KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY

KUMASI, GHANA

AN ASSESSMENT OF THE STATUS OF OCCUPATIONAL HEALTH AND SAFETY AT BULK OIL STORAGE AND TRANSPORT COMPANY LTD (BOST) KUMASI TERMINAL

BY

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A Thesis submitted to the College of Engineering, Department of Mechanical Engineering, in partial fulfillment of the requirements for the degree of Professional Master of Engineering (Industrial Operations with Management)

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DECLARATION

I hereby declare that this piece of work is the outcome of my own research, carried out towards the award Professional Masters in Engineering Industrial Operations with Management. With the exception of references made to other literature which have been duly acknowledged, no part of this research has ever been presented anywhere, fully or partly for the award of a degree and therefore any other person who wants to use any part of this research should get the permission of the author.

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ABSTRACT

Oil and gas industries remain the backbone for many oil producing economies. The discovery of oil in Ghana raised high anticipation among Ghanaians for a remarkable rise in the living standards. The industry is, however, challenged with safety issues as more occupational accidents and injuries dominate the news headlines globally. Interruption in oil production caused by fires and accidents easily lead to huge economic losses and potential hazards to humans and the environment. This study is focused on an assessment of the status of occupational health and safety at Bulk Oil Storage and Transport Company, Kumasi branch. A sample of 100 respondents was purposively selected for the study. Data gathered were analyzed using statistical tools embedded in the Statistical Product for Service Solution Software (SPSS) and also Microsoft Excel. The results indicates that regulatory requirements and enhanced hazards management are the major motivating factors for complying with health and safety standards. Also, the highest contributing factor to the success of health and safety system design, implementation and continued improvement is education and training. Lack of access to adequate information, insufficient technical knowledge and skills, blame culture, resistance to change and lack of government support were the major challenges encountered during the implementation and continuous improvement of safety management system. The study recommends for various stakeholders to strengthen the regulatory requirements for the oil and gas industries. It is also recommended for BOST to consider motivation of employees as a major means for safety standards implementation. Finally, it is also recommended for a further study to be conducted on the implementation of safety standards in the oil and gas industry in a wide coverage beyond BOST- Kumasi.

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DEDICATION

I dedicate this work to my Lord and savoiur Jesus Christ the only begotten of the Father and to management and staff of BOST.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

ACRONYMS

API	American Petroleum Institute
BOST	Bulk oil storage and Transportation
BSI	British Standard Institute
EPA	Environmental Protection Agency
ESAW	European Statistics on Accidents at Work
GDP	Gross Domestic Product
GNA	Ghana News Agency
GNPC	Ghana National Petroleum Corporation
ILO	International labour Organisation
IPIECA	International Petroleum Industry Environmental Conservation Association
NFPA	National fire protection association
NIOSH	National Institute for Occupational Safety and Health
NOK	Norwegian Krone
OECD	Organisation for Economic Co-operation and Development
OGP	Oil and Gas Producers
OSH	Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
SPSS	Statistical Product for Service Solution
TOR	Tema oil refinery
UNEP	United National Environmental Programme
USEIA	United States Energy Information Administration
VPP	Voluntary Protection Program

WHO	World Health Organisation
WOGISA	Wyoming Oil and Gas Industry Safety Alliance

CHAPTER ONE

INTRODUCTION

1.1 Background

One of the main sources of revenue to many economies is the petroleum industry, which also, is often highly depended on to contribute intensely to the performance of the economy (Blanchard, 2009). Oil and gas business supports a country to gain hugely in foreign exchange, and further assists the nation in building good infrastructure. This sector is often relied on by many governments as their main sources of revenue and contribution to their gross domestic products (GDPs) and also providing employment opportunities to their citizens. For instance, Iraq, one of the main oil producing countries in the world sees the oil and gas industry as a very important economic sector as 90% of the governments revenue as well as 74% of the country's gross domestic product (GDP) all comes from this industry. The petroleum (oil and gas) industry also offers tremendous employment opportunities for the people of Iraq (Looney, 2006).

Oil and gas industries remain the backbone for many oil producing economies in Africa. Mathiason (2006) estimates that 57 per cent of Africa's export earnings are derived from hydrocarbons. Angola and Nigeria particularly derived their net exports from crude oil and very little refined oil (KPMG, 2015). Oil was recently discovered in Ghana in commercial quantities and has become one of the major exports for the Ghanaian economy. The industry has a lot of influence on the Ghanaian economy and it is the determiner of prices of various commodities. An increase in the price of crude affects the prices of almost all other commodities in the market.

Despite the significance of the oil and gas industry to most economies, safety measures to effectively protect the workers in the sector remains a challenge. Most employees within the oil and gas industry are frequently exposed to different kinds of hazardous environment. Mearns and Yule (2009), assert that the oil and gas industries all over the world are a high risk industry due to the nature of the industry and the difficult working conditions involved. Similarly, Kane (2010) indicates that the oil and gas industry is one of the industries that has a very high risk factor and has high workplace fatalities and injuries. The term fatal injuries, suggests those deaths which mostly results from traumatic injuries or other extraneous causes that occurred in the workplace (Gong, Xue-feng & Xian-fei, 2009). While non-fatal injuries are those ones which leads to physical, emotional and other damages. These injuries can be taken care of by medical aid within a certain period of time and these injuries usually dont lead to death (Cryer et al., 2008).

Occupational accidents can be caused by various factors; due to lack of knowledge, training, lack of supervision, and lack of rules implementation. In addition, negligence, carelessness of workers, recklessness of workers and lack of monitoring and controlling can lead to human error resulting in occupational accidents. According to Khdair et al. (2011), based on available records in 2009, the oil and gas sector in Iraq recorded 322 accidents that include 34 fatal work injuries and 288 non-fatal work injuries. This can also happen in Ghana if care is not taken. This is the reason why this study is focused on an assessment of safety standards and performance in the oil and gas sector in Ghana.

1.2: Problem Statement

The contributions of the oil and gas industries to economic growth cannot be under estimated. The industry is however challenged with safety issues as more occupational accidents and injuries dominate the news headlines globally. Interruption in oil production caused by fires and accidents easily lead to huge economic losses and potential hazards to humans and the environment (Osabutey et al., 2013).

Safety at work is a difficult and complex phenomenon, and the subject of safety performance across industries is hard and demanding to achieve (Khdair and Shamsudin, 2011). It needs a lot of measures and policies to be applied on the ground. The increase in occupational accidents is due to lack of attention given to safety performance, safety procedures and improvement of methods to prevent accidents and injuries (Jiang et al., 2010). These occurrences could also be owing to lack of knowledge, training, adequate supervision, and lack of rules implementation. Futhermore, a human error leads to negligence, carelessness , recklessness and lack of monitoring and controlling are also the causes of occupational accidents. All these factors have influence on safety performance or lead to the weakening safety performance and the high rate of accidents (Tharaldsen et al., 2010).

Occupational accident in oil and gas sector can have an enigmatic direct impact on production if safety measures and policies are not properly implemented. The Tema oil refinery (TOR) which previously could refine 45,000barrels of oil a day has come under heavy public criticism for failing to implement prudent risk management techniques (Osabutey et al., 2013). The failure to implement prudent risk management techniques could be one of the reasons that led to the fire outbreak at the refinery

(TOR) on the 18th of January 2010 claiming one life and injuring some other employees as well as the destruction of the corporation's property.

Some research has been done on oil and gas studies around the area (Osabutey et al., 2013; Taiwo, 2009; Donwaet al., 2015; Jones et al., 2015), however much of these studies have been focused on revenue generation and management in the oil and gas sector with very little focus on the assessment of safety standards and performance in the oil and gas sector in Ghana. Hence carrying out a study on the assessment of safety standards and performance in the oil and gas sector will minimize occupational accidents in the sector. It will also enhance the knowledge of workers in the oil and gas industries to adapt policies and strategies to boost their safety practices. Therefore it is important for a study to be conducted to fill the gap in knowledge.

1.3: Research Questions

1. What are the safety challenges in the Bulk oil storage and Transportation (BOST) industry in Kumasi?
2. What policies or programs are put in place to address safety challenges in the BOST in Kumasi?
3. How effective are the policies put in place towards addressing safety challenges in BOST industry in Kumasi?

1.4: Research Objective

The main objective of the study is to assess safety standards and performance in the BOST industry in Kumasi.

1.4.1: Specific Objectives

1. To assess safety challenges in BOST industry in Kumasi

2. To examine policies or programs put in place to address safety challenges in the BOST industry in Kumasi
3. To assess the effectiveness of the policies put in place towards addressing safety challenges in the BOST industry in Kumasi

1.5: Scope of the Study

The study is focused on an assessment of safety standards and performance in the BOST industry in Kumasi. Geographically, the study will be carried out at the BOST in Kumasi. The study is restricted to BOST in Kumasi because of their critical roles in oil storage and distribution of petroleum products.

1.6: Significance of the Study

Occupational health and safety standards play a crucial role in the survival of every company, organisation and industry. For any company to break-even it needs to ensure that its workers are in good health. A healthy worker would contribute to the high productivity level of the company or industry. Therefore, it is prudent to study and know how industries in oil and gas are taking care of the health needs of their workers.

