli, Zainura, & Norruwaida, 2013).

1.2 Problem Statement

In Malaysia, there has been many cases of accidents at the palm oil mills reported to Department of Occupational Safety and Health (DOSH) particularly in need of attention is the boiler operation. Despite the fact that lack of organized quality in steam boilers were because of original deformities, awful workmanship and weakening from use or mismanagement (Karthika, 2013), human error were also commonly being cited as being the cause of accidents. Specifically, boiler are still fail even though being equipped with automated control system and set of safeties interlocks to the boiler if to the procedures and maintenance schedule are not followed properly by operators (Jing and Chung, 2013).

Moreover, from a preliminary survey among boiler workers in palm oil mills, most of the workers were found high reliance and dependency on the automation of the boiler system and they believe that the automated system will shut the boiler or correct itself if there are any error or deviation. It is unsure if the boiler workers have the appropriate knowledge level in the management of hazards associated with boiler operation. This may be attributed to the perception of risk and have their attitude or vice versa.

1.3 Study Justification

Although numerous studies on the knowledge, attitude and practice of workers engaged in various occupations have been published, none has been reported among boiler workers of the oil palm industry. This study could serve as an input to management of palm oil mills to improve the knowledge, awareness, attitude and perception of their workers towards boiler. In turn, improvement in the knowledge, attitude and perception of the boiler workers can contribute to reduction of near miss and accidents in the workplace especially in boiler room. As the result, the cost due to accidents and explosion of boiler, compensation to the workers, damages not only to properties but also environment and reputation can be avoided or prevented.

1.4 Research Objectives

1.4.1 General Objectives

To determine the knowledge, attitude and perception of risk in management of steam boiler among workers in palm oil mills.

1.4.2 Specific Objectives

i. To determine the socio demographic and occupational information of the respondents.
ii. To determine the prevalence of accidents and near miss among workers.
iii. To determine the cause of accidents.
iv. To determine the knowledge, attitude and perception of the risk management among steam boiler workers in palm oil mills.
v. To determine the association between knowledge, perception and attitude of risk managements among steam boiler workers in palm oil mills.
vi. To determine the association between knowledge, perception and attitude of risk managements of steam boiler with accidents' frequency among workers in palm oil mills.

1.5 Hypothesis

i. There is an association between knowledge with attitude of risk management of steam boiler among workers in palm oil mills.

ii. There is an association between perception with attitude of risk management of steam boiler among workers in palm oil mills

iii. There is an association between knowledge, perception and attitude of risk management of steam boiler with accident frequency among workers in palm oil mills.

1.6 Definition of Terms

1.6.1 Conceptual Definition

i. Socio-demographic of the respondents

Socio-demographic is characterized by a combination of sociological and demographic characteristic. For example were age, race, education level and etc.

ii. Knowledge

Knowledge is defined as facts, information, and skills acquired through experience or education; the theoretical or practical understanding of a subject (Hornby, 2015).

iii. Attitude

Attitude is defined as manner, disposition, feeling, position with regard to a person or thing; tendency or orientation, especially of the mind a negative attitudes or group attitudes. Attitude can be in the form of likes and dislikes, biases, views, feelings concerning a situation or issue (Sammut, 2013).

iv. Perception

Perception is defined as a belief or opinion, often held by many people and based on how things seem; the quality of being aware of things through the physical senses, especially sight; someone's ability to notice and understand things that are not obviously to other people (Hornby, 2015).

v. Boiler workers

The workers who are involve with boiler operation in the palm oil mills.

vi. Steam Boiler

A steam boiler is defined as a receptacle in which water is boiled to generate steam.

vii. Risk management

Managing work, health and safety involve four steps which are identify the hazard that have potential to cause harm, assessing the risk by understanding the harm that could be caused by the hazard including seriousness and likelihood. Then controlling the risk by implementing the most effective control measure and reviewing the control measure as planned (Safe Work Australia, 2012).

viii. Accidents

Something bad that happens that is not expected or intended and that often damages something or injuries someone; without intending to, or without being intended (Cambridge Dictionary Online, 2016).

ix. Near Miss

A situation in which something almost hits something else: an attempt to do or achieve something that fail although it almost succeeds (Cambridge Dictionary Online, 2016).

1.6.2 Operational definition

i. Socio-demographic and occupational information of the respondents

The socio-demographic was measured by using self-administrated questionnaire consist of questions related to age, race and occupational information.

ii. Knowledge

Knowledge in this study is the theoretical and understanding of the hazards and operations associated with steam boiler which is measured using self-administrated questionnaire.

iii. Attitude

The attitude in this study is focused on attitude of workers towards handling the steam boiler whether in operation or maintenance. The attitude was determined by using self-administrated questionnaire.

iv. Perception

Perception is defined as the subjective judgements that respondents (boiler workers) make about the character and severity of a risk of the steam boiler. The individual perception is different from others and measured using questionnaire.

v. Boiler Workers

The boiler workers who were able to participate in this study.

vi. Steam Boiler

The boiler that used fiber and kernel as a fuels to generate an electricity throughout the palm oil mills.

vii. Risk Management

The hazards of the steam boiler and its operation were identified and the risk of the steam boiler to the workers were assess. The preventive measures were reviewed. All the risk management items were identified by using self-administrated questionnaire in the knowledge, attitude and perception items.

viii. Accidents

The event of failure on the steam boiler operation that can cause injuries to the boiler workers and the questionnaire is used to determine the prevalence of accidents.

ix. Near miss

The event that not causing harm to the boiler workers but has a potential to cause accidents and injuries in the mill and determined by using a questionnaire.

1.7 Conceptual Framework

Figure 1.4 shows the overview of this study. The red outline of boxes is the variables involve in this study. In the palm oil mill, there is a sequence of major processes involved, such as sterilizing, threshing, steam boiler and pressing. Focusing on the steam boiler, the main function of the boiler is to generate an electricity to the whole mill and concurrently transfer the steam to the sterilizer. The steam boiler operates typically on automated system assisted by the workers. The common parameters monitored both by workers and the system are water level, smoke, fuel supply and steam pressure. The operation of steam boiler can be routine or non-routine. If deviations occur, the alarm will be triggered. The alarm may act as a warning sign to the workers. If there is any failure on the alarm, accidents can be happen to the boiler. The boiler system then reset or continued to operate back as a normal operation to produce steam. Besides that, the workers may require to check on the boiler manually when there were any failure. The system will reset and continued to operate normally or stop operate. In order to operate and handle the boiler effectively and safely, the workers need to have knowledge on the risk management of boiler, correct attitude towards risk management and the perception of risk management of steam boiler.

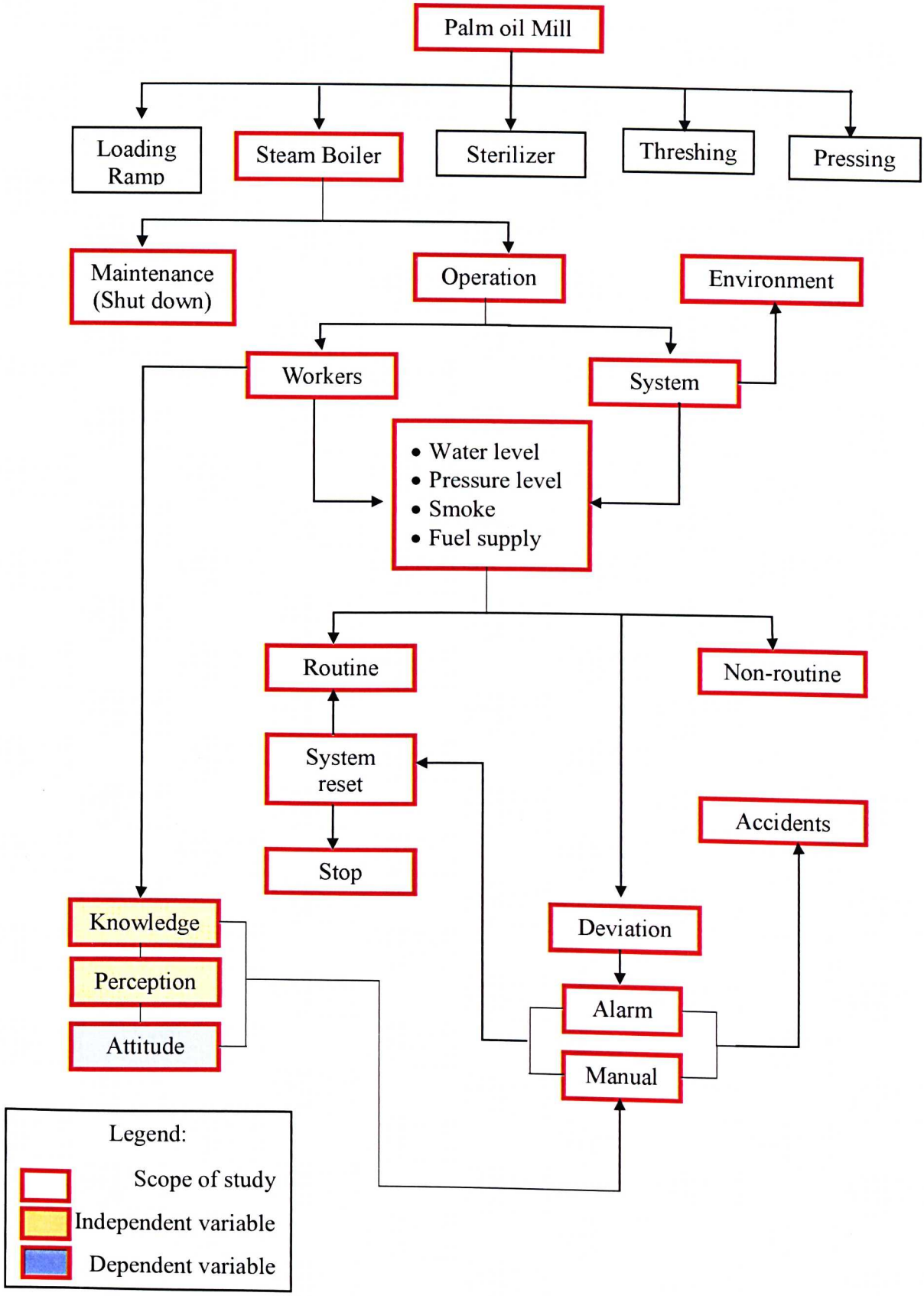

Figure 1.4: Conceptual framework

CHAPTER 2

LITERATURE REVIEW

2.1 Palm Oil Production Overview in Malaysia

2.1.1 Palm Oil Mill in Malaysia

Table 2.1 shows that the number of palm oil mills are increases year by year in Malaysia. The latest statistic shows that 426 palm oil mills with the capacity to produce 99.85 million tonnes of Fresh Fruit Bunches (FFB) in a year. The increasing palm oil mills in Malaysia indicates the increasing production of the palm oil.