The study will, therefore, be useful to the companies in order to put health and safety measures in place if there is none to protect their employees. The study, thus, will help to identify many problems employees of oil and gas industries face in the cause of their duty. Finally, the study will adds knowledge to the already existing studies on occupational health and safety system in oil and gas industry.

1.7: Organisation of the Study

The thesis will be structured into five chapters. The first chapter will be made up of the introduction, problem statement, objectives, scope, and significance of the study.

Chapter two will be devoted to the review of relevant literature related to the study. The third chapter will describe the methodology to be employed in collecting relevant data for the study. This section will look at data collection methods, sampling techniques and methods of data analysis. The fourth chapter will focus on data processing, analysis and presentation. Chapter five, the last chapter will focus on the summary of findings of the study, conclusion and recommendations.

CHAPTER TWO

REVIEW OF LITERATURE ON OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT

The chapter reviews both theoretical literature and empirical literature on occupational health and safety management and employees' performance in oil and gas industry. It also explains the concept of occupational health and safety in oil and gas industry, challenges of employees in oil and gas industry. And finally, the responsibilities of employers and employees with regards to occupational health and safety management in oil and gas industry.

2.1: The Overview of the Global Oil and Gas Industry

The global competitiveness within the industry has resulted in the swift development of very large services and supplies industries for the oil and gas exploration and production. According to International Oil and Gas Producers Association (2011), the dangers and health risks that are associated with drilling and processing of oil and gas made imperative for the industry players to put in health and safety measures in place to protect the workers. Since its inception in 1919, ILO has formulated regulatory system that required all players in the industry to operate within the constitution of the ILO (IPIECA andOGP, 2011).

The ILO's international labour standard provides the minimal legal framework for promoting OSH (Alli, 2008). The ILO's Constitution rightly sets the principles that, workers should be protected from sicknesses, diseases and injuries resulting from their jobs. According to ILO (2008), the documents on OSH promote tripartite collective efforts by governments, employers and workers to mould, implement and

continuously enforce a preventative safety and health culture. Tripartism is a key composition for effective OSH administration in the oil and gas industry. A hydrocarbon progressive development project, addressing the trends in risk level in the petroleum activity (RNNP) process, serves to illustrate how tripartism works in the Norwegian oil and gas industry (Blanchard, 2014).

The operation has developed considerably since its inception in 1999 to 2000 as a result of tripartite partnership. Blanchard reports that from a governmental point of view, OSH governance is a combination of related parts organized into a related whole or system. A procedural approach to OSH means that emphasis is on the interdependence and interactive attitude of its different components and on the total outcome of moves to improve it (ILO, 2016).

2.2: Evolution of Oil and Gas Industry in Ghana

The discovery of oil in Ghana has resulted in anticipation among Ghanaians of the prospects of massive makeover of the economy and a remarkable rise in the living standards. According to the Centre for Democratic Development (2008), Ghana's discovery of oil has raised high hopes and expectation that Ghana's long delayed dream of accelerated development might soon become a reality. In 2007, Ghana discovered a significant quantity of crude oil when Kosmos Energy Ghana HC (KOSMOS) drilled the first well that unlocked the potential of Ghana's western shores, nicknamed the Jubilee Field (Africa Business Sources, 2009).

The field was estimated to potentially hold 1.8 billion barrels and that production of oil was expected to commence in the last quarter of 2010 with a first flow of 120,000 barrels per day output during the first quarter with the potential to increase to 200,000 barrels per day (Cook, 2010). Indeed, on December 15, 2010, the president of the

Republic of Ghana launched the commercial production of oil in Ghana. Analyses of seismic data have further estimated an upward potential of 4 billion barrels in the basin that comprises West Cape Three Points, Tano Shallow and Deep water Tano (Cook, 2010).

A second company to Ghana's oil exploration is Tullow Ghana Limited (Tullow). At the end of 2008, a new discovery of oil and natural gas deposits with an expected 800 million barrels of oil was also announced. It was further reported that the value of services to be demanded by the oil industry when production begins was estimated to be around US $ 5 billion (Oppong, 2011).Ghana finally, begun production of oil in commercial quantity in 2010, and the discovery of new oil fields had provided a critical boost to the industry. This growth story had attracted increasing support from the government and global entities, such as the World Bank (Kastning, 2011).

However, Kastning argues that at this budding stage, the industry's growth will be largely dependent on external investments. While huge capital investments are inevitably required to develop the infrastructure necessary for oil exploration, external technical expertise was also required to train the existing unskilled workforce, improve downstream operational efficiencies and support sustainable growth practices. These needs for investment and technical expertise offer immense opportunities for global and regional entities focused on the oil and gas sector (Ghana web, 2011).

The recent fire outbreaks in the oil, gas and related industries in Ghana and the resultant adverse impact on life and property of the affected industries, and on the Ghanaian economy in general has suddenly brought to the fore the importance and practice of occupational health and safety in industry in the nation (GNA, 2010 and

2005).In the case of the oil, gas and related industries the matter has particularly assumed renewed national importance in view of the recent oil discovery in Ghana and the inherent hazards in the form of inflammable hydrocarbons and derived products associated with the exploitation of crude oil (Owusu, 2010).

According to Owusu, safety and health risks prowl across all levels of the industry including production projects, facility operations, maintenance, construction, transport, storage, and during the application of the oil derived products. Moreover, the huge volumes of materials that are processed, handled or used exacerbate any accident situation in the industry (Africa business sources, 2010). Added to this is the complexity of the instrumentation and technology used in these industries, the nature of the effect of the products, by-products and waste products on human health and the environment. The apprehension of the public is further heightened by the experiences in the Niger Delta of neighbouring Nigeria where the devastation of environment and the consequent effect on the livelihood and health of inhabitants has been quite alarming (United Nations, 2011).

As such concern is often expressed about the availability of requisite expertise and technology in the industry, and the adequacy of the regulatory regime to manage the newly found oil resources in a safe and environmentally friendly manner. In particular, the generally weak regulatory environment in the country, the recent accidents in the industry, and the continued pollution of the environment by industry raises questions about the ability of these entities to effectively discharge their duties and thus safeguard the safety and health of the citizenry and the environment (EPA, 2010).

Indeed, a number of standards and regulations exist worldwide (API, 2010; National Fire Protection Association, 2009) that provide guidelines for safety practice specifically in the oil and gas industry, and also for industry in general and which all manner of industries irrespective of geographical location could exploit to the benefit of safe operations of their plants.

Currently Ghana has only one refinery the state owned Tema Oil Refinery (TOR), with a capacity of around 45.000 barrel per day. Due to some financial and technical problems the refinery seldom worked at upside production rate in the past. In March 2010, Ghana's Government made GH¢445 million (US$316 million) available to amortize the refinery's debt to the Ghana Commercial Bank.

In order to achieve international economic viability, it has to increase its capacity utilization. In future years the government intends to invest US$300 million in TOR to increase its capacity to 100.000 barrels per day (GNPC, 2010).Nevertheless this plan was already on the table in the late 1990s and nothing happened since (Ghana Business News, 2010).As there is only a very limited number of jobs in the highly technical upstream production of oil (approximately 300 at Jubilee), it is of enormous importance to create a strong mid and downstream oil industry.

Mid and downstream means every sector of the oil and gas industry in addition to the actual exploration and production. By supporting these sectors, not only jobs are being created, but moreover value is added to the resources and dependence on the traded barrel price is being decreased (Essandoh-Yeddu, 2010).

According to Ghana National Petroleum Corporation (2010), construction of two new refineries was planned by foreign companies. Barclays Gedi Group planned construction of 100.000 barrels per day refinery next to Takoradi was originally

scheduled to begin construction in early 2011. Apparently the building of the refinery has been delayed because of the lack of a contractual agreement with the Government of Ghana (Ghanan web, 2011).

In July 2009 South Africa's New Alpha Refinery Ghana Ltd. and the Ghanaian government wrote a Memorandum of Understanding to construct a new US$6 billion oil refinery in Accra. Production rates would be 200.000 barrels per day, but with a possible expansion to 400.000 barrels per day. The aim was to start production in 2015(Africa Business Source, 2009).

2.3: Challenges Employees Face in the Course of their Duty

According to US occupational safety and health research and practice (2010), employees in the industry are generally predisposed to chemical hazards such as toxic, corrosive, carcinogens, asphyxiates, irritant and sensitizing substances. They are also vulnerable to physical hazards such as noise, vibration, radiations, and extreme whiles the biological hazards are virus, parasites, and bacteria. In addition, workers involved in hazards which include overwork, odd working hours, repetitive motions and awkward postures (Harrison, 2016).

ILO and OHS (2012) posit that oil and gas workers are susceptible to diseases caused by infections and parasites such as hepatitis A, cholera, typhoid fever; cumulative trauma disorders chloric obstructive pulmonary diseases. Besides that they are predisposed to gastrointestinal disorders, dermal and eye issues, spinal disorders, neoplasms/cancer, stroke and stress. OGP (2012) collaborate that workers surfer from the midstream activities such as dust from filing and scaling when cleaning the pipes and tanks. In the downstream for example, workers surfer from hazards such as noise

induced hearing loss, neoplasms/cancer when using chemicals for treatment WHich includes silica, solvents and metals like lead.

NIOSH (2005) intimate that workers within the oil and gas industry are exposed to acute hydrocarbon substances and gases which can have impact on the eyes, lungs, and central nervous system. If presents with enough concentrations to displace oxygen, this exposure can sensitize the heart to stress hormones, such as catecholamine, causing abnormal rhythms and ventricular fibrillation that can cause sudden death (Martinez, 2012).

According to Miller and Mazur (2005), even a brief exposure to high concentrations of hydrocarbons and a low-oxygen atmosphere is liable to rapid onset of respiratory depression, hypoxia, and fatal cardiac arrhythmias. He further states that pre-existing coronary artery disease may worsen the risk. According to him, these exposures may also have narcotic effects, causing dizziness, rapid disorientation, and confusion that could lead to loss of judgement, narcosis and incapacitation (Drummond, 2006; Sugie, 2007).

WorkSafeBC (2010) intimates that workers in the oil and gas industries are exposed to chemicals that may result in occupational health diseases of the lungs, skin, and other organs, depending on the amount and how long exposures has been going on. The industry's operational workers are also liable to hazardous noisy levels that may cause noise-induced hearing loss. Other endangerment includes confined spaces in which untrained workers have been seriously injured or killed. According to OSHA-NIOSH (2013), workers who spend a significant portion of their shifts in the following areas such as drilling floor, chemical mixing station or room, mud pits or tanks were treated drilling fluids are retained prior to pumping to the drill hole, and

shale shakers where drill cuttings are shaken from the drilling fluids that return from the drill hole may be overexposed to hydrocarbons and oil mist.

2.4: Occupational Health and Safety Management in Oil and Gas Industry

The human, social and economic costs of occupational accidents, injuries and diseases and major industrial diseases have long been a major concern at all levels from the individual's workplace to the national and international places of work. Measures and strategies rolled out to prevent, control, minimize or eradicate occupational hazards and risks have been developed and applied continuously (ILO, 2008).

All employers, whether operators or contractors have a commitment to protect and promote the health of those involved in every possible way through better field operational structures in the oil and gas industry. This is best achieved by establishing an effective health management system (IPIECA, and OGP, 2011).

According to Esswein (2014), the system should convey the company's structure, responsibilities, practices, procedures and resources for implementing health management, including processes to identify root causes of poor performance, prevent recurrences and drive continuous improvement. Occupational health is an integral part of the health management system. It is concerned with the inter-relationship between work and health. The purpose of an OHS is to protect, promote and maintain the health, safety and welfare of the people at work, advice on the provision of safe and healthy conditions by the informed assessment of the physical and psychological aspects of the working environment (Jordan, 2015).

According to Oil and Gas Producers (OGP) and International Petroleum Industry Environmental Conservation Association (IPIECA) (2011), the purpose of a health work assessment is to find health hazards, evaluate their possible effects on health and

determine appropriate mitigation, control and recovery measure. In addition, to identify and advise management on the causes of occupational diseases and injuries and the means of preventing them, advise on the rehabilitation and placement in suitable work of temporally or permanently incapacitated by illness or injury and assist in the planning and preparedness of emergency response plan (NIOSH, 2015).

2.5: Global Health and Safety Regulations

Occupational Health and Safety Management Systems (OHSMS) have been defined by Gallagher (2000) as a combination of the planning and review, the management organizational arrangements, the consultative arrangements, and the specific program elements that work together in an integrated way to improve health and safety performance. OHSMS implementation has four primary components. These are safety policy (policy statement, organizational structure, procedures), safety risk management (hazard identification, risk assessment, risk mitigation and tracking), safety assurance (internal audits, external audits, corrective action), and safety promotion (culture, training, communication) (Ludwig, 2007).

Over the past decade OHSMS has been used by many industries as a proactive process to avoid injuries and loss of life, and reduce several costs. Safety regulations have been reactive and prescriptive because they generally occur after a significant safety failure (Ludwig, 2007). However, today most industries such as aviation, petroleum, nuclear, railroad, marine, and chemical have complex production processes. Prescriptive regulations are not effective for improvements so these industries have replaced the prescriptive approach with OHSMS processes (Ludwig, 2007; Alli, 2008). Management leadership and employee participation have been

found to be the most important components to be successful on OHSMS (Manuele, 2008).

The British Standard Institute (BSI) is the business standard company which assists organizations in improving performance, reducing risks and achieving sustainable growth all over the world. International Organization for Standardization (ISO) is the world's largest developer of voluntary International Standards. These standards ensure that products and services are safe, reliable and of good quality and make industry more efficient and effective. OHSAS 18001 Standard was first published in 1999 by BSI as compatible with ISO 9001 and ISO 14001 Management System Standards in order to facilitate an integration of the three systems. OHSAS 18001 defines the minimum requirements for the best practice of occupational health and safety management.

International Labour Office (ILO) is the international organization responsible for drawing up and overseeing international labor standards. The ILO Guidelines on OSHMS (ILO-OSH 2001) were created by ILO for the same purposes as the other organizations (International Labour Office (ILO), 2001). The Occupational Safety and Health Act of 1970 (OSH Act) created OSHA, which issues safety and health standards and program management guidelines and provides information, training, and assistance to employers and employees to prevent work-related injuries and illnesses in the United States (Safety and health, 1989)

In 1982, OSHA announced the Voluntary Protection Program (VPP) and approved it. OSH Act of 1970 is the legal basis of VPP. The VPP encourages private and federal agencies to keep work-related accident and illness rates below National Bureau of Labor Statistics averages and allows workplaces to implement safety and health

management systems. OSHA also issued voluntary Safety and Health Program Management Guidelines on January 26, 1989 in 54:3904-3916 Federal Register to encourage employers to do more to protect their employees ("OSHA factsheet: Voluntary," 2005; "Safety and health," 1989).

American National Standards Institute (ANSI) is an administrator and a coordinator of the United States Private Sector Voluntary Standardization System, which is a nonprofit organization founded in 1918. The ANSI/AIHA Z10-2012 Standard contains management principles and systems to improve the health and safety performance that is published by ANSI ("ANSI/AIHA Z10,") and is compatible with other standards such as ISO 9001, 14001 like the OHSAS 18001 Standard.

In the United States, the National Institute for Occupational Safety and Health (NIOSH) is the federal agency responsible for conducting scientific research, developing guidance, making recommendations, and responding to requests for workplace health hazard evaluations to prevent work-related injuries and illnesses ("About national institute," 2013). NIOSH developed the Health Hazard Evaluation (HHE) program and the HHE is implemented to determine if workers are exposed to hazardous materials or harmful conditions. This program evaluates the workplace environment and the health of employees, but it does not include the entire management system ("Health hazard," 2012). In Australia and New Zealand, there are many standards and guidelines related to occupational health and safety such as AS/NZS 4804 and 4801 Occupational Health and Safety Management Systems, Victory Safety MAP, Australian Federal Government Safety-Wise, Western Australia Work Safe Plan, South Australia Safety Achiever Business Scheme, and Queensland Tri-Safe (Makin & Winder, 2009; "AS/NZS 4804:2001,") .

The common aim of the organizations: OSHA, ANSI, VPP, NIOSH, BSI, ISO and etc. assists private and federal agencies to prevent work-related accident and illnesses in the workplace and implement effective safety and health management systems. ISO 9001 and ISO 14001 management system standards are not directly related to OHS, however, ISO 9001 helps organizations to implement quality management system and ISO 14001 helps implement environmental management system. These standards are models for continual improvement, satisfying internal and external customers and other stakeholders. Therefore, the goal of ISO 9001 and ISO 14001 is to improve the product quality and work environment. These can be implemented by the companies easily with other safety based standards.

The best OHSMS involves every level of the organization, creates a safety culture that decreases accidents and injuries and improves the bottom line for managers. When safety and health culture is in the organization, everyone wins. Other benefits are the reduction of the direct and indirect costs of accidents, avoiding incident investigation costs and increasing employee morale and productivity, establishing a marketable safety record, compliance with legal responsibilities for safety, more efficient maintenance scheduling, and continuous improvement of operational processes (Ludwig, 2007). OHSMS are used in many industries. Management systems have been implemented to prevent accident costs and loss of life. Piper Alpha Oil Rig was a North Sea oil production platform operated by Occidental Petroleum (Caledonia) Ltd. On 6 July 1988, there was an explosion, and oil and gas fires started in an offshore platform. Approximately 225 men were working on the rig; unfortunately, 167 people died in the incident, which was the worst offshore oil disaster in the world. It also caused loss of oil production, and about $2.8 billion insurance cost. At the time of the disaster, the platform accounted for approximately 10% of the UK's North Sea

oil and gas production. The public investigation found the company's management directly responsible for lack of preventive actions. The report suggested changing the prescriptive safety system with a safety risk management/assessment approach that is the main structure of the safety management system (Ludwig, 2007). The OHSAS is an example of this kind of management system.