Table 2.1: The number of Palm Oil Mills in Malaysia

Year	No. of mills	Capacity (Million tonnes FFB/year)
1980	149	13.33
1985	229	21.43
1990	261	31.03
1995	281	42.20
2000	350	65.95
2005	395	84.11
2010	421	97.38
2011	426	99.85

(Source: MPOB, Malaysian Palm Oil Statistic, 2012)

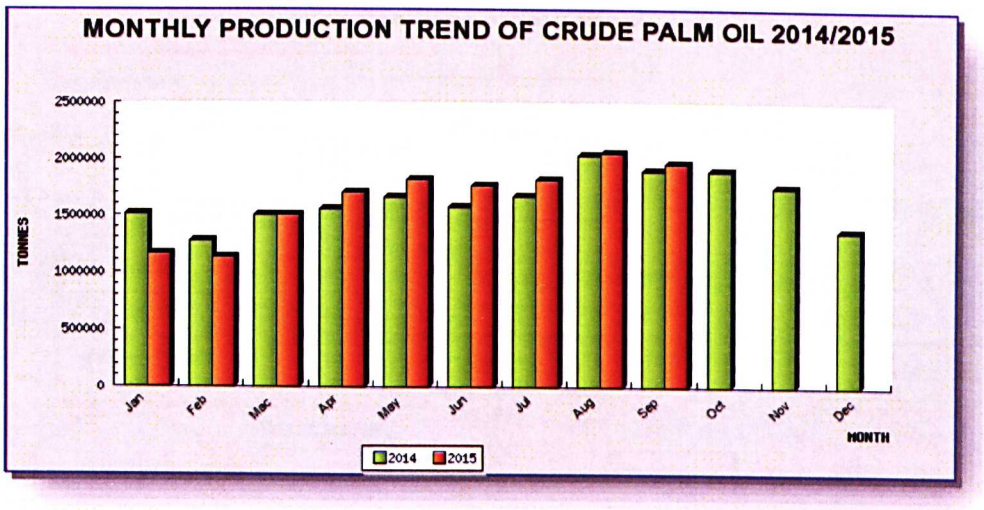

Figure 2.1: Monthly Production Trend of Crude Palm Oil 2014/2015 in Malaysia

[Source: Retrieved at Economics & Industry Development Division, Malaysian Palm Oil Board (MOPB), October 28, 2015]

Palm oil mills in Malaysia process fresh fruit brunches (FFB) received from the palm oil plantations into crude palm oil (CPO) and other by-products. Two products are produced in a palm oil which are palm oil (CPO) and palm kernel (Malaysia Palm Oil Board, 2012). In summary, it involves receiving the fresh fruit bunches from the plantations, sterilizing and threshing it to free the palm fruit, mashing the fruit pressing out the crude palm oil.

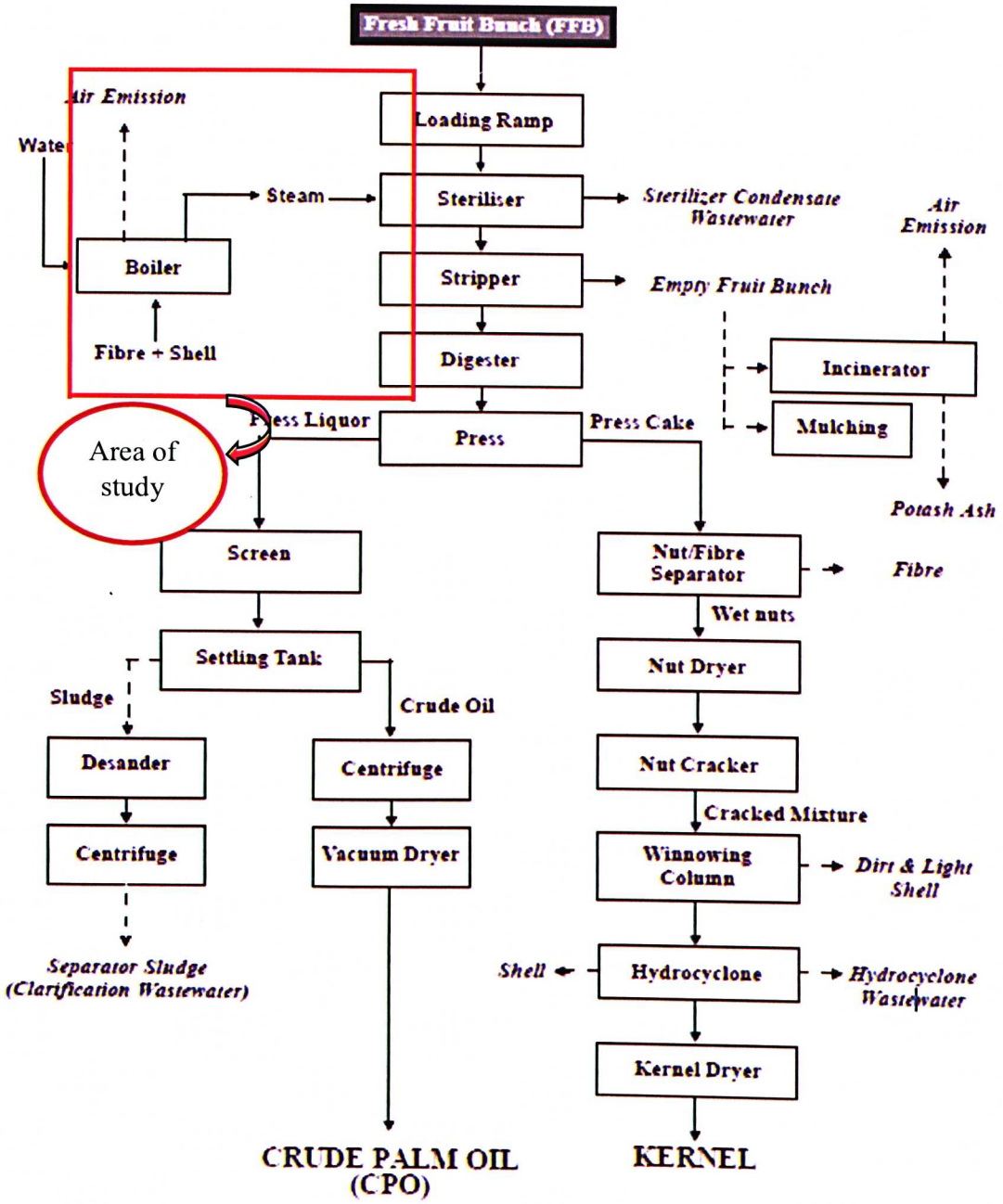

Figure 2.2: Process of Crude Palm Oil Mill

(Source: Adopted from Industrial Process and the Environment Handbook 3.0)

2.1.2 Steam Boiler Operation in Palm Oil Mill

The boiler fuel for palm oil mills are palm fiber and shell to regenerate the steam and electricity. Without proper maintenance, the boiler produces intermittent dark smoke emission of soot and partially carbonised fibrous particulates. It became hazardous when the combustion is incomplete due to the lack of steady-state condition in the boiler furnace and insufficient combustion (Ngan, Singam, & Eam, Jenny Tan Suat, 1999). Moreover, oil palm mills produced air emission from the boilers and incinerators mainly gases with particulates such as tar and soot droplets from 20-100 microns and dust load from 3000 to 4000 mg/m. The fly ash have been used to reduce the BOD, TSS, colour and other contaminants before discharged into the atmosphere and remove the heavy metals (Igwe & Onyegbado, 2007). In palm oil mills, the electricity co-generated roughly 1-1.5 billion kWh or less than 2% of 2003 generation of over 82 billion kWh (Abdullah & Sulaiman, 2013).

2.1.3 Hazard and Operability (HAZOP) Study of Steam Boiler

There are various techniques can be conducted to identify hazards in new or existing process facilities and one of them is Process Hazard Analysis (PHA). PHA are designed to complete risk evaluations and adequate protective devices such as safeguard and to ensure the safe design and operation of a syatem. The Hazard and Operability study is one tool of the PHA that have been applied worldwide to study hazards and operability problems (Dunjo, Fthenakis, Vilchez, & Arnaldos, 2010).

A Hazard and Operability (HAZOP) study is a detailed hazard and operability problem identification process, carried out by a team. HAZOP consists of the identification of potential deviations from the design intent, examination of their possible causes and assessment of their consequences (Sinnott, 2005). In simple words, HAZOP is the theory that evaluate the risk events caused by deviations from design or operating intentions. The deviations can be identified by using sets of "guide word" as a systematic list of deviation. HAZOP is the qualitative risk assessment.

Hazard is anything that have potential to cause harm. In HAZOP study, the hazard that are focusing is from the design or operational intent and every single hazard should be noted because multiple forms of harm can be produced from a single hazard. In addition, any operation involving toxic, flammable or explosive chemicals can lead to catastrophic events that could result in injury to personnel, damage to property and effect on environment. Operability is connected with the way in which a business, machine, system and etc. works (Oxford Advance Learner's Dictionary, 2015). In other words, any operation inside the design that can cause shutdown and gives negative impact on environment, health or safety regulations and negatively impact the profitability of the company.

Table 2.2: Terminology of HAZOP study

Elements	Definition
Study nodes	Section of equipment with definite boundaries within which process parameters are investigated for deviations. Location on P&ID (Process and Instrumentation Diagram) at which process parameters are investigated for deviations.
Intention	Definition on how plant is expected to operate in the absence of deviations. It can be either descriptive or diagrammatic.
Guide Words	Simple words that are used to qualify/ quantify the design intentions and to guide and stimulate the brainstorming process.
Process parameters	Physical or chemical property associated with the process.
Deviations	Departure from the design intentions that are discovered by systematically applying suitable guide words.
Causes	Reasons why deviation might occur.
Consequences	Result from deviations
Safeguards	Engineered systems or administrative control designed to prevent causes.
Recommendations	Suggestion for design changes, procedural changes or areas of further study.

(Samera et.al, 2012)

Table 2.3: Guide word and deviation

Deviation type	Guide word	Example interpretation for process industry
Negative	NO	No part of the intention is achieved, e.g. no flow
Quantitative modification	MORE	A quantitative increase, e.g. higher temperature
	LESS	A quantitative decrease e.g. lower temperature
Qualitative modification	AS WEEL AS	Impurities present Simultaneous execution of another operation
	PART OF	Only some of the intention is achieved, e.g. only part of an intended fluid transfer take place
Substitution	REVERSE	Covers reverse flow in pipes and reverse chemical reactions
	OTHER THAN	A result other than the original intention is achieved, e.g. transfer of wrong material
Time	EARLY	Something happens early relative to clock time, e.g. cooling of filtration
	LATE	Something happens late relative to clock time, e.g. cooling of filtration
Order or sequence	BEFORE	Something happens too early in a sequences, e.g. mixing or heating
	AFTER	Something happens too late in a sequences, e.g. mixing or heating.

(Source: Adapted from IEC International standard 61882)

There are many different types of techniques or tools available to identify the potential hazards and operability problems, starting with Checklist, Fault Modes and Effect Analysis (FMEA) and Fault Tree Analysis (FTA). The technique used in determining and examining the hazard is "guide word" examination which is a deliberate search for deviations from the design intent. The guide word is use to stimulate imaginative thinking, to focus the study and gives some ideas while maximizing the chances of study completeness.

2.2 Knowledge, Attitude and Perception of Risk

A KAP study measures the knowledge, attitude and perception of risk of a community. It serves as an educational tool for community. In addition, KAP study are common in the medical and public health field (WHO, 2008 and Yassin et al., 2002). The main tools for this study is a questionnaires survey (WHO, 2008) that complemented with focus groups, in depth interviews and observation. The concept of attitude is applied and explained by different disciplines and sciences (Bergam, 1993). Aizen and Fishbein, (1980) define as learned predisposition to respond in a consistently favourable manner with respect to a given object.

An official definition of risk is "a measure of the probability and severity of adverse effects". In other words, risk is a calculation of how likely an incident is to occur, and given its occurrence, how dire the consequences would be. Being able to accurately assess the risk in a situation or resulting from a set of actions is, at a personal qualitative level, dependent upon an individual's risk perception and risk tolerance. Risk perception is the ability of an individual to discern a certain amount of risk, and

risk tolerance refers to a person's capacity to accept a certain amount of risk (National Safety Council, (2003).

Industrial safety and risk management is an integrated and consistent approach toward the elimination of incidents and the reduction of risks to people, production, facilities and the environment (Wilson et al, 2001). The main cause of hazard in mill is organizational inadequacies. It can be related with safety controls, Safe Operating Procedure (SOP), hazard and risk assessment and controls, training and awareness. The workers usually do not realized the hazard and consequences of their action. To eliminated or minimize risk exposed to all employees, contractors and visitors in their activities, the management should establish occupational health and safety management system (Hashim, 2011). Biased perception of risk can cause misjudgements of potentially hazardous risk sources (Rundmo, 1997).