2.6: OHSAS 18001 Occupational Health and Safety Management System

Occupational Health and Safety Assessment Series (OHSAS 18001) is an internationally recognized assessment specification for occupational health and safety management systems. The OHSAS 18001 was developed by the OHSAS Project Group, a consortium of 43 organizations from 28 countries, which consisted of national standards bodies, accreditation bodies, certification bodies and OSH institutions with the UK's National Standards Body, BSI Group, providing the secretariat.

OHSAS 18001 is designed to help organizations formulate occupational health and safety policies and objectives. It was first released in 1999 by the OHSAS Project Group and revised in 2007. It is applicable to all kind of organizations, large or small, and any business sector. OHSAS 18001 is largely aligned with the structure of ISO 14001 and is based on the two concepts of continual improvement and regulatory compliance. The OHSAS 18001 Specification follows the Plan-Do-Check-Review cycle; this model fits in other management system documents such as ISO 9001 and 14001 and allows implementation of Integrated Management Systems (Gallagher, Underhill & Rimmer, 2001).

By setting up systems that are assessed by a third party certification body, organizations prove to their staff, suppliers and customers that they take health and

safety seriously. OHSAS 18001 accreditation provides a framework to help organizations meet their legal obligations to Health and Safety in the workplace. The OHSAS approach utilizes a risk management system to enable organizations to identify their hazards and determine risks that are not acceptable and need to be controlled.

The OHSAS 18000 series has two publications: OHSAS 18001 Occupational Health and Safety Management Systems - Requirements and OHSAS 18002 Occupational Health and Safety Management Systems - Guidelines for the Implementation of OHSAS 18001:2007. The OHSAS 18001 specifies requirements for an OHSMS to enable an organization to develop and implement a policy and objectives and improve their OSH performance (OHSAS 18001:2007 Occupational, 2007). The OHSAS 18002, as a non-certifiable guideline, quotes the specific requirements from OHSAS 18001 and follows with generic assistance to an organization for establishing, implementing or improving OHSMS. Corporations can continuously improve health and safety issues, enact prevention as a priority in their organization, support entrepreneurial responsibility, involve staff in decision-making, motivate managers and employees, reduce costs, synergize with other management systems, and demonstrate organization transparency following the objectives of the OHSMS.

2.7: Health and Safety Regulations in Ghana

Ghana signed to ILO which requires, as per the ILO convention number 155 1981, that member countries formulate, implement and periodically review a coherent policy on occupational safety and health and work environment, Ghana has not yet ratifyed this convention and the nation has no established authority dedicated to Occupational Safety and Health to guide and facilitate the implementation of the "Action at the National Level" as indicated in the R164 Occupational Safety and

Health Recommendation, 1981. What exist today, are pieces of out-dated legislations and regulations such as the Environmental Protection Agency Act (Act 490), Mining Regulations Act 1970 LI 665 and Factories, Offices and Shops Act, LI 328 which are sector focused and therefore cannot be enforced across board. Apart from EPA, much has not been heard or seen of the rest of the agencies mandated to enforce the Acts mentioned above. This may be as a result of lack of resources and logistics as is always the excuse of most enforcement agencies in the country and more importantly 'non-applicability' of some of these laws. The inability of these agencies to perform their oversight responsibilities and strictly enforce compliance at their respective sectors coupled with the absence of a comprehensive regime have brought untold hardships, pain, suffering and in some cases death to some employees and their families.

Besides the Petroleum (Exploration and Production) Law, 1984 which mandates companies in the oil production sector to adopt international best practices in their operations, no legislative instrument or body has been identified that caters uniquely to occupational health and safety in the oil, gas and related energy industries. Rather, a number of legislative instruments including some of those mentioned above have their area of coverage incorporating aspects of safety practices of the industries (see Table 2.1). These several bodies listed under Table 2.1 are responsible for regulating, promoting and administering Occupational Health and Safety (OHS) issues in the country. Notable on Table 2.1 is that the individual legislations cover only specific occupations or specific aspects of OHS. Moreover, these legislations come under the jurisdiction of different administrative bodies. The foregoing underlines the key weakness of OHS practice in Ghana. There is no unifying legislation or a central regulatory body to oversee its administration. The disjointed array of legislations and

bodies has made assessment of the performance of OHS practice in the country difficult and consequently stalled its development in keeping with new trends.

The Factories, Offices and Shops Act 1970, by its contents, was identified as the single broad legislative instrument in the country that purports to tackle all aspects of occupational health and safety in all entities that by definition are considered as factory, shop or office premise. The Act is administered by the Factory Inspectorate Department (FID-Ghana) under the Ministry of Employment and Social Welfare.

Table 2.1: Legislation Relevant to Safety Practices in the Oil, Gas and Related Energy Industries

Legislation	Jurisdiction	Administering Body
National Building Regulations, 1996(LI 1630)	All physical structures	Ministry of Works
Factories, offices and shops Act 1970 (Act 328)	Factories, Offices and Shops	Factories Inspectorate Department
Labour Act 2003 (Act 651) (Section 118)	Employer and employee responsibilities	Labour Commission
Ghana National Fire Service Act, 1997(Act 537)	Fire prevention and protection in all facilities	Ghana National Fire Service
EPA Act 1994 (Act 490)	Protection of the environment at all levels	EPA-Ghana
Petroleum (Exploration and Production) Law, 1984	All petroleum operations	Ghana National Petroleum
Radiation Protection Instrument, 1993, L.I. 559	The control and use of any ionizing and radiation sources	Ministry of Science, Tech and Environment
Mining Regulations, 1970, L.I. 655	All registered mines and works	Ministry of Lands and Natural Resources
Explosives Regulations, 1970, L.I. 666	The importation, storage, disposal and use of explosives	Ministry of Lands and Natural Resources
The 1992 Constitution of Ghana	Safety of all Ghanaians	The Judiciary

2.8: Concept of Employee Performance in OiL and Gas Industry

Wei and Lau (2005) admit that most organisation are fully aware of the importance of employee performance,increasing employee performance or to find out the ways through which high level of employee's performance can be achieved is to becoming

one of the decisive factors for any organisation success. According to Wood, Holman and Stride (2006), the mission of management of organisation is to bring people together to realize corporate goals and objectives by using available resources effectively and efficiently. Employees' performance can be enhanced by putting efforts to factors that increase the employees' motivational level, creativity, job satisfaction and comfort workplace environment and use of appropriate working tools (Le Tran Thach, Thao, and Chiou-Shun Hwang, 2009).

Mathis and Jackson (2009) add that performance is associated with quantity of output, quality of output, timeliness of output, presence attendance on the job, efficiency of the work completed. They argue that employee performance is the successful completion of tasks by a selected individual or individuals, as set and measured by a supervisor or organisation, to pre-defined acceptable standards while efficiently and effectively utilizing available resources within a changing environment.

McCloy (1994) contributes that employee performance may be taken in the perspective of three factors which make possible to performance better than others and determinants of performance may be such as declarative knowledge, procedural knowledge and motivation. Aguinis (2009) collaborates that the definition of performance does not include the results of an employee's behaviour but only the behaviours themselves. According to Aguinis, performance is about behaviour or what employees do not about what employees produced or the outcomes of their work. Employees' performance represents the general belief of the employee about his behaviour and contributions in the success of organisation.

According to Janssen and Yperen (2004), the influence level of working environment is the counterpart requirement of a creative job. They argue that higher job

satisfaction and lower intentions to leave were found for those individuals whose work environment accompanied the creative requirements of jobs. Dessler (2008) however, state that to remain competitive in a dynamic environment and for enhancing the overall innovations of an organization the creative performance of employees has been recommended.

Dessler further states that "working environment can be divided into two components namely physical and behavioural components. The physical environment consists of elements that relate to the office occupiers' ability to physically connect with their office environment". The behavioural environment consists of components that relate to how well the office occupiers connect with each other, and the impact the office environment can have on the behaviour of the individual. According to Haynes (2008), "the physical environment with the productivity of its occupants falls into two main categories, office layout that is open-plan verses cellular offices and office comfort matching the office environment to the work processes". In addition, the behavioural environment represents the two main components namely interaction and distraction.

Jobber (1994) posits that motivation is a key determinant of job performance and a poorly motivated force will be costly in terms of excessive staff turnover, higher expenses, negative morale and increased use of managements' time. Therefore, management must know what exactly stimulates their staff so resources are not misallocated and dissatisfaction develops among employees. As Green (2000) has described motivation to be proactive in the sense of in dealing with employees who are high performers, motivation is essential, otherwise their performance will decline or they will simply leave the job. While dealing with low performers, motivation is a

prerequisite, otherwise these employees will drag results down, lower productivity and certainly would not leave the organisation, as they will have nowhere else to go.

A motivated workforce is essential because the complete participation of employees will certainly drive the profitability of the organisation (Carlsen, (2003), Darmon (1974) believe motivation is the educating of employees to channel their efforts towards organizational activities and thus increasing the performance of the said frontier covering roles. According to Denton (1991), a motivated workforce will lead to greater understandsing, acceptance, commitment to implementation, understanding of objectives and decision making between management and employees. According to Denton, there are six most important elements of motivation. These are rewards, pay, profit sharing, promotion, recognition, and job enrichment.

Gordon (1992) emphasises the developing process of employees' Skill in order to improve the performance is training. Training is a type of activity which is planned, systematic and it results in enhanced level of skill, knowledge and competency that are necessary to perform work effectively (Swanson, 1999). Existing literature presents evidence of an existence of obvious effects of training and development on employee performance. According to Wright and Geroy (2001) notes that employee competencies change through effective training programmes. Training has been proved to generate performance improvement related benefits for the employee as well as for the organization by positively influencing employee performance through the development of employee knowledge, skills, ability, competencies and behaviour (Appiah2010; Harrison 2000; Guest 1997). Employers in oil and gas industry must ensure that the suitable environments are provided for utmost performance of employees.

2.9: Managers/Employers Responsibilities on OHS Management System

There are numerous acts which stipulate OHS standards and requirements for most fields of activity being construction, offshore, onshore, welding, excavation, mining, etc. General compliance enforcement with OHS regulations is carried out by Federal Labour Inspection within the Ministry of Labour and Social Security, with some related authorities delegated to sanitary, technical, marine and other administrative compliance. Specific OHS requirements are contained in various standards and regulations adopted by the appropriate governing bodies (OGP and ILO, 2012).

In the past decade, industry, government, and the general public have become increasingly aware of the need to respond to the hazardous waste problem, which has grown steadily over the past 40 years (ILO, 1997). In 1980, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) the Superfund law to provide for liability, compensation, clean-up, and emergency response for hazardous substances released into the environment and the clean-up of inactive waste disposal sites (OSHA-NIOSH, 2012).

In furtherance, the act is a guidance document for manager's responsible for occupational safety and health programmes at inactive hazardous waste sites. It assumes a basic knowledge of science and experience in occupational safety and health. It is the product of a four agency committee, the National Institute for Occupational Safety and Health (NIOSH), the Occupational Safety and Health Administration (OSHA), the U.S. Coast Guard (USCG), and the U.S. Environmental Protection Agency (EPA) mandated by CERCLA section 301(f) to study the problem of protecting the safety and health of workers at hazardous waste sites, and by CERCLA section 111(c)(6) to develop a programme to protect the health and safety

of employees involved in response to hazardous substance releases, removals, or remedial actions (NIOSH- OSHA, 2013).

In addition, standards of ILO especially on OSH provides very essential tools for governments, employers and workers to establish such practices and to provide for maximum safety and health at work (ILO, 2010). The driving force behind ILO work in the area of OSH is the instruments that specifically regulate the main principles for managing or preventing exposure to occupational hazards and the associated means and methods for achieving this. These are laid down in 15 ILO Conventions, one Protocol and 17 Recommendations, as well as in the ILO codes of practice relating to OSH.

According to Alli (2008), Conventions are legally binding international treaties that may be ratified by member States, while Recommendations serve as non-binding guidelines. In many cases, a Convention lays down the basic principles to be implemented by ratifying countries, while a related Recommendation supplements the Convention by providing more detailed guidelines on how it could be applied (ILO, 2008). Alli adds that Recommendations can also be autonomous, that is to say not linked to any Convention.

International Labour Organisation Conventions and Recommendations are drawn up by representatives of governments, employers and workers and are adopted at the International Labour Conference. Once a standard is adopted, member States are required under the ILO Constitution to submit it to their competent authority for consideration. In the case of Conventions, this means consideration for ratification. If it is ratified, a Convention generally comes into force for that country one year after the date of ratification. Ratifying countries commit themselves to applying the

Convention in national law and practice and reporting on its application at regular intervals (World Bank, 2009).

In the oil and gas industry, the code of practice Safety and health in the construction of fixed offshore installations in the petroleum industry was published by the ILO in 1981 (WorkSafeBC, 2010). First, Safety and health in the non-ferrous metals industries, published in 2003, requests employers to provide workers with extra care when they are required to move from a very hot working environment to a much colder one, especially when exposed to strong wind. The code further states that workers should be protected against the severest forms of cold stress, hypothermia, and cold injury (ILO, 2010).According to ILO, the core body temperature should not be allowed to fall below 36ºC (96.8ºF). Suitable protection should be provided to prevent injury to the bodily extremities.

The second code of practice ambient factors in the workplace, published in 2001, has a few provisions on the protection of workers from cold. This code applies to the oil and gas industry, but it does not provide specifically for the protection of workers in extreme cold working and living conditions (ILO, 2016). It places emphasis on the role and obligations of competent authorities, the responsibilities of employers, and the duties and rights of workers and others with regard to the prevention of illness and injury to health resulting from hazardous ambient factors in the working environment.

It deals, in particular, with the setting up of legal, administrative and practical procedures and frameworks for the assessment of hazards, risks and of control measures, the aims of and mechanisms for identifying and eliminating or controlling the hazard and risk from hazardous ambient factors (OGP2011).In addition, the surveillance of workers health and of the working environment, and the provision of

information and training to workers, including regarding specific factors such as cold and low temperature working environments.

However, the provisions of this code do not apply to other ambient factors, such as shift work, to ergonomic factors, or to psychosocial factors, such as work intensification, repetitive work and stress. According to WorkSafeBC (2010), the code is not a legally binding document and is not intended to replace national laws, regulations or accepted standards. However, It provisions are considered as the basic requirements for the protection of workers health against hazardous ambient factors and are not intended to discourage competent authorities from adopting higher standards. More stringent national or international regulations have priority over the recommendations in this code (API, 2010).

Alli (2008) argues that to ensure a safe response, employers must put in place a work plan describing anticipated clean-up activities must be developed before beginning onsite response actions. He adds that the work plan should be periodically re-examined and updated as new information about site conditions is obtained. The work plan should be comprehensive and contain information about the site records, waste inventories, generator and transporter manifests, previous sampling and monitoring data, site photos, state and local environmental and health agency records, define work objectives, and determine methods for accomplishing the objectives.

According to United National Environmental Programme (UNEP) (2011), the working plan should determine personnel requirements, determine the need for additional training of personnel, evaluate their current, knowledge/skill level against the tasks they will perform and situations they may encounter. UNEP further states that the work plan should also include method to determine equipment requirements

and evaluate the need for special equipment or, services, such as drilling equipment or heavy equipment and operators.

National fire protection association (NFPA) (2009) hints that preparation of the work plan requires a multidisciplinary approach, and may therefore require input from all levels of onsite and offsite management. It advices that consultants may also be useful in developing sections of the work plan for example, chemists, occupational health and safety professionals, and statisticians may be needed to develop the sampling plan. Furthermore, a site safety plan, which establishes policies and procedures to protect workers and the public from the potential hazards posed by a hazardous work site, must be developed before site activities precede. The site safety plan must provide measures to minimize accidents and injuries that may occur during normal daily activities or during adverse conditions such as hot or cold weather (OSHA-NIOSH, 2013).

According to OGP (2011), employees should not engage in field activities until they have been trained to a level commensurate with their job function and responsibilities and with the degree of anticipated hazards. Those to be trained are general site workers, such as equipment operators, general labourers, technicians, and other supervised personnel, should attend training sessions that apply to their individual jobs and responsibilities, as well as training sessions that provide an overview of the site hazards and the means of controlling those hazards. Their training should include classroom instruction in the subject areas, depending on their individual jobs such as site safety plan, safe work practices, nature of anticipated hazards, handling emergencies and self-rescuerules and regulations for vehicle, safe use of field equipment (Oppong, 2011).

In addition to classroom instruction, general site workers should engage in actual field activities under the direct supervision of a trained, experienced supervisor. Some general site workers who may be exposed to unique hazards or who may occasionally supervise others should receive additional training in Site surveillance, and site safety plan development. Oppong further, suggests the use and decontamination of fully encapsulating personal protective clothing and equipment and use of instruments to measure explosivity, and radioactivity, and safe use of specialized equipment.

Furthermore, ILO (2011) stipulates that periodic medical examinations schedules should be developed and used in conjunction with pre-employment screening examinations. Comparison of sequential medical reports with baseline data is essential to determine biologic trends that may mark early signs of adverse health effects, and thereby facilitate appropriate protective measures.

According to National Commission on the BP Deep water Spilling (2008), since site activities and weather conditions change, an on-going air monitoring programme should be implemented after characterization has determined that the site is safe for the commencement of operations. The on-going monitoring of atmospheric chemical hazards should be conducted using a combination of stationary sampling equipment, personnel monitoring devices, and periodic area monitoring with direct-reading instruments. Anyone entering a hazardous waste site must be protected against potential hazards.

According to Parkes, (2010), the purpose of personal protective clothing and equipment (PPE) is to shield or isolate individuals from the chemical, physical, and biologic hazards that may be encountered at a hazardous waste site. Careful selection

and use of adequate PPE should protect the respiratory system, skin, eyes, face, hands, feet, head, body, and hearing.

2.10: Employees' Responsibilities

The Occupational Safety and Health Standard were formulated in 1978 in compliance with the constitutional mandate to safeguard the worker's social and economic well-being as well as his physical safety and health (ILO, 1997). These safety standards were adopted through the tested democratic machinery of tripartism, the 1978 Standard was considered as a landmark in Philippine labour and social legislation (ILO, 2008).