2.2.1 Risk Perception

Risk perception involves two factors: the magnitude of the potential loss and the probability of its occurrence (Sjöberg, 2000). In other words, the existence or not of different risk factors and occupational accidents. This might explain why people perceive the same risk in very different situations or why the same individual might perceive risk differently depending on when he or she is asked about it (Leoni, 2010).

2.3 Health and Safety Risk Management

The health and safety management should embrace in a holistic way. Hence, the interactions between the working environment, equipment, systems and procedures, and the people in the organisation plays the important roles to improve the safety management. Poorly designed tools, machine or operations, poor system and poor working environment could lead to unsafe behaviours. An organisation's attitudes is very important regarding to create safe working procedure to the employees. It will influences the safety performance of the workers [The Institution of Occupational Safety and Health (IOSH), 2012].

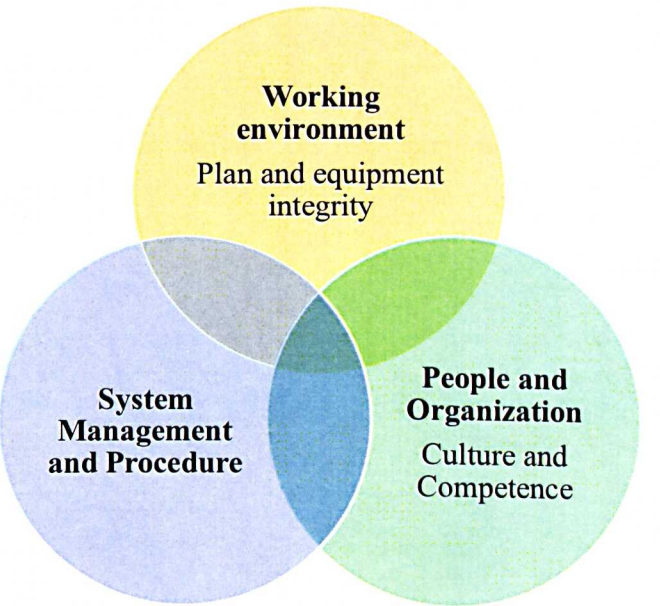

Figure 2.3: Health and Safety Risk Management

[Adopted from: The Institution of Occupational Safety and Health (IOSH), 2012]

2.4 Industrial Accidents in Malaysia

The accidents is important to prevent in the workplace because a minor accidents can lead to major accidents which gives impact to the workplace and organization. The cost to return normalcy requires a lot of resources. A study from Zakaria, (2012) founds that the stress and fatigue, unsafe act, machinery or tools, design of workplace and also training procedures contribute to workplace accidents among workers. Besides that, the level of awareness and knowledge on safety issue among workers and management also were involved (Jamaluddin, 1994; Mansur et al., 2003; Ariffin et al., 2006; Rampal and Nizam, 2006; Lugah et al., 2010; Said & Halim, 2016).

Figure 2.3 shows the statistic of the occupational accidents reported until February 2016.

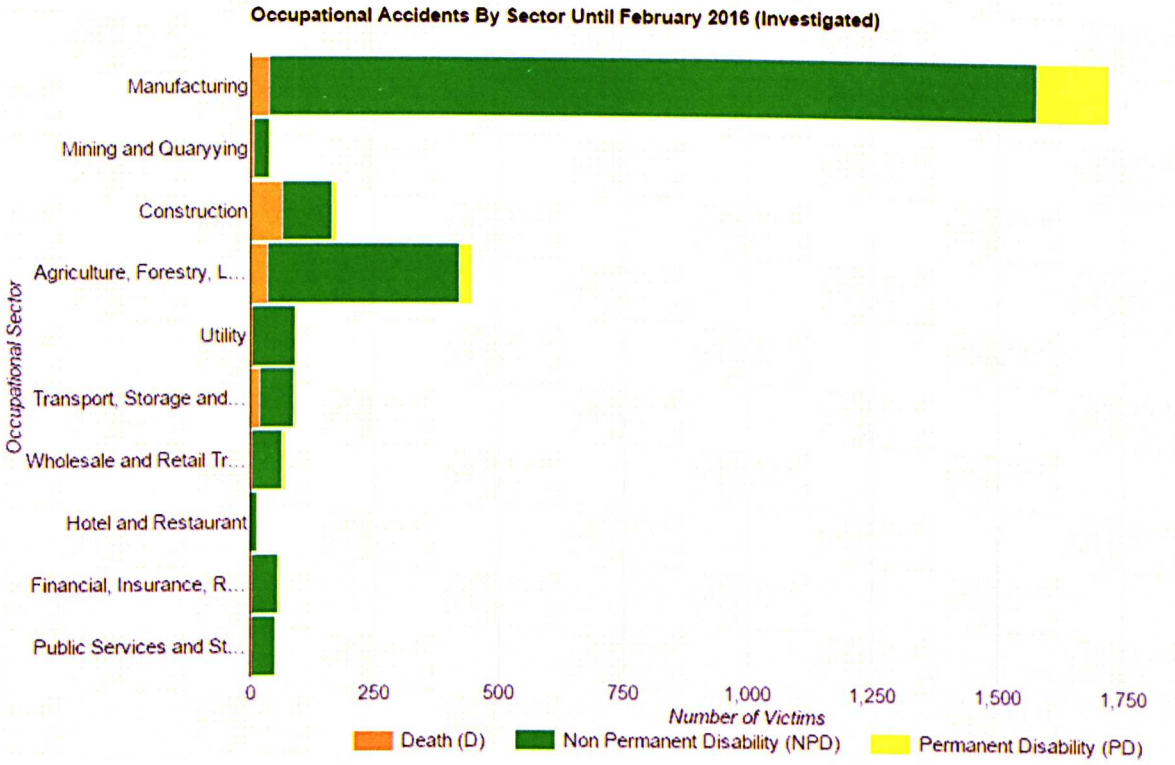

Figure 2.4: The Occupational Accidents by Sector until February 2016
(Source: DOSH, 2016)

Table 2.4 reported the several cases of accidents related to the palm oil mills in Malaysia. The latest case reported to DOSH was in Johor. The workers died when handling the hot furnace.

Table 2.4: The several cases of accidents related to the palm oil mills in Malaysia

Location	Year	Summary case	Classification case
Palm oil mill, Johor	2014	The victim died due to burn when the furnace collapsed and hot ashes spread out.	Fatal (1 dead due to seriously burn)
Palm oil mill, Terengganu	2013	The explosion of sterilizer cause damage to sterilizer and building structures.	Fatal (4 workers dead)
Palm oil mill, Perak	2011	Victim trapped in the thresher when he tried to clean the machine which was still running.	Fatal (1 dead)
Palm oil mill, Perak	2011	The victim was caught between the cages when the shovel pushed the cages	Fatal (1 dead)

(Source: Fatal Accident Cases, DOSH, 2015)

2.4.1 Boiler accidents

Boiler system are designed from safety and efficiency. The boiler operator is the key of the safe boiler operations. The knowledge about boiler system and maintenance can prevent the accidents and explosion. In addition, it can ensure years of safe and reliable services (Hashim, 2011). The most important safety device in boiler is safety valve. The function is to prevent the catastrophic failure if there is any failure of any parts in the circuit of the boiler (Willis, 2015).

Figure 2.5: Steam Boiler Explosion in Thailand, 2014
(Source: http://www.thewbia.com/WP/boiler-accidents/)

Table 2.5: Summary of Literature Review of Knowledge, Attitude and Perception of Risk and the Industrial Accidents

Title	Result	Researcher (s)
Risk perception	Define perception as learned predisposition to respond in a consistently favourable manner with respect to a given object.	Aizen and Fishbein, (1980)
	Risk perception involves two factors: • The magnitude of the potential loss • The probability of its occurrence.	Sjöberg, (2000)
	Same individual might perceive risk differently depending on when he or she is asked about the risk	Leoni, (2010)
Cause of accidents in the workplace	Stress and fatigue, unsafe act, machinery or tools, design of workplace and training procedures contribute to workplace accidents among workers.	Zakaria, (2012)
Prevention of accidents	Awareness and knowledge on safety issue among workers and management also were included in the accidents prevention.	Said and Halim, (2016)
Boiler explosion	• The boiler operator is the key of the safe boiler operations. • The knowledge about boiler system and maintenance can prevent the accidents and explosion. • A boiler explosion occurs if steam flow output is prevented or restricted. Then, the temperature and pressure in the boiler increase. If the safety device is not provided or inadequate to limit the pressure to a safe value, the boiler will rupture.	Speegle, (2013) and Hashim, (2011)

CHAPTER 3

METHODOLOGY

This chapter explains the method and tools used in this study. The various section will explain the design, duration, population and methods used for selection of respondents.

3.1 Study Location

This research was conducted at 4 palm oil mills; 2 in Perak and Negeri Sembilan, Malaysia respectively (Figure 3.1). The palm oil mills are as follows:

a) Kilang Sawit FELCRA Engineering and Processing, Teluk Intan

b) Kilang Sawit FELCRA Seberang Perak.

c) Kilang Kelapa Sawit Tanah Merah, Port Dickson

d) Kilang Kelapa Sawit Labu, Negeri Sembilan.

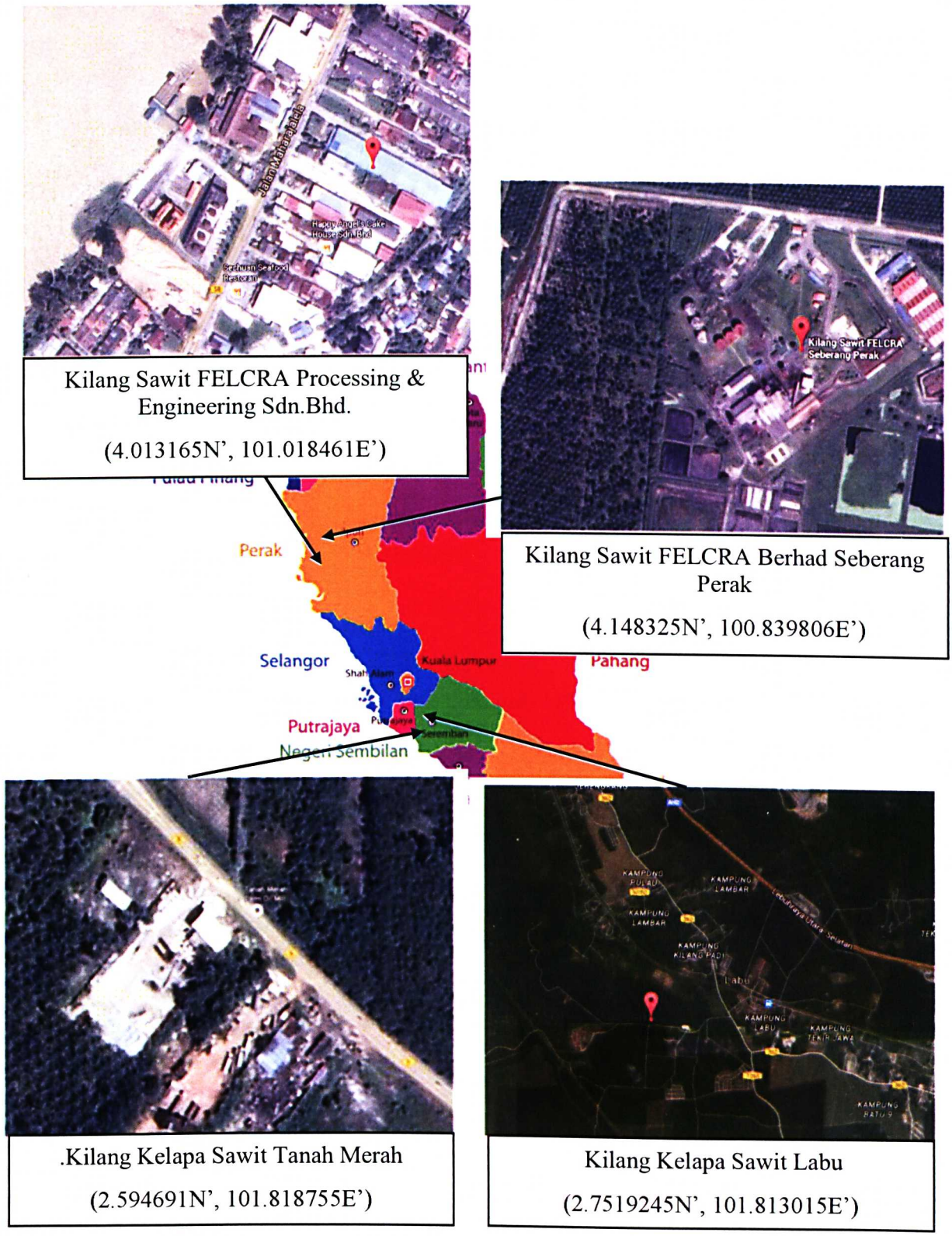

Figure 3.1: Study Location with GPS Location

3.2 Study Design

Cross sectional study design has been conducted to determine the current knowledge, perception and attitude of risk management of steam boiler among palm oil mill worker. This type of study design was used due to the advantage of determining or gathering the required information of knowledge, attitude and perception of boiler workers from January to March, 2016.