According to Mode and Conway (2008), the dawn of industrialization and the continuing introduction of technological innovations in world today have, however, correspondingly increased the number and types of occupational hazards that workers are exposed to. United States Energy Information Administration (2010) postulates that as a result of the high occupational fatality rate in the oil and gas extraction industry there are concerns that the rapid growth and new technologies may increase or change the nature of hazards for oil and gas industry workers. Therefore, a need to characterize risks, identify solutions, and discover research gaps exists so that occupational health and safety in this growing industry sector may be addressed. Viewed against this background, it became imperative that the Standards be revised to make it truly responsive to the workers' needs (Wyoming, 2012).

Wyoming House of Representatives General Session (2013) intimate that the joint efforts exerted by the Bureau of Working Conditions, the ILO Manila Office and the tripartite sectors bore fruit in August 1989 when the revisions were finally approved by the Secretary of Labour and Employment pursuant to his authority under Article

162 of the Labour Code of the Philippines. With the latest improvements in the Standards, all establishments covered had been provided with a better tool for promoting and maintaining a safe and conducive working environment (NIOSH, 2013).

Consequently, the constitution states that every worker shall cooperate with the employer in carrying out the provisions of these standards. He shall report to his supervisor any work hazard that may be discovered in his workplace (Wyoming, 2014).Every worker shall make proper use of all safeguards and safety devices furnished in accordance with the provisions of these standards for his protection and that of others, and shall follow all instructions given by the employer in compliance with the provisions of these standards. Besides, it shall be the duty of any person, including any builder or contractor or enforcement agent, who visits, builds, renovates, or installs devices, or conducts business in any establishment or workplace, to comply with the provisions of these Standards and all regulations of the employer issued there under as well as with other subsequent issuances of the Secretary (WOGISA, 2014).

2.11: Benefits of Occupational Health and Safety Management System

The oil and gas industry in effect benefits enormously when occupational health and safety management is put in place. It enables Oil and Gas industry in performing hazard identification, risk assessment and implementing various control methods, it ensures well-being of all the employees and thus contributes to amore inspired, and performance driven workforce (Bullard, 2014).According to Wyoming Oil and Gas Industry Safety Alliance (WOGISA) (2014), regular risk assessment process helps in frequent tracking and monitoring of health and safety indicators. It reduced costs

associated with accidents and incidents, improved regulatory compliance, it argues that the implementation of OSH management system gives competitive edge and improves relationships between stakeholders, such as clients, contractors, subcontractors, consultants, suppliers, employees and unions (USEIA, 2014).

2.12: Empirical Literature

A recent ILO report estimated that 2 million occupational fatalities occur across the world every year (ILO,2003), the highest proportions of these deaths being caused by work-related cancers, circulatory and cerebrovascular diseases, and some communicable diseases. The overall annual rate of occupational accidents, fatal and non-fatal, is estimated at 270 million (Hämäläinen, Takala and Saarela, 2006). According to the report, some 160 million workers suffer from work-related diseases and about two-thirds of those are away from work for four working days or longer as a result. After work-related cancers, circulatory diseases and certain communicable diseases, accidental occupational injuries are the fourth main cause of work related fatalities.

Recent data from the ILO and from the World Health Organization (WHO) indicate that overall occupational accident and disease rates are slowly declining in most industrialized countries (ILO, 2003). However, accidents are rising or increasing in developing and industrializing countries**.** According to the European Statistics on Accidents at Work (ESAW, 2004), every year in the 15 member states of the European Union (EU) before the enlargements of 2004 and 2007 about 5,000 workers were killed in accidents at work and about 5 million workers were victims of accidents at work leading to more than three days' absence from work (EU, 2004).

In India and China, the rates of occupational fatalities and accidents are similar at, respectively, 10.4 and 10.5 per 100,000 for fatalities, 8,700 and 8,028 for accidents. In Latin America and the Caribbean, about 30,000 fatalities occur each year and 22.6 million occupational accidents cause at least three days' absence from work. In sub-Saharan Africa, the fatality rate per 100,000 workers was 21 and the accident rate 16,000. This means that each year 54,000 workers die and 42 million work-related accidents take place that cause at least three days' absence from work (World Bank, 2008).

According to United States Energy Information Administration (2010), the economic costs of these injuries and deaths are colossal, at the industry, national and global levels. Taking into account compensation, lost working time, interruption of production, training and retraining, medical expenses, and so on, estimates of these losses are routinely put at roughly 4 per cent of global GNP every year, and possibly much more. Mitchell (2011)collaborates that the overall spending on compensation for a group of OECD countries was estimated at US$122 billion for 1997 alone, with 500 million working days lost as a result of accidents or health problems. Mitchell adds that if property losses from accidents, and more specifically major industrial accidents, are included, recent studies suggest that insured losses are in the region of US$5 billion annually and are on the increase.

Moreover, these figures are based mainly on acute and intensive events and do not include uninsured losses, delayed losses associated with acute events such as oil and other toxic chemical spills, or the environmental impact and losses caused by chronic industrial pollution (Government of Viet Nam, 2006). The total annual cost to the EU of work-related injuries and ill health in 2001 was estimated at between €185 billion

and €270 billion, or between 2.6 per cent and 3.8 per cent, of the EU's GNP. In comparison, the cost of occupational accidents in Viet Nam for 2006 was estimated at US$3 billion (Mode and Conway, 2008).

In the years 2005 to 2009, the occupational fatality rate of the oil and gas extraction industry was 2.5 times higher than the construction industry and 7 times higher than general industry (Bureau of Labour Statistics, 2009, 2008). The industry's fatal injury rate is correlated with fluctuations of industry activity, as measured by the number of active drilling rigs (Baker Hughes Incorporated, 2010 andNational Institute for Occupational Safety and Health, 2014).

According to Bureau of Labour Statistics (2009) and Mode and Conway, (2008), the most common fatal events were due to highway crashes 29.3 per cent and being struck by an object 20.1 per cent. When a fatal traffic accident occurred, light duty trucks were most often involved, single vehicle rollover events were most common and most fatalities were associated with lack of seat belt use (Retzer et al., 2013). Well servicing workers were at highest risk for fatal traffic accidents. Among companies involved in oil and gas extraction, small companies had higher rates of fatal injuries than did medium and large-sized companies (National Institute for Occupational Safety and Health; Retzer et al., 2013).

By Bureau of Labour Statistics (2009) estimation, new company employees were at highest risk of a fatal injury, regardless of the length of time working in the industry. Over half (53.4 per cent), of fatal injuries occurred within a year of service with employer, and over one quarter (28.2 per cent)of fatal injuries occurred within 1 to 5 years of service with employer (Retzer et al., 2013).

Occupational Safety and Health Administration (2011) argue that although the oil and gas industry has had a high rate for fatalities, however, reported injuries are below that for construction (United States Department of Commerce and United States Census Bureau, 2011). In the years 2005 to 2009, when compared to the construction industry, the oil and gas industry injuries were three-fold lower with respect to recordable, nonfatal injuries and injuries with job transfer or restriction (National Institute for Occupational Safety and Health, 2014).

According to United States Department of Labour and Bureau of Labour Statistics(2010), days away from work were due to being struck by or against object (35.8 per cent), caught in an object, equipment, material (21.2 per cent), falls (14.6 per cent), overexertion (11.5 per cent),and exposure to harmful substance (3.3 per cent) slips, trips (1.3 per cent) and other (10.6 per cent).In addition, transportation accidents were responsible for only 2.0 per cent of the injuries with days away from work. While these data provide some insight into the causes of injury in this industry, systematic underreporting to the Bureau of Labour Statistics (BLS) is well documented and likely due to many causes (Baker Hughes Incorporated, 2010 andNational Institute for Occupational Safety and Health, 2014).

Furthermore, investigation into the injuries occurring in this industry indicated that during the period from October 2010 to September 2011, Federal OSHA conducted 141 inspections of oil and gas drilling sites (SIC 1381),which resulted in 581 records and $1,576,646 in penalties measured. In the same period, there were 122 inspections of oil and gas field services (SIC 1389), resulting in 447 citations and $1,089,568 in penalties (Occupational Safety and Health Administration, 2011).

In the oil and gas industry alone, the OSHA top five violations nationwide included failure to guard floor openings, safety violations related to confined spaces, citations under the general duty clause, electrical wiring, and personal protective equipment. The top health-related violations included work in confined spaces, violations in hazard communication, medical services and first aid respiratory protection, and injury/illness recordkeeping (Occupational Safety and Health Administration, 2011).

Regarding violations of hazard communication, fifteen OSHA inspections in the drilling sector resulted in 26 citations for hazard communication standard violations and $102,719 in penalties and fourteen field services sector inspections resulted in 23 citations and $27,225 in penalties (Occupational Safety and Health Administration, 2011).