3.3 Sampling

3.3.1 Sampling Method

Purposive sampling was employed in this study to focus on workers who were engaged in the operation of steam boiler. This sampling was used as selection of respondents based on a set of inclusion criteria, which will be explained further in the following sub-chapter 3.3.4.

3.3.2 Sampling Population

The sampling population consists of any workers who is involved with the steam boiler operation or management of steam boiler in a palm oil mill in Malaysia.

3.3.3 Sampling Frame

The sampling frame of this study was the name list of workers that handling with boiler operation from the Department of Human Resource (administration office) of each of the palm oil mills.

3.3.4 Inclusion Criteria

The following were the inclusion criteria for the sampling of respondents in this study:

i. Workers in palm oil mill
ii. Male workers
iii. Workers who are directly work with steam boiler
iv. Permanent workers – with more than 3 months experience as steam boiler worker.

3.3.5 Sampling size

The sample size for this is calculated using formula of Lemeshow, Klar & Lawanga (1990) as below:

$$n = \frac{\left\{ z_{1-\alpha}\sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta}\sqrt{P_1(1-P_1) + P_2(1-P_2)} \right\}^2}{(P_1 - P_2)^2}$$

Eq. 3.1

Where:

N = sample size

Z = Z statistic for a level confidence = 1.96

1-α = 1.96

1-β = 0.842

According to the previous study related to knowledge, attitude and practice (KAP) in other industries, the highest proportion score is 0.47 (Amirah et al., 2013) and the lowest proportion score is 0.217 (Amirah et al., 2013).

$P = (P_1 + P_2) / 2$

P_1: estimated proportion (larger) = 0.47

P_2: estimated proportion (smaller) = 0.217

$P = (0.40 + 0.26) / 2$

$= 0.344$

Therefore, the sample size is;

$$n = \frac{\left((1.96)\sqrt{(2)(0.344)(1-0.344)}+(0.842)\sqrt{(0.47)(1-0.47)+(0.217)(1-0.217)}\right)^2}{(0.47-0.217)^2}$$

$n = 54$

Effect size,

ESp = Φ1, - Φ2,

ESp = Effect Size Proportion Φ1, Φ2 = Arcsine Transformation for Proportion

ESp = 0.535

Referring to table of ESp (effect size population) and power of study (80%) the sample size required to achieve is 55 respondents.

80% = 55

100% = n

Where n = the number of respondents in this study

n = 5500 / 80

n = 69

An additional 20% of minimum sample size, 14 workers were included to 55 workers in order to anticipate missing data and low response rate.

3.4 Data Collection

3.4.1 Study Instrumentation

The materials used in this research were HAZOP report, questionnaires and Statistical Packages for Social Science (SPSS) version 22.0 for data analysis.

3.4.1.1 HAZOP Report

The HAZOP study report was produced with a guidance of the specialist from another organization. This result was used for analysis the hazard in the operation of the steam boiler to know the consequences failure from the guide words. Then, the result of the report were extracted to produce a questionnaire for respondents.

3.4.1.2 Questionnaire

A questionnaire was used to extract information from respondents. The questionnaire was prepared in both language, Malay and English version in order to reduce language bias among respondents. The questionnaire consists of five sections.

The questionnaires consist of four sections as follows:

I. Section A: Socio demographic information

This section contains socio demographic contain 10 questions regarding general information about age, education level and occupational information.

II. Section B: Knowledge of risk management towards boiler

There are 9 questions in this section. The question asked for the knowledge of the boiler operation and risk related. A correct answer was given 1 score and 0 score for wrong answer. The score varied from 0 to 9 points.

Table 3.1: Knowledge risk management towards boiler

Items	Optional answer
Risk management is important to prevent accidents in the workplace.	a) Yes b) No
Low water level inside steam drum can cause explosion.	a) No regular maintenance b) Impossible due to automatic system c) Not sure
Safety valve produces a sound	a) Yes b) No
Reasons of sound produce by safety valve	a) Exceed safe working pressure (TKS) b) Warning c) Normal operation d) Not sure
Steam boiler can explode.	a) Yes, Possible b) Yes, due sabotage c) Yes, too long operation d) Impossible e) Not sure
Smoke from chimney	a) Environmental problem b) Workers problem c) No problem
Inspection from DOSH	a) Disturb my job b) Perform their duties c) Prevent accidents d) Learn about the boiler
Good combustion of furnace	a) No black smoke b) Slow fire c) Less steam production d) Not sure
Excessive steam delivers to the sterilizer.	a) Danger b) The system will give warning c) Not sure

III. Section C: Attitude of risk management towards boiler

There are 14 questions in this section. This section includes the attitude of the workers towards the boiler operation and management. Question of attitude are designed to be answered using a Likert scale (Strongly agree/ Agree/ Don't know/ Disagree/ Strongly Disagree). For positive attitude item score of 5, 4, 3, 2, 1. For negative attitude, the scoring system was reverse where 5 score being strongly disagree while 1 being strongly agree.

Table 3.2: Attitude risk management towards boiler

Items	**Statement**	**Optional answer with Likert-type scale score**
Wear PPE Safety helmet Safety shoes Earplug Glove	Positive statement	Strongly agree=5 Agree=4 Don't know=3 Disagree=2 Strongly disagree=1
I always check the logbook before start my duty shift.		
Before start working, I have been given short briefing about the boiler performance from the previous shift.		
I have check all the parameters of the boiler to ensure it is under control.		
Every failure of damages happen must be reported quickly to the employer.		
I will keep all the records about the parameters of boiler's performance.		
I have to attend the training before start working.		
Steam boiler can be operate without boiler man. I don't have to check the boiler performance due to automatic system is used. I don't have to worry because boiler will shut down if there is any failure.	Negative statement	Strongly disagree=5 Disagree=4 Don't know=3 Agree=2 Strongly agree=1

IV. Section D: Perception of risk management of steam boiler

There are 12 questions from this section. This section use scale from 1 ('Not risk'), 2 ('Low risk'), 3 ('Moderate Risk'), 4 ('High Risk') and 5 ('Extremely High Risk').

Table 3.3: Perception risk management towards boiler

	Items	Statement	Optional answer with Likert-type scale score
1.	Steam boiler have potential to explode.	Positive statement	No=1 Low=2 Moderate=3 High=4 Very high=5
2.	Low water level inside water drum can cause explosion.		
3.	Sound of safety valve shows the high level of pressure.		
4.	Regular maintenance is important to prevent boiler explosion.		
5.	Loss of water inside the water tube can cause the boiler dry and lead to an explosion		
6.	Training to the workers is important to prevent any accidents in the workplace.		
7.	Record about the operation of boiler need to keep.		
8.	The inspection from DOSH officer is important to prevent potential accidents.		
9.	Logbook of boiler need to update to prevent operational problem.		
10.	Boiler man and other workers need to monitor the boiler control system.		
11.	Steam boiler may be left without supervision from boiler man and other employees		
12.	The automatic system of boiler is used nowadays.		

3.4.2 Data Collection Procedure

In order to produce the HAZOP report, the approval from the palm oil mills was acquired. Then, the HAZOP team conducted the HAZOP study assessment. From HAZOP report, a questionnaire was developed. The pilot-test was then conducted to test the reliability of the questions which was explained in the sub-heading 3.6. The data collection started with the distribution of questionnaires among boiler workers in the palm oil mills. Only the workers who were fulfilled the inclusion criteria were gathered for analysis.

3.5 Data analysis

Statistical method for analysing data for this study was carried out by using Statistical Packages for Social Science (SPSS) version 21.0. The level of significance was set up at $p<0.05$. The data was analysed descriptively using frequencies, percentages, means and standard deviations for knowledge, attitude and perception of risk management of steam boiler. The score in each KAP category was shown in Table 3.5.

Table 3.4: Statistical Analysis

	Objectives	Statistical analysis
1.	To determine sociodemographic of respondents.	Descriptive analysis • Percentage • Frequency • Standard deviation • Mean
2.	To determine the knowledge of the risk management of steam boiler among workers in palm oil mills.	
3.	To determine the attitude of the risk management of steam boiler among workers in palm oil mills.	
4.	To determine the perception of the risk management of steam boiler among workers in palm oil mills.	
5.	To determine the prevalence of accidents and near miss.	
6.	To determine the cause of accidents.	
7.	To determine the association between knowledge, perception with attitude among palm oil mill workers.	Chi square test
8.	To determine the association between the knowledge and perception and attitude of risk management's steam boiler with accidents level cases among workers in palm oil mills.	

Table 3.4 indicates the score for each category of attitude, knowledge, perception and total score. Each part of the questionnaire has optional answer with different score. Attitude and perception questions consists of mixture positive and negative statement. However, answers for knowledge were either "Yes "or "No". Then, each part will calculated manually to determine the grand score for each respondent. For all the attitude questions, the total score varies from 0 to 70. Answer were summed up for each total score percentage. For perception, the answer scored varied from 0 to 60.

Table 3.5: Score for Knowledge, Attitude and Perception Categories

Variables	Score
Knowledge	
Poor knowledge	0-3 (0-33.3 %)
Moderate knowledge	4-6 (44.4-66.7%)
Good knowledge	7-9 (77.8-100%)
Attitude	
Poor attitude	0-42 (less than 60%)
Moderate attitude	43-55 (61-79%)
Good attitude	56-70 (80-100%)
Perception	
Poor perception	0-36 (less than 60%)
Moderate perception	37-47 (61-79%)
Good perception	48-60 (80-100%)

(Filza et al., 2013)

9 question for knowledge = Correct answer = 1 score

Wrong answer = 0 score

14 question for attitude = Consist of 5 Likert score (Strongly agree/ Agree/ don't know/ Disagree/ Strongly Disagree).

(Total highest score= 14x5=70)

12 question of perception = Consist of scale from Not risk, Low risk, Moderate Risk, High Risk, and Extremely High Risk.

(Total highest score= 12x5=60)

Examples of score calculation:

Respondent 1

Table 3.6: Example of scoring for a respondent

Items	Score
Knowledge	5 answers correct per 9 questions, Score=5 (5/9) x 100=55.6% (Moderate)
Attitude	Total score for 10 questions, Score=40 (40/70) x 100=57.1% (Poor)
Perception	Total score for 12 questions, Score=30 (30/60) x 100=50% (Poor)

Chi-square was used to determine the association between knowledge, perception with attitude among palm oil mill's workers and association between the knowledge and perception and attitude of risk management's steam boiler with accident's level cases among workers in palm oil mills.

3.6 Quality Control

i. Questionnaires

Pre-test were conducted among boiler workers in other industries for more than 10% of the sample size to ensure understanding of the question. Reliability was tested for internal consistency using Cronbach's Alpha coefficient range from 0.0 to 1.0 which is quantifies the degree correlation with one another (Kausto et al., 2011). The Cronbach's Alpha value of the questionnaire used was 0.77.