For the same time period, OSHA Region eight offices covering Colorado, Wyoming, North Dakota, South Dakota, Montana, and Utah conducted 23 inspections of the oil and gas drilling sector, issued 49 citations and assessed fines of $16,661 (Stavanger and Oslo, 2011). The Region eight office conducted 46 inspections of the well servicing sector, issued 49 citations, and assessed $91,971 in fines (Occupational Safety and Health Administration, 2011). During FY2010, the five most frequently cited paragraphs in Colorado were violations of the general duty clause, personal protective equipment signage for confined spaces, guardrails for platforms, and guarding of vertical belts. The signage for confined spaces and hazard communication were the most frequently health related standards (National Institute for Occupational Safety and Health; Retzer et al., 2013).

2.13: Conceptual Framework

Safety and safety practices have been explained and conceptualized in various dimensions towards achieving safety standards. For instance, Fishback and Kantor (2007) have described safety and safety practices as a process, belief or an ideology and also a system or mechanism of retaining human resources. The aim of this study is trying to explore more possible ways of conceptualizing safety and safety practices.

Stranks (2006) conceptualized safety and safety practices as consisting of a wide variety of multi-dimensional elements categorized into six groups in the oil and gas industry. These six categorize of safety and safety practices are interrelated. They include commitment, behaviour, awareness, adaptability, information and justness.

Figure2.1: Conceptual Framework on Safety and Safety Practices in the Oil and Gas Industry

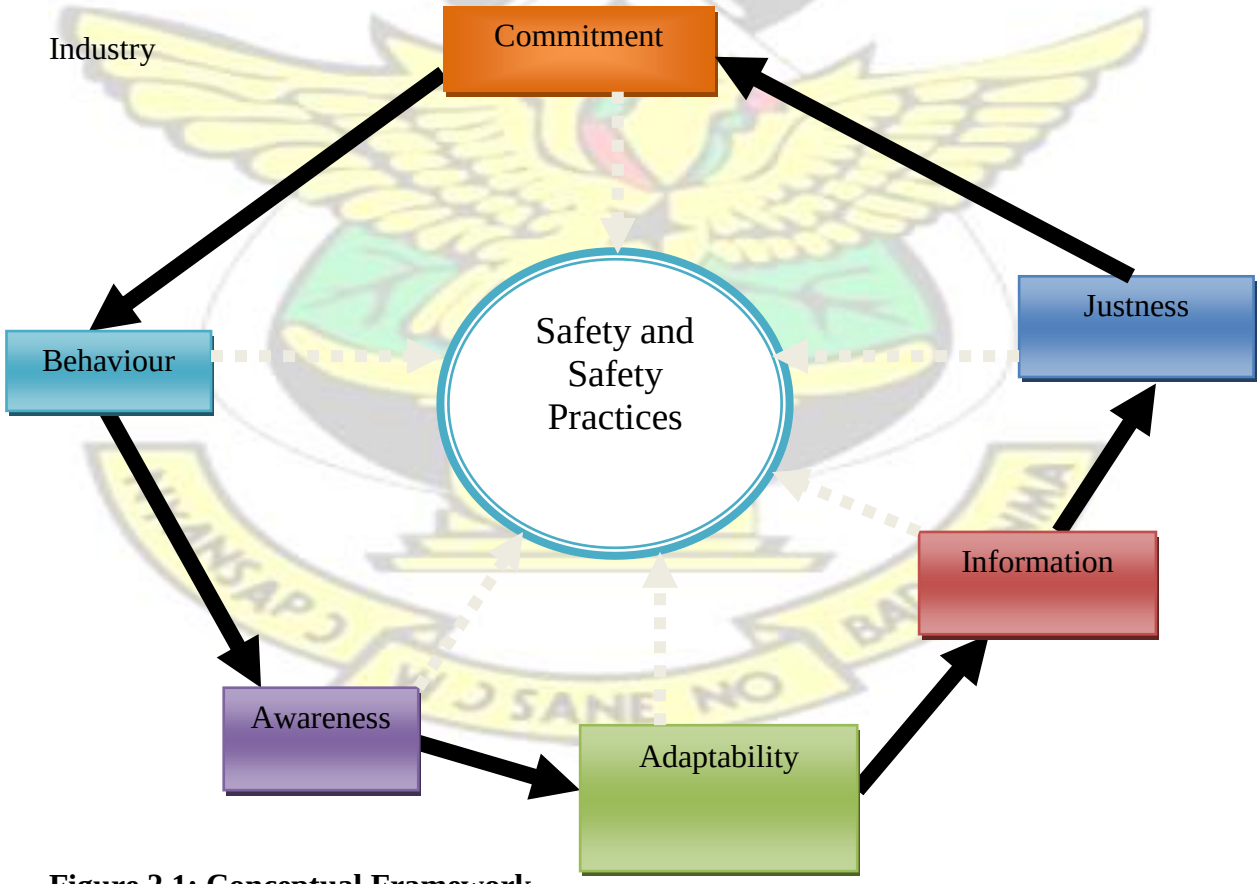


Figure 2.1: Conceptual Framework

Adopted from Kilaparthi, 2014

Commitment is explained as the extent to which management and personnel of oil and gas industry constitute positive attitude towards ensuring safety practices and providing safety to its members. This portion of the framework is of much concern to managerial authority in the oil and gas industry because it is believed commitment is required by the top management of oil and gas industry for implementing and maintaining safety practices. The commitment on the part of top management determines and influence the amount of resources allocated and provided by top management for implementing safety practices. The lack of commitment on the part of top management will prevent the implementation of safety and safety practices. Therefore, gaining genuine commitment of top management for implementing safety practices in order to give high level of safety to employees is considered as essential prerequisite.

Behaviour is the second component of the safety and safety practices framework. This component reflects the attitude of employees and other organisation members towards implementing, maintaining and improving level of safety and safety practices. It is said that it is the behaviour of employees and other organisation members of oil and gas companies that determines successful and effective implementation of safety practices (Burke and Clarks 2012). Besides, positive attitude and behaviour on the part of organisation members towards safety practices also prove beneficial in minimising chances of risks, danger, threats in the concerned business firms (Walker, 2007).

In today's environment of oil and gas industry instances of risks, threats, and dangers invite and increase the chance of legal litigation. In order to avoid the chances of legal litigation and portraying positive image on the world' map, it is necessary for the

companies of oil and gas industry to depict positive behaviour and attitude towards the framework of safety and safety practices (Burke and Clarks 2012).

Furthermore, awareness is the third component of the safety framework. Awareness reflects the level and extent to which personnel of oil and gas companies are aware and appreciate the fact that safety and wellbeing of themselves and others is the implied duty of every business organisations irrespective of the level and scope of operations. This component of safety framework applies equally to both higher and lower authorities of oil and gas companies. This is so because awareness is conceptualized by top managerial authorities of the companies while it is implemented actually by employees and other staff members. Vigilance and surveillance regarding safety issues and concerns should be maintained in high degree and should also be of high priority and concern for employees and managers at oil and gas companies (Walker 2007). Adaptation to safety practices precedes awareness in the safety framework. According to Stranks (2010), it is the willingness and commitment of employees and other organisation members to learn and adapt to new safety coping strategies and actions. The failure to adhere to safety issues and concerns often result in various dangers and risks in the oil and gas environment. The extents to which such dangers and risks are taken seriously by the members of respective industry and level of willingness towards learning from past mistakes determine the successful implementation of safety practices (Stranks 2010).

Information represents the fifth component in the safety framework which bring attention towards right flow and distribution of information to the right people from the right source. Right flow of information is necessary to avoid any kind of miscommunication and taking rights actions at the right time. At many instances,

miscommunication and deteriorated flow of information lead to hazardous situation at oil and gas firms (Wien 2011). Therefore, authorities handling safety concerns and issues should ensure that employees and other staff members should receive information in the right manner for avoiding hazardous situations at the initial possible stage. Safety and safety practices in the oil and gas industry should be focused on the manner and approach in employees and staff members react to the safety related information.

It has been identified that many at times employees assign less importance to circulation and distribution of safety related information which makes functioning process of oil and gas firms more prone to hazardous situations (Kilaparthi, 2014). In this context, it is therefore recommended that employees and staff members should be encouraged to assign high importance to safety related information and react seriously towards such information (Burke and Clarks 2012).

Justness is the last component in the safety framework. This component is of much concern to higher authorities in the oil and gas industry. It is focused on how the extent to which safety behaviour and adherence with safety standards are encouraged, rewarded and motivated in the oil and gas companies. It also measures the extent to which unsafe behaviour and attitude of ignorance is punished and discouraged at the respective environment. Justness determines the future success and influence of safety culture in oil and gas companies (Kilaparthi, 2014). This is evident as rewards and encouragement make employees and staff members more motivated towards implementation and adherence of safety issues and concerns. Similarly, punishment and discouragement for depicting unsafe behavior also develop a kind of fear among employees and can lead them in right direction (Collins 2009).

The availability and distribution of information leads to awareness creation. People need to be informed to become aware of a phenomena or situation before adapting. Information is a powerful tool for creating awareness and enhancing adaptation. Successful adaptation requires recognition of the necessity to adapt through awareness creation, knowledge about available options, the capacity to assess the options, and the ability to choose and implement the most suitable ones (Lee 2007). In terms of safety and safety practices, this can be demonstrated through acquisition and dissemination of information on available safety measures.