3.7 Research Ethics

This study had been approved by ethic committee members of University Putra Malaysia (UPM/TNCPI/RMC/JKEUPM/1.4.18.1/F1). This study was conducted on a voluntary basis. All respondents were briefed on the importance and procedure of study was conducted. The respondents were given a set of questionnaire and the instruction was briefing by the researcher. The respondents need to fill up the information and answered the questions given. In order to respect the right of the respondents, the identity of the respondents including their personnel information remained confidential.

CHAPTER 4

RESULT

This chapter provides a detailed description of result obtained from the analysis of the data corresponding to each objective in this study.

4.1 Description of Respondents

Table 4.1 shows the socio-demographic of the respondents. There were 19 (38%) respondents in the category of 21 to 30 years. Majority of the respondents were Malay (90%) followed by Indian (4%) and other's ethnicity (6%). In terms of education level, the majority of 36 (72%) respondents were attended secondary school. A total of three respondents only finished their study at primary school and 36 (72%) of respondents were completed their tertiary level. Only eight (16%) respondents have the certificate of boiler man Grade 2. The job titles of the respondents were fireman (54%), boiler man (22%), supervisor (6%), and steam engineer (4%) and other job related such as managers and mill assistances (14%).

The distributions of working experience were divided into three, which were three months to five years (44%), 5 to 10 years (28%) and more than 10 years (28%). Most of the respondents attended the general training for their work task in workplace (84%) once since the first time of working (71.43%).

Table 4.1: Socio-demographic and occupational information of respondents

Variable	Characteristic	Study group (N=50)	
		N	(%)
Age	21-30 years old	19	38
	31-40 years old	18	36
	41-50 years old	9	18
	More than 50 years old	4	8
Race	Malay	45	90
	Indian	2	4
	Others	3	6
Educational level	Primary	3	6
	Secondary	36	72
	Tertiary	3	6
	Certificate of steam boiler	8	16
Job title	Boiler man	11	22
	Fireman	27	54
	Steam engineer	2	4
	Supervisor	3	6
	Others	7	14
Working experiences	3 months – 5 years	22	44
	5-10 years	14	28
	More than 10 years	14	28
Training of Job Task	Yes	42	84
	No	8	8
Training frequency	Once in a week	1	2.38
	Once in a month	2	4.76
	Once in a year	9	21.43
	Once since the first time working	30	71.43

N=50

4.2 Knowledge of Risk Management of Steam Boiler

Table 4.2 shows that the distribution of knowledge scored by the respondents of the four mills regarding the importance of risk management in workplace, low water level, safety valve, explosion of steam boiler, smoke from chimney, inspection from DOSH, combustion of fuel in furnace and excessive steam.

The Figure 4.1 shows the level of knowledge among all respondents. The mean score and standard deviation for knowledge were 77.22 and 19.60. The scored varied from 33.33% to 100%. The distribution of knowledge level for all respondents were shown. The respondents were had good level of knowledge which was 28 (56%). A total of 19 (28%) respondents had moderate level of knowledge and only 3 (6%) respondents were scored poor level of knowledge.

Table 4.2: Knowledge of Risk Management of Steam Boiler

Items	Frequency (N)	Percentage (%)
Risk management is important to prevent accidents in the workplace.	50	100
Low water level inside steam drum can cause explosion.		
No regular maintenance	36	72
Impossible due to automatic system	3	6
Not sure	11	22
Safety valve produce a sound.		
Yes	43	86
No	7	14
Reason of sound produce from safety valve		
Exceed safe working pressure (TKS)	33	66
Warning	6	12
Normal operation	5	10
Not sure	6	12
Steam boiler can explode.		
Yes, Possible	34	86
Yes, due sabotage	1	2
Yes, too long operation	3	6
Impossible	8	16
Not sure	4	8
Smoke from chimney.		
Environmental problem	45	90
Workers problem	1	2
No problem	4	8
Inspection from DOSH		
Disturb my job	6	12
Perform their duties	19	38
Prevent accidents	22	44
Learn about boiler	3	6
Good combustion of furnace.		
No black smoke	40	80
Slow fire	3	6
Less steam production	4	8
Not sure	3	6
Excessive steam deliver to sterilizer.		
Danger	29	58
System will give warning	11	22
Not sure	10	20

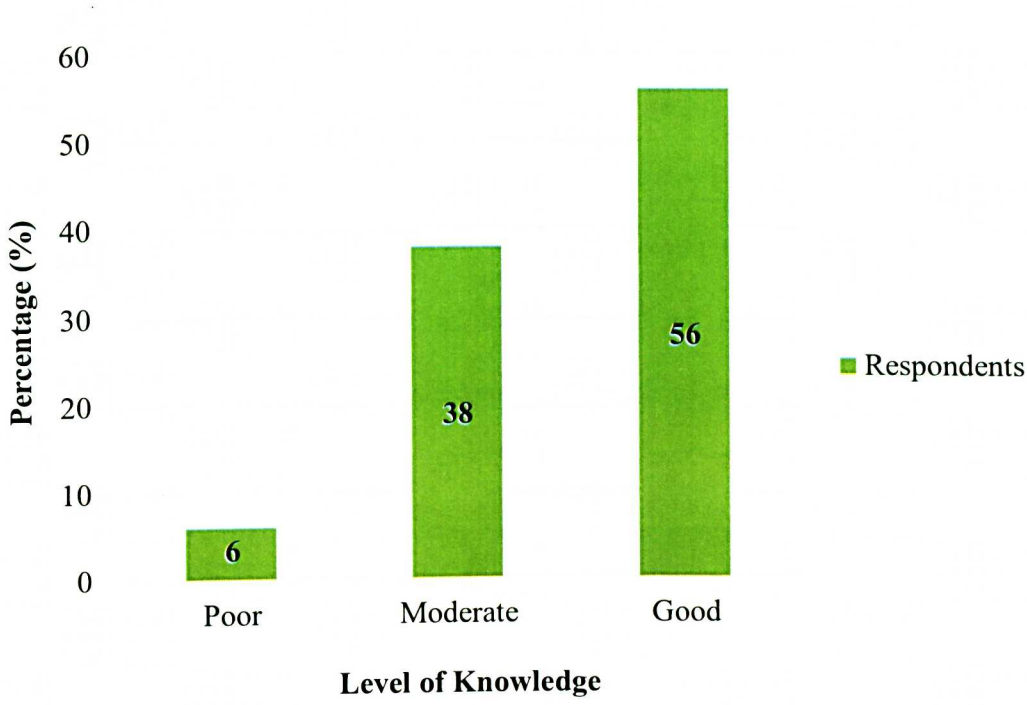

Figure 4.1: Level of Knowledge

4.3 Attitude of Risk Management of Steam Boiler

The questions of this varies from the PPE and the attitude towards boiler management. The respondents were asked about usage of PPE including each part of PPE such as safety helmet, safety shoes, gloves and earplug. Then, the question asked about logbook, short briefing before start working and all parameters related. In addition, the failure of boiler was asked and the attitude of the respondents if the boiler man was not around. Then, the respondent also asked about the attitude towards automated boiler system, training of the risk and record keeping. The last question was asked to the respondents was their worries about boiler system and the consequences about explosion.

The mean score and standard deviation were reported 83.17 and 5.85 respectively. The overall scored were in between 71.43% to 94.29%. Figure 4.2 shows the attitude level of the respondents. The respondents were scored good attitude which was 37 (74%) while 13 (26%) of respondents were had moderate attitude towards risk. There was no respondents had poor attitude.

Table 4.3: Attitude towards Risk Management

Items	Frequency (N)	Percentage (%)
Wear PPE		
Strongly agree	41	82
Agree	9	18
Don't know	-	-
Disagree	-	-
Strongly disagree	-	-
Safety helmet		
Strongly agree	39	78
Agree	11	22
Don't know	-	-
Disagree	-	-
Strongly disagree	-	-
Safety shoes		
Strongly agree	38	76
Agree	12	24
Don't know	-	-
Disagree	-	-
Strongly disagree	-	-
Earplug		
Strongly agree	37	74
Agree	13	26
Don't know	-	-
Disagree	-	-
Strongly disagree	-	-
Glove		
Strongly agree	34	68
Agree	16	32
Don't know	-	-
Disagree	-	-
I always check the logbook before start my duty shift.		
Strongly agree	23	46
Agree	27	54
Don't know	-	-
Disagree	-	-
Strongly disagree	-	-
Before start working, I have been given short briefing about the boiler performance from the previous shift.		
Strongly agree	20	40
Agree	30	60

Items	Frequency (N)	Percentage (%)
Don't know	-	-
Disagree	-	-
Strongly disagree	-	-
I have check all the parameters of the boiler to ensure it is under control.		
Strongly agree	22	44
Agree	28	56
Don't know	-	-
Disagree	-	-
Strongly disagree	-	-
Every failure of damages happen must be reported quickly to the employer.		
Strongly agree	24	48
Agree	25	50
Don't know	-	-
Disagree	1	2
Strongly disagree	-	-
Steam boiler can be operate without boiler man.		
Strongly agree	3	6
Agree	6	12
Don't know	3	6
Disagree	20	40
Strongly disagree	18	36
I don't have to check the boiler performance due to automatic system is used.		
Strongly agree	3	6
Agree	8	16
Don't know	4	8
Disagree	21	42
Strongly disagree	14	28
I have to attend the training before start working.		
Strongly agree	15	30
Agree	28	56
Don't know	1	2
Disagree	4	8
Strongly disagree	2	4

Items	Frequency (N)	Percentage (%)
I will keep all the records about parameters of boiler's performance.		
Strongly agree	13	36
Agree	34	68
Don't know	1	2
Disagree	1	2
I don't have to worry because boiler will shut down if there is any failure.		
Strongly agree	10	20
Agree	19	38
Don't know	4	8
Disagree	6	12
Strongly disagree	11	22

N=50

Figure 4.2: Level of Attitude of Respondents

4.4 Perception of Risk Management of Steam Boiler

The frequency and percentage of the perception of risk management for steam boiler section shows in Table 4.4. The questions asked in the questionnaire were potential of explosion of steam boiler, perception of explosion if low water level inside water drum, sound of safety valve shows the high level of pressure and maintenance aspect. Besides, the perception question about DOSH inspection, logbook and monitor of boiler control system by boiler man were asked. This section also asked about the perception of palm oil mills workers towards the supervision of workers especially boiler man to steam boiler and their perception about automatic system used in machine nowadays regarding to risk of accidents and explosion occurrences.

The minimum scored for perception varied from 50% to maximum 100% scored with the mean of 79.50 and 11.22 for standard deviation. The perception level of respondents were presented in Figure 4.3. About 32 (64%) respondents were had good perception of risk. A total of 15 (30%) respondents had moderate level of perception. Meanwhile, only 3 (6%) of respondents scored poor perception level.

Table 4.4: Perception of risk management of steam boiler

Items	Frequency (N)	Percentage (%)
Steam boiler have potential to explode.		
No	2	4
Low	6	12
Moderate	4	8
High	18	36
Very high	20	40
Low water level inside water drum can cause explosion.		
No	6	12
Low	5	10
Moderate	8	16
High	21	42
Very high	10	20
Sound of safety valve shows the high level of pressure.		
No	-	-
Low	3	6
Moderate	8	16
High	27	54
Very high	12	24
Regular maintenance is important to prevent boiler explosion.		
No	2	4
Low	4	8
Moderate	4	8
High	28	56
Very high	12	24
Loss of water inside water tube can cause boiler dry and lead to explosion.		
No	2	4
Low	3	6
Moderate	6	12
High	25	50
Very high	14	28
Training to the workers is important to prevent any accidents in workplace.		
No	1	2
Low	1	2
Moderate	7	14
High	24	48
Very high	17	34

Items	Frequency (N)	Percentage (%)
Record about operation of boiler need to keep.		
No	-	-
Low	-	-
Moderate	5	10
High	29	58
Very high	16	32
The inspection from DOSH officer is important to prevent potential accidents.		
No	-	-
Low	1	2
Moderate	4	8
High	27	54
Very high	18	36
Logbook of boiler need to update to prevent operational problem.		
No	-	-
Low	-	-
Moderate	7	14
High	28	56
Very high	15	30
Boiler man and other workers need to monitor the boiler control system.		
No	-	-
Low	2	4
Moderate	7	14
High	26	52
Very high	15	30
Steam boiler may be left without supervision from boiler man and other employees.		
No	3	6
Low	2	4
Moderate	-	-
High	29	58
Very high	16	32
Automatic system of boiler is used nowadays.		
No	4	8
Low	4	8
Moderate	6	12
High	27	54
Very high	9	18

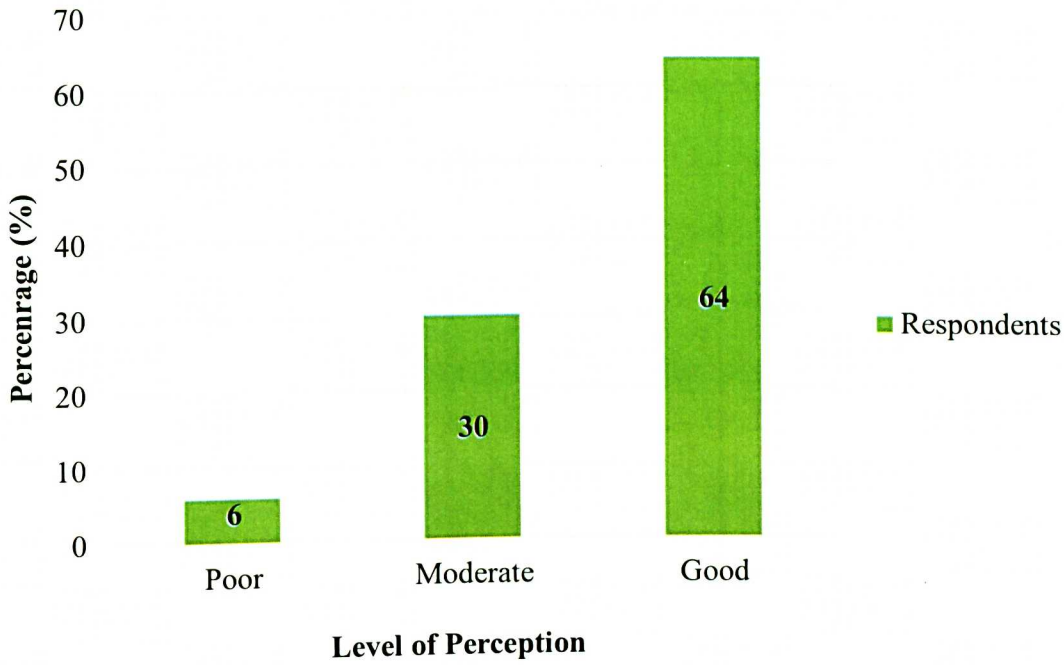

Figure 4.3: Level of Perception

4.5 Prevalence of Accident and Near Miss

Table 4.5 shows the prevalence of accidents and near miss among respondents. The prevalence of accidents was 8 (16%) and 12 (24%) for near miss. The cause of accidents reported higher in careless were 40 (80%) respondents compared to failure on operation, three respondents (6%), lack of knowledge, six respondents (12%) and two respondents (2%) for others in Table 4.6. No respondents choose for overconfident as the cause of accidents in the workplace.

Table 4.5: Prevalence of Accident and Near Miss

Items	Yes		No	
	N	%	N	%
Accidents	8	16	42	84
Near miss	12	24	38	76

N=50

Table 4.6: Cause of accidents

Cause	Frequency (N)	Percentage (%)
Failure on operation	3	6
Careless	40	80
Lack of knowledge	6	12
Overconfident	0	0
Others	1	2

N=50

4.6 The Association between Knowledge and Perception with Attitude

The association between Knowledge and Perception with Attitude was presented in Table 4.7 below. From the result, there was no significant association between knowledge and attitude (χ^2=4.249; p=0.119) as well as perception and attitude (χ^2=0.104; p=0.949). Both *p*-value exceed 0.05.

Table 4.7: Association between Knowledge and Perception with Attitude

Items		Category of attitude		χ^2(df)	*p*-value
		Moderate	Good		
		N (%)	N (%)		
Category of knowledge	Poor	1 (2)	2 (4)	0.422 (2)	0.810
	Moderate	4 (8)	15 (30)		
	Good	8 (16)	20 (40)		
Category of perception	Poor	1 (2)	2 (4)	0.104 (2)	0.949
	Moderate	4 (8)	11 (22)		
	Good	8 916)	24 (48)		

N=50
χ^2=Chi-square test
**p*-value is significant at < 0.05 level

4.7 The Association between Knowledge, Attitude and Perception with Accidents

Table 4.8 shows the result of association of knowledge, attitude and perception of risk management with accidents. For knowledge, there was no significant association between knowledge and perception with accidents (χ^2=0.75; p=0.686) and (χ^2=2.91; p=0.233) respectively. In contrast, there was a significant association between attitude and accidents (χ^2=6.56; p=0.010).

Table 4.8: Association between Knowledge, Attitude and Perception with Accident

		Accidents		χ^2(df)	*p*-value
		Yes	No		
		N (%)	N (%)		
Knowledge	Poor	2 (4)	1 (2)		
	Moderate	18 (36)	1 (2)	0.75 (2)	0.686
	Good	22 (44)	6 (12)		
Attitude	Poor	-	-		
	Moderate	8 (16)	5 (10)	6.56 (1)	0.010*
	Good	34 (68)	3 (6)		
Perception	Poor	3 (6)	-		
	Moderate	12 (24)	3 (6)	2.91 (2)	0.233
	Good	27 (54)	5 (10)		

N=50
χ^2=Chi-square test
**p*-value is significant at < 0.05 level

CHAPTER 5

DISCUSSION

This chapter provides a discussion of the data and the association of the variables. From the discussion, the findings of this study were concluded and some recommendations were provided at the end of this chapter.

5.1 Knowledge, Perception and Attitude of Risk Management of Steam Boiler

This findings of this study can be supported by the study of KAP in printing industry who scored appropriate attitude (38.4%) (Paramasivam, Raghavan, Srinivasan, & Kumar, 2010). The respondents were scored good perception of risk management. The good perception of risk can lead to better behaviour and attitude. The finding of KAP among textile workers in Karachi, India reported that 182 (48.9%) of the workers had good knowledge and 302 (81%) of the respondents scored good attitude and a total of 80 (21%) respondents were practising the preventive measures appropriately (Khoso & Nafees, 2015). In contrast with the study done by Filza Ismail et al., (2013) shows that the poor KAP score among quarry workers similar to this study.

5.2 Prevalence of Accident and Near Miss

According to Heinrich Law, one major injury accidents have 29 cases of accidents that lead to minor injuries and 300 accidents that caused no injury (proportion of 1-30-300). The axioms of Heinrich Law that apply until today are the cause of

accidents resulting from an unsafe act (Embrey, 1992). This statement was supported by the cause of accidents resulted in this study. The cause of accidents was careless found throughout this study. However, another study was stated that accidents were caused by subconscious processes that include guilt, aggression, anxiety, ambition and conflict (Khanzode, Maiti, & Ray, 2012).

The rate of industrial accidents in Malaysia reported on 2014 were 55.73% and it was decreased by 1.68%, from a total of 35,898 cases in 2013 to 35,294 cases in 2014 (SOCSO, 2016). This statistic shows that the prevalence of the accidents in Malaysia were higher compared to the prevalence of this study. Besides, the study among gas station workers shows that 91.4% reported occupational accidents (Cezar-Vaz et al., 2012) higher than the prevalence in this study. In addition, the study done by Azlina, Rahman, Ismail, & Mansor, (2014) shows that the accident occurrences were increased when the workers were lack of knowledge and poor awareness. However, awareness on why an accident happens is the first step of accidents prevention (Hui-Nee, 2014). Therefore, due to small sample size, the prevalence cannot be generalized to the whole population of workers.

5.3 Association between Knowledge and Perception with Attitude

The study of KAP on occupational hazard and safety among textile mill in India shows there was highly statistically significant between knowledge with attitude (Ahmad et al., 2012) but differently resulted in this study. The knowledge and attitude were not significant to each other. The study among textile mill workers shows there were no significant association between knowledge and attitude (Khoso & Nafees, 2015) that same finding with this study. Another previous study about KAP on the civil

and structural engineers stated differently about safety attitude was more critical than knowledge (Goh & Chua, 2015). The result found differently in study done by Mearns & Flin, (1995) in offshore that safety attitude of personnel affects their perception of risk with the findings of this study about association of perception and attitude.

In theory, the knowledge is not necessarily transformed into effective safe behaviors (Leiter, Zanaletti, and Argentero, 2009) but integrated knowledge can improve the safety through practical application in the workplace. The Theory of Reasoned Action (TRA) estimates a strong association of behaviour with behavioural beliefs about the efficacy of procedures to assure safety (Albarracı´n, Johnson, Fishbein, & Muellerleile, 2001; Laschinger, Goldenberg, & Bello, 1995). The respondents beliefs and their behavioural in this study were not in line with this theory due to many factors. One of the possible reason is they were not showing their actual behaviour and attitude when they filled in the questionnaire. Moreover, several studies done by Donald & Canter, (1994); Tomas, Melia, & Oliver, (1999) shows that the individuals who hold more good attitude towards safety are more likely to show proper safety behaviors and less involve in an accidents or injury.

5.4 Association between Knowledge, Perception and Attitude of Risk Managements of Steam Boiler with Accidents

The association between knowledge and accidents was clearly briefed in the study by Kalatpour, (2016) the major accidents can prevented by applying safety knowledge. The knowledge can be used as a tool to educate people to prevent accidents. The previous study stated that the cognitive and emotional components of risk

perception were related differently to risk behaviour that not same resulted in this study (Rundmo, 2000). The accidents was depends on the attitude of the workers. Attitude change is an important roles in preventing the accidents even though it gives little direct impact to behaviour (Lund, 2004). The effective risk management depends on the behaviour of the workers in the workplace and the significant number of accidents resulted from the unsafe act (The Institution of Occupational Safety and Health (IOSH), 2012). In addition, the steps to reduce accidents are highlighting danger spots in the workplace, prevention programmes from employees to local authorities and corporate between employer and employees for bringing accidents down to zero (European Agency for Safety and Health at Work, 2001).

CHAPTER 6

CONCLUSION AND RECOMMENDATION FOR FUTURE RESEARCH

6.1 Conclusion

In conclusion, the knowledge, attitude and perception of workers plays an important role to reduce the accidents causation in the workplace. In addition, the steam boiler is one of the vessel that have potential to cause explosion. The boiler workers need to have high level of knowledge and awareness before they were able to work. This study found that the respondents had good knowledge, good perception and good attitude of risk management of steam boiler in palm oil mills. However, the management of the palm oil mills should take into consideration about the training frequency. This is important to ensure that the workers continuously aware of the risk surrounding them. Moreover, the prevalence of near misses was higher than accidents among workers due to the unsafe act such as careless during work. The workers need to report the near misses and minor accidents to prevent the major accident happen in the future. Lastly, there was a significant association between attitude of risk management and accidents. The accidents can happen in any time at any condition without the workers realise it.

6.2 Study Limitation

There are several limitation in this study. This study was conducted in a limited time because it was a cross sectional survey. Only small number of workers were available to participate in this study. Due to limitation of time and budget constrain, various variables were not considered in this study. The questionnaire used should also be improvised. In addition, this study only determining the knowledge, perception and attitude of the workers. The outcome was measured by the answers from the self-administered questionnaires. Therefore, the result were entirely based on the worker's honesty and how they perceived their attitude towards the knowledge and perception. The presence of researcher might have influenced the response of the participant. They were tended to respond according to what study objective rather than providing the actual lived experienced.

6.3 Recommendation

The recommendation for future research is improved in the future by including larger sample size. The bigger sample size is important for this study to be generalized to the whole population of palm oil mills workers. This study also can be applied to access the other palm oil mill workers in other job task such as at sterilization. There were a few cases also reported about accidents and explosion lately. Other than palm oil industry, the other industry that handling with steam or fire tube boiler can also be used to determine the worker's knowledge, attitude and risk perception towards the risk that they are facing during work.

The recommendation for palm oil industry is by administrative control. In addition, knowledge, perception and attitude of risk management of steam boiler was effective in administrative control. One of ways to prevent the accidents among workers is to educate them by implement intervention safety programme and government authorities such as DOSH. From the programme, the knowledge of workers about the risk can be increase and indirectly increase the level of awareness among workers about safety. The workers should be adequately briefed about the risk and hazard associated with their job task and preventive measure that they should obey to prevent any accidents and injury. Other than that, the employer should enhancing their Zero Accidents Policy in the workplace. In order to achieve zero accidents, the employer should implement good occupational safety and health (OSH) practices to ensure that the safety is a culture at their organization. This is because the commitment of all workers towards the safety attitude plays an important roles when the goal is zero accidents.

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APPENDICES 1

(ETHICAL APPROVAL)

JKEUPM Ref No. : FPSK(EXP15-OSH)U051

a) Members of the JKEUPM who reviewed the documents:
Assoc Prof Dr Hejar

b) Date of approval: 25/3/2016

Endorsed at JKEUPM Meeting on **4/4/2016**, attended by:

NAME	DESIGNATION	GENDER	TICK IF PRESENT
Prof. Dato' Dr. Abdul Jalil Nordin	Professor of Radiology& Dean, Faculty of Medicine and Health Sciences	Male	√
Prof. Dr Zamberi Sekawi	Professor of Medical Microbiology & Deputy Dean (Research and Internationalization, Faculty of Medicine and Health Sciences	Male	√
Prof. Dato' Dr. Lye Munn Sann	Professor of Medical Statistics, Department of Community Health, Faculty of Medicine and Health Sciences	Male	
Prof. Dr. Tengku Aizan Abd Hamid	Professor Gerontology, Institute of Gerontology	Female	
Prof. Dr. Lekhraj Rampal	Professor of Medical Statistics, Department of Community Health, Faculty of Medicine and Health Sciences	Male	√
Prof. Dr. Lim Thiam Aun	Professor of Anesthesiologist, Department of Surgery, Faculty of Medicine and Health Sciences	Male	√
Prof. Dr. Patimah Ismail	Professor of Biomedicine, Department of Biomedical Sciences, Faculty of Medicine and Health Sciences	Female	√
Prof. Dr. Johnson Stanslas	Professor of Pharmacology, Department of Medicine, Faculty of Medicine and Health Sciences	Male	√
Prof. Dr. Sherina Mohd.Sidik	Professor of Medicine, Department of Psychiatry, Faculty of Medicine and Health Sciences	Female	
Prof Dr. M. Iqbal Saripan	Professor of Biomedical Engineering, Department of Computer and Communication Systems, Faculty of Engineering	Male	
Assoc. Prof. Dr. Mansor Abu Talib	Associate Professor of Guidance and Counseling, Department of Human Development and Family Studies, Faculty of Human Ecology	Male	
Assoc. Prof. Dr. Hejar Abd.Rahman	Associate Professor of Public Health / Head Of Unit, Department of Community Health, Faculty of Medicine and Health Sciences	Female	√
Assoc. Prof. Dr. Normala Ibrahim	Associate Professor of Psychiatry, Department of Psychiatry, Faculty of Medicine and Health Sciences	Female	√

Assoc Prof Dr Sharmala Paramasivam	Associate Professor of English Language, Department of English, Faculty of Modern Languages and Communication	Female	
Assoc Prof Dr Arshad Abdul Samad	Associate Prof of Teaching English as a Second Language(TESL), Department Language and Humanities Education, Faculty of Educational Studies	Male	√
Assoc Prof Dr Muhamamd Najib Mohamad Alwi (Independent Member)	Associate Professor of Psychiatry and Psychiatric Consultant, Cyberjaya University College of Medical Sciences (CUCMS)	Male	√
Dr. Salmiah Md. Said	Lecturer of Epidemiology, Medical Statistics, Department of Community Health, Faculty of Medicine and Health Sciences	Female	
Assoc. Prof. Dr. Noritah Omar (Lay Person)	Associate. Professor of English Language, Department of English Language, Faculty of Modern Languages and Communication	Female	√
Dr. Rojanah Kahar (Lay Person)	Lecturer of Human Development and Family Studies, Faculty of Human Ecology	Female	
Tan Sri Dato' Napsiah Omar (Independent Member)	Chairman, Women's Institute of Management	Female	
En John Posko Anthony (Lay Person)	Headmaster of Sekolah Jenis Kebangsaan (Tamil) Kajang	Male	√

APPENDICES 2

(RESPONDENT'S INFORMATION SHEET AND CONSENT)

JAWATANKUASA ETIKA UNIVERSITI UNTUK
PENYELIDIKAN MELIBATKAN MANUSIA (JKEUPM)
UNIVERSITI PUTRA MALAYSIA, 43400 UPM SERDANG,
SELANGOR, MALAYSIA

BORANG B1: PENERANGAN DAN PERSETUJUAN RESPONDEN

Sila baca maklumat berikut dengan teliti. Sekiranya anda mempunyai sebarang pertanyaan, sila kemukakan kepada penyelidik.

1.TAJUK KAJIAN

Pengetahuan, persepsi dan sikap terhadap pengurusan risiko dandang stim di kalangan pekerja di kilang sawit.

2. PENGENALAN

Kajian ini adalah tentang tahap pengetahuan, persepsi dan sikap terhadap pengurusan risiko dandang stim di kalangan pekerja kilang sawit. Kajian ini diadakan adalah untuk menilai sejauh mana tahap pengetahuan pekerja dan persepsi mereka terhadap risiko berlakunya kemalangan berkaitan dandang. Dandang stim merupakan satu mesin yang boleh meletup jika tidak dikawal dan diselenggara dengan baik oleh pekerja.

3. APAKAH YANG PERLU ANDA LAKUKAN?

Anda yang terpilih untuk menjadi salah satu responden dalam kajian ini. Anda hanya perlu menandatangani borang peserta respondent selepas membaca dan memahami huraian ini. Borang ini perlulah dikembalikan kepada penyelidik sebelum meenjalankan apa-apa ujian. Selepas itu, anda Cuma perlu lengkapkan kajia soal selidik ini.

4. SIAPA YANG TIDAK BOLEH MENYERTAI KAJIAN INI?

Pekerja kilang sawit yang tidak mengendalikan operasi dikilang dan pekerja yang bekerja bawah daripada tiga bulan pengalaman termasuklah pekerja kontrak dan pelajar praktikal.

5. APAKAH FAEDAH MENYERTAI KAJIAN INI?

a) KEPADA ANDA SEBAGAI PESERTA?

Mendapat kesedaran betapa pentingnya langkah keselamatan, latihan yang berterusan daripada pihak pengurusan dan penyelenggaraan yang kerap terhadap dandang stim untuk mengelakkan risiko untuk meletup dan kemalangan yang lain.

9. PERSETUJUAN

Saya..... No Kad Pengenalan. .....
beralamat.....
.....dengan ini bersetuju untuk mengambil bahagian secara sukarela dalam penyelidikan yang tersebut di atas *(kajian klinikal/percubaan ubat-ubatan/rakaman video/kumpulan sasaran/temuduga/ soal selidik).

Saya telah diberi penjelasan secara menyeluruh mengenai penyelidikan ini dari segi metodologi, risiko dan komplikasi (seperti tertulis pada Helaian Penerangan Responden). Saya memahami bahawa saya berhak menarik diri dari penyelidikan ini pada bila-bila masa tanpa memberi sebarang alasan.Saya juga memahami bahawa sebarang maklumat yang berkaitan identiti saya akan dirahsiakan.

Saya* berminat / tidak berminat untuk mengetahui keputusan kajian yang melibatkan saya.

I setuju/tidak bersetuju untuk imei/gambar/rakaman video/ rakaman suara digunakan dalam apa jua bentuk penerbitan atau pembentangan. (sekiranya berkaitan).

*potong yang tidak berkenaan

Tandatangan .....
(*Responden*)

Tarikh :.....

Tandatangan .....
(*Saksi*)

Nama :.....

No. K/P: .....

Saya mengesahkan bahawa saya telah menerangkan kepada responden ini sifat dan tujuan penyelidikan yang tersebut di atas.

Tarikh .....

Tandatangan .....
(*Penyelidik*)

APPENDICES 3

(QUESTIONNAIRE)

RESPONDENT ID : _____

DEPARTMENT OF ENVIRONMENT AND OCCUPATIONAL HEALTH,

FACULTY OF MEDICINE AND HEALTH SCIENCES,

UNIVERSITY PUTRA MALAYSIA,
43400 UPM SERDANG, SELANGOR.

QUESTIONNAIRE

SOALAN KAJI SELIDIK

Title: Knowledge, Perception and Attitude of Risk Management of Steam Boiler among Workers in Palm Oil Mills

Tajuk: Pengetahuan, Persepsi dan Sikap Terhadap Pengurusan Risiko Dandang Stim di Kalangan Pekerja di Kilang Sawit.

Introduction: This study is aim to determine the knowledge, perception and attitude of risk management of steam boiler among workers in palm oil mills. Please give accurate information as required. All the information provided will be confidential and used for research purpose only.

Pengenalan: Tujuan kajian ini adalah untuk menentukan tahap pengetahuan, persepsi dan tingkah laku pengurusan risiko dandang stim di kalangan pekerja di kilang sawit. Anda diminta untuk menjawab semua soalan yang dikemukakan. Segala maklumat berkenaan responden akan dirahsiakan dan hanya akan digunakan untuk kajian ini sahaja.

Respondent ID : .....

ID responden

Telephone no : .....

No tel.

Date : .....

Tarikh

For researcher's use

Untuk kegunaan penyelidik

RESPONDENT ID: _____

SECTION A: RESPONDENT INFORMATION

BAHAGIAN A: DATA PERIBADI RESPONDEN

Please fulfil the information and tick (/) in a provided space.

Arahan: Sila lengkapkan semua maklumat dan tandakan (/) pada ruangan yang berkenaan.

1. Age : _____ years/ *tahun*

Umur

A1:

2. Phone No. /*No. telefon* :

A2:

3. Race

Bangsa:

a.	Malay *Melayu*	
b.	Chinese *Cina*	
c.	Indian *India*	
d.	Others, please state: *Lain-lain, sila nyatakan:*_____	

A3:

4. Educational level:

Tahap pendidikan

a.	Primary/ UPSR *Rendah/ UPSR*	
b.	Secondary/ PMR/SPM/STPM *Menengah/PMR/SPM/STPM*	
c.	Tertiary (University) Universiti	
d.	Certificate related to steam boiler *Sijil Perakuan berkaitan dandang* *If yes, state:*_____	

A4:

5. Job scope:

skop kerja

a.	Boiler man *Penjaga dandang*	
b.	Fire man Penjaga api	
c.	Steam engineer *Jurutera stim*	
d.	Others work, please state: *Kerja yang lain, sila nyatakan:* _____	

A5:

6. Working experiences (years):

Pengalaman bekerja (tahun)

a.	< 3 months Kurang 3 bulan	
b.	3 bulan - 1 tahun 3 months -1 year	
c.	1-5 years 1-5 tahun	
d.	>5 years 5 tahun ke atas	

A6:

RESPONDENT ID: _____

For researcher's use *Untuk kegunaan penyelidik*

7. Did you have attend any training of the handling the steam boiler operation and the risk related?

Pernahkan anda menghadiri latihan untuk mengendalikan dandang stim dan risiko yang berkaitan?

A7:

Yes / *Ya*	
No / *Tidak*	

8 If yes, when?

Jika ya, bila?

A8:

a.	Once in a month *Sebulan sekali*	
b.	Once in a week *Seminggu sekali*	
c.	Once in a year *Setahun sekali*	
d.	Once since the first time work *Sekali dalam tempoh bekerja*	
e.	Others frequency, please state: *Kekerapan lain, sila nyatakan:* _____	

9. Have you been experienced in accidents during working hour?

Pernahkah anda mengalami kemalangan semasa bekerja?

A9:

Yes / *Ya*	
No / *Tidak*	

10. Have you been experienced near misses when you are working?

Pernahkah anda mengalami keadaan hampir kemalangan?

A10:

Yes / *Ya*	
No / *Tidak*	

11. What is the cause of the accidents that was happened to you before?

Apakah punca kemalangan yang pernah berlaku kepada anda?

A11:

a	Failure of the boiler operations *Kerosakan pada operasi boiler*	
b	Careless during work *Kecuaian semasa bekerja*	
c	Sleepy *Mengantuk*	
d	Overconfident *Terlalu yakin*	
e	Lack of knowledge of the job task *Kurang pengetahuan tentang tugas kerja*	
f	Others, please stated: *Lain-lain, sila nyatakan:*	

RESPONDENT ID: _____

For researcher's use *Untuk kegunaan penyelidik*

SECTION B: KNOWLEDGE ON RISK MANAGEMENT OF THE BOILER

BAHAGIAN B: MAKLUMAT TENTANG PENGETAHUAN DANDANG DAN RISIKO

Please fulfil the information and tick (/) in a provided space.

Arahan: Sila lengkapkan semua maklumat dan tandakan (/) pada ruangan yang berkenaan.

1. Do you know that the risk management is important to apply in the workplace to prevent the accident?

Adakah anda tahu bahawa pengurusan risiko adalah penting untuk diaplikasikan di tempat kerja anda untuk mengelakkan kemalangan?

	B1

Yes / *Ya*	
No / *Tidak*	

	B2

2. Do you know is the cause of the low water level inside the boiler?

Adakah anda tahu punca air di dalam dandang stim boleh menjadi rendah ?

	B3

Yes, if there is no regular maintenance and inspection *Ya, sekiranya tiada penyelenggaraan dan pemeriksaan yang kerap*	
Yes, if there is sabotage from other people *Ya, sekiranya terdapat sabotaj daripada pihak lain*	
Impossible because of the automatic system *Tidak mungkin kerana sistem automatik*	
Not sure *Tidak pasti*	

	B4

3. Do the safety valve produce a sound before?

Adakah valve keselamatan pernah mengeluarkan bunyi sebelum ini?

Yes / *Ya*	
No / *Tidak*	

4. If yes, why? Jika ya, kenapa?

To indicate the pressure is exceed the TKS (Safe Working Pressure) *Untuk menunjukkan tekanan melebihi TKS (tekanan kerja selamat)*	
To give warning that the boiler will explode *Untuk memberi amaran boiler boleh meletup*	
It is the normal operation *Sebahagian daripada operasi biasa/rutin*	
Not sure *Tidak pasti*	

RESPONDENT ID: _____

For researcher's use *Untuk kegunaan penyelidik*

5. Do the steam boiler can explode?

Adakah dandang stim boleh meletup?

Yes, have possibility *Ya, berkemungkinan*	
Yes because of sabotage *Ya kerana sabotaj*	
Yes because the boiler was operating in longer duration *Ya kerana boiler sudah terlalu lama operate*	
No because alarm will be functioning *Tidak mungkin kerana alarm akan berbunyi*	
Not sure *Tidak pasti*	

B5

6. Smoke from chimney can:
Asap dari cerobong boleh

Can cause environmental problems if nor treated well *Boleh menyebabkan masalah persekitaran jika tidak dirawat dengan betul*	
Does not cause any problems *Tidak akan menyebabkan apa-apa masalah kepada persekitaran*	
Can cause health problem *Boleh menyebabkan masalah kesihatan kepada pekerja*	

B6

7. DOSH officer comes to do the regular inspection the boiler to:

Pegawai DOSH datang membuat pemeriksaan berkala di dandang stim untuk:

Disturb my work *Menyusahkan kerja saya*	
To perform their duties *Menjalankan tugas mereka*	
To prevent the accidents *Mencegah kemalangan*	
Learn about steam boiler *Belajar mengenai dandang stim*	

B7

8. How can we classified good combustion of furnace?
Ba*gaimanakah yang dikatakan pembakaran yang sempurna dan baik?*

No black smoke and can see the visual of fire *Dapat melihat secara visual api sedang membakar dan tiada asap hitam*	
Slow motion of fire *Api di dalam furnace menyala dengan kadar perlahan*	
Less steam production *Kurang mengeluarkan asap dan stim*	
Not sure *Tidak pasti*	

B8

B9

RESPONDENT ID: _____

9. What will happen if the excessive steam delivers to the sterilizer?
Apakah yang akan berlaku sekiranya stim yang disalurkan kepada sterilizer melebihi tahap yang ditetapkan?

Danger due to excessive steam *Boleh menyebabkan lebihan stim dan merbahaya*	
The system will give alarm *System akan memberi amaran*	
Not sure *Tidak pasti*	

RESPONDENT ID: _____

For researcher's use *Untuk kegunaan penyelidik*
C1
C2
C3
C4
C5
C6
C7
C8

SECTION C: RISK PERCEPTION

BAHAGIAN C: PERSEPSI TERHADAP RISIKO

Please fulfil the information and tick (/) in a provided space.

Arahan: Sila lengkapkan semua maklumat dan tandakan (/) pada ruangan yang berkenaan.

No.	Item	**Not risk** ***Tidak berisiko***	**Low risk** ***Risiko rendah***	**Moderate risk** ***Risiko sederhana***	**High risk** ***Risiko tinggi***	**Extremely high risk** ***Risiko terlalu tinggi***
1	Steam boiler have potential to explode. *Dandang stim berpotensi untuk meletup*					
2	Low water level inside water drum can cause explosion. *Paras air yang rendah (melebihi separuh drum) di dalam* ***drum air*** *boleh menyebabkan letupan dandang*					
3	Sound of safety valve shows the high level of pressure. ***Safety valve*** *berbunyi merupakan amaran paras tekanan tinggi.*					
4	Regular maintenance is important to prevent boiler explosion. ***Penyelenggaraan yang kerap*** *dandang penting dilakukan selalu untuk mengelakkan dandang daripada meletup.*					
5	Loss of water inside the water tube can cause the boiler dry and lead to an explosion ***Kehilangan air*** *di dalam water tube boleh menyebabkan dandang menjadi sangat kering dan berpotensi untuk meletup.*					
6	Training to the workers is important to prevent any accidents in the workplace. ***Latihan*** *kepada para pekerja di dandang sangat penting untuk mengelakkan sebarang kemalangan jiwa dan harta.*					
7	Record about the operation of boiler need to keep. *Segala* ***rekod*** *mengenai operasi dandang penting untuk disimpan.*					
8.	The inspection from DOSH officer is important to prevent potential accidents ***Pemantauan dari pihak DOSH*** *sangat penting untuk meninjau keadaan dandang untuk mengelak potensi kemalangan.*					

RESPONDENT ID: _____

No.	Item	**Not risk** ***Tidak berisiko***	**Low risk** ***Risiko rendah***	**Moderate risk** ***Risiko sederhana***	**High risk** ***Risiko tinggi***	**Extremely high risk** ***Risiko terlalu tinggi***	For researcher's use *Untuk kegunaan penyelidik*
9.	Logbook of boiler need to update to prevent operational problem. ***Buku log dandang (boiler)*** *mesti dikemaskini selalu untuk mengelak sebarang masalah operasi dandang.*						
10.	Boiler man and other workers need to monitor the boiler control system. *Boilerman dan pekerja di dandang mestilah sentiasa memantau* ***system kawalan dandang (boiler control system)***						C9
11.	Steam boiler may be left without supervision from boiler man and other employees. *Dandang stim boleh* ***ditinggalkan tanpa pengawasan*** *daripada boilerman dan pekerja lain.*						C10
12.	The automatic system of boiler is used nowadays. *Operasi dandang stim yang digunakan secara* ***system automatic.***						C11 C12

RESPONDENT ID: _____

For researcher's use *Untuk kegunaan penyelidik*

SECTION D: ATTITUDE TOWARDS RISK MANAGEMENT OF BOILER

BAHAGIAN D: TINGKAHLAKU TERHADAP PENGURUSAN RISIKO DANDANG

Please fulfil the information and tick (/) in a provided space.

Arahan: Sila lengkapkan semua maklumat dan tandakan (/) pada ruangan yang berkenaan.

Bil.	Item	**Strongly agree** ***Sangat setuju***	**Agree** ***Setuju***	**Don't know** ***Tidak tahu***	**Not Agree** ***Tidak bersetuju***	**Strongly not agree** ***Sangat tidak bersetuju***	
1	When you enter the work area, make sure that you wearing the proper PPE. *Apabila anda mula memasuki kawasan kerja anda, anda memastikan diri anda memakai PPE yang lengkap.*						D1
	Safety Shoes / *Kasut Keselamatan*						D2
	Safety Helmet / *Topi Keselamatan*						D3
	Ear plug/ *Perlindungan pendengaran*						D4
	Safety glove/ *Sarung tangan keselamatan*						D5
2	I always check the logbook before start my duty shift *Saya selalu memeriksa buku log sebelum memulakan kerja*						D6
3	Before start your work shift, you have been given the briefing about the performance of the boiler on that day from other shift workers? *Sebelum memulakan shif kerja, anda telah diberikan taklimat ringkas mengenai prestasi dandang pada hari itu daripada pekerja shif lain.*						
4	I have check all the parameters of the boiler to ensure it is under control. *Saya akan memeriksa semua parameter di mesin bacaan prestasi dandang untuk memastikan keadaan terkawal.*						
5	Every failure of damages happen must be reported quickly to the employer. *Setiap kerosakan yang berlaku pada dandang akan dilaporkan dengan segera kepada pihak majikan.*						

RESPONDENT ID: _____

Bil.	Item	**Strongly agree Sangat setuju**	**Setuju Agree**	**Tidak tahu Don't know**	**Tidak bersetuju Not agree**	**Sangat tidak bersetuju Strongly not agree**
6.	Steam boiler can be operate without boiler man. *Dandang stim boleh dioperasi tanpa kehadiran jurudandang (Boilerman).*					
7	I don't have to check the boiler performance due to automatic system is used. *Saya tidak perlu memeriksa perkembangan operasi dandang kerana system automatic digunakan.*					
8	I have to attend the training before start working. *Saya mesti menerima latihan dan tunjuk ajar terlebih dahulu sebelum dibenarkan bekerja.*					
9	I will keep all the records about the parameters of boiler's performance. *Saya akan menyimpan rekod mengenai parameter dandang seperti tahap tekanan, paras air dan sebagainya.*					
10	I don't have to worry because boiler will shut down if there is any failure. *Saya tidak risau mengenai kemalangan kerana dandang akan terhenti operasi dengan sendirinya jika terdapat kerosakan.*					

For researcher's use

Untuk kegunaan penyelidik

D7
D8
D9
D10

**THANK YOU FOR YOUR COOPERATION **

TERIMA KASIH DI ATAS KERJASAMA ANDA

APPENDICES 4

(GANTT CHART)

Gantt Chart for Project Schedule

Activities	2015												2016											
	Sep				Oct				Nov				Dec				Jan				Feb				March				May				Jun			
Library research/ Literature Review																																		
Select topic																																		
Further reading and searching for additional information																																		
Drafting the proposal																																		
Submit proposal to be reviewed by Supervisor																																		
Revised draft																																		
Submit proposal																																		
Feedback on proposal																																		
Develop schedule for data collection																																		
Data collection																																		
Data analysis																																		
Report writing																																		
Submit final thesis																																		