CHAPTER THREE

METHODOLOGY

This section of the thesis provides the framework that directs how data was collected, analysed and interpreted to address the research problem. It also contains a description of the research approach; sources of data, study population; methods of data collection; sampling technique, sampling procedure and sample size selection, data analysis and the interpretation.

3.1: Research Design

The case study design was used. According to Bromley (1990), a case study is a systematic inquiry into an event or a set of related events which aims to describe and explain the phenomenon of interest. The design was used to make inquiries into the safety standards and performance in the Bulk Oil and Storage (BOST) industry in Kumasi. According to Baxter and Jack (2008), case study ensures that the issues under investigation are not explored through one lens, but rather a variety of lenses which allow for multiple facets of the phenomenon to be revealed and understood. A systematic approach was used in the data collection and presentation so as to reflect a given situation. The data was obtained basically from documentation, archival records, interviews and direct observations. According to Yin (1994), in a case study data come largely from documentation, archival records, interviews, direct observations, participant observation and physical artifacts. The design also used a survey by administering questionnaires and conducting interviews as its data collection techniques. In order to acquire detailed and factual information for the fulfilment of the study objectives, managers and coordinators at the BOST industry in Kumasi were interviewed.

3.2: Research Variables

The study set out to investigate three main issues. One of these issues was to investigate safety challenges in the BOST industry in Kumasi. Under this variable, the study sought clarification from coordinators, managers and other staff of the BOST industry on the motivations for complying with elements of standards and the benefits for complying with the requirements of the standards.

Another issue the study investigated was regulations put in place to address the safety challenges that the BOST industry is faced with in Kumasi. Under this, the study investigated factors contributing to the success of health and safety system design, implementation and continuous improvement in the organization. Again, challenges encountered by the organization during the implementation and continuous improvement of safety management system. The study also investigated kinds of support drive from sector bodies and associations towards the implementation and continuous improvement of safety system.

An investigation was made on programs put in place to address safety challenges. The mode of communicating safety policy requirements to employees, how employees were motivated to comply with health and safety standards and how the organization monitors compliance were also investigated.

Furthermore, the study also assessed the effectiveness of the programs put in place towards addressing safety challenges in the BOST industry in Kumasi. Under this issue practices related to the organization towards implementing safety standards were investigated. The ways the organization equip personnel with knowledge and skills required to design and implement a safety management system, the mode of

determining the learning needs of employees relevant to health and safety and also planning and realization of safety procedures were investigated.

3.3: Sources and Types of Data

In conducting any research, the sources of data are of utmost importance. Both primary and secondary sources of data were required for the study. The data were both quantitative and qualitative. The secondary data will be obtained from relevant books and journals, and the data base of the BOST industry. The primary data sources which formed the core of this study was obtained through field interviews.

3.4: Study Population and Sample Size Selection

The total number of workers at BOST is 100. The study population includeed managers, coordinators and staff of BOST industryin Kumasi. These people numbering 100 constituted the respondents since they are the stake holders in the BOST industry in Kumasi. Purposive sampling techniques was employed in sampling all the workers at the study area. Questionnaires were administered to all the 100 respondents.

3.5: Data Collection Instrument and Techniques.

3.5.1: Questionnaire

Questionnaires were prepared for the respondents. The questionnaires were designed to contain both closed and open-ended questions. Items in this research instrument include the background information of the respondents, safety challenges confronting them at the industry, the most frequent challenges and why they occur, regulations put in place to address the safety challenges, the effectiveness of the regulations and what they suggest can be done to reduce the occurrence of safety challenges at the industry.

3.6: Data Analysis and Reporting

The quantitative data was analyzed using descriptive and inferential statistics with the help of tools embedded in the SPSS software. Cross tabulations, Chi-square Test for significance, percentage charts and bar graphs were employed with the aid of the Statistical Product for Service Solution (SPSS) and Microsoft Excel software to analyze the quantitative data. Chi-square test is a statistical test which measures the association between two categorical variables. It was used in measuring the association between challenges encountered during the implementation safety management system and number of years working with BOST. The descriptive characteristics were interpreted based on emerging trends. Qualitative data was analyzed based on content analysis and took a narrative form through descriptions. The results were then used to support the quantitative data.

CHAPTER FOUR

DATA PRESENTATION AND ANALYSIS

This chapter presents analysis of data collected through field survey, interviews, and personal observation. The socio-demographic characteristics of respondents are described, followed by a description of the factors affecting the implementation of safety standards in BOST. The chapter further discusses policies put in place to address safety challenges and the effectiveness of the safety policies put in place to address safety challenges.

4.1: Socio-demographic Characteristics

All 100 questionnaires that were distributed were retrieved. Majority of the respondents representing 79% were male and the remaining 21% were female. Also, the majority representing 33% were educated up to Higher National Diploma status followed by 25% and 22% who were educated up to degree and SHS statuses respectively. The least representing 13% were those with basic education (see Table 4.1). Many of the respondents (26%) worked with the industry for the past 1 to 3 years and 4 to 6 years (47%) respectively. The least representing 7% had the longest working years (11 years and above) with the industry. Departments within the industry include administration, Maintenance, Occupational Health Safety Security and Environment (OHSSE) and operations. The majority of the respondents representing 61% were from the operations department while the least were from the maintenance department. The data also showed that the majority of the respondents (46%) were technicians while the least were safety officers (6%) and other officers (6%).

Table 4.1: Socio-demographic Characteristics

Variable	Frequency (N= 97)	Percentage (%)
Sex		
Male	77	79
Female	20	21
Educational Status		
Basic	13	13
SHS	21	22
HND	32	33
Degree	24	25
Others	7	7
Number of Years at Work		
1-3	25	26
4-6	46	47
7-10	19	20
11+	7	7
Department of Respondent		
Administration	20	21
Maintenance	6	6
OHSSE	12	12
Operations	59	61
Position of Respondent		
Dispatch Officer	13	13
Driver	21	22
HR	7	7
Officer	6	6
Safety officer	6	6
Technician	44	46

Source; Field Survey, 2017

4.2.1: Motivation for Complying with the Elements of Standards

The study investigated the organization's motivation for complying with the elements of safety standard (see Figure 4.1). According to the management, health and safety standards are in place. These standards include wearing of PPE at work and following standard procedures for operating machines. In trying to operationalize these standards, PPE for workers which included safety boots, safety overalls, nose masks, hand gloves, among others are provided. Proper induction is also done for new recruits and shift workers. The organization also subscribes to ISO 18001. Reminder notices are also published regularly.

All the respondents indicated they were motivated by regulatory requirements and enhance hazard management. Also, 93% were motivated by product quality improvement while 66% and 65% were respectively motivated by insurance requirements and prospects of operational cost reduction. Again, 55% indicated they were motivated by administrative policy which involves punishment and rewards. However, only 28% were motivated by preventing liability claims.

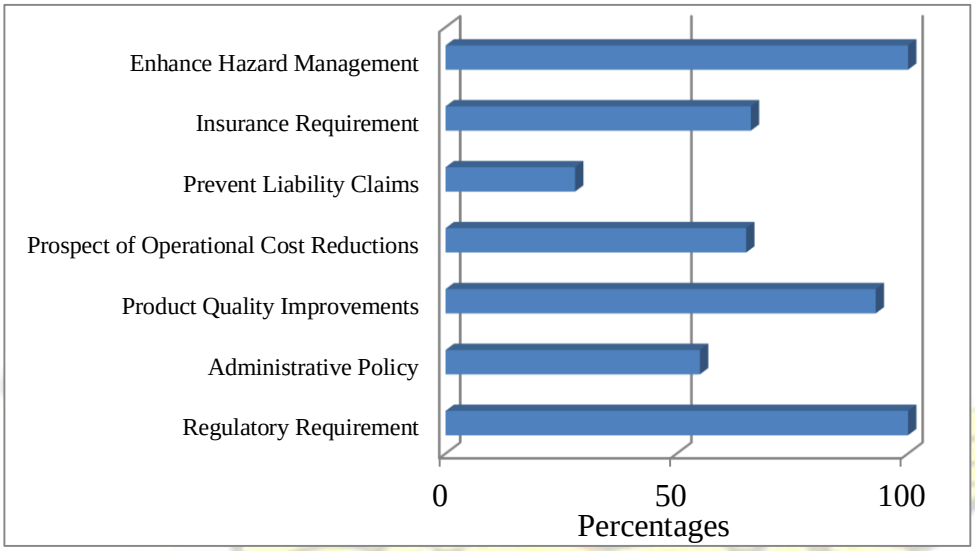


Figure 4.1: Organization's Motivation for Complying with the Elements of Standards

Source; Field Survey, 2017

4.2.2: Benefits for Complying with the Elements of Standards

The study also investigated the benefits that BOST derive for complying with the elements of standards. The findings are presented in Figure 4.2. From Figure 4.2, 86% of the respondents benefits through the reduction in Hazards. Also, 79% benefits through compliance with regulatory requirements while 73% also derive the benefit of improved internal procedures. Again, 72% benefit from lower insurance charges and

reduced operating cost respectively. only 48% indicated they benefit through improved product quality.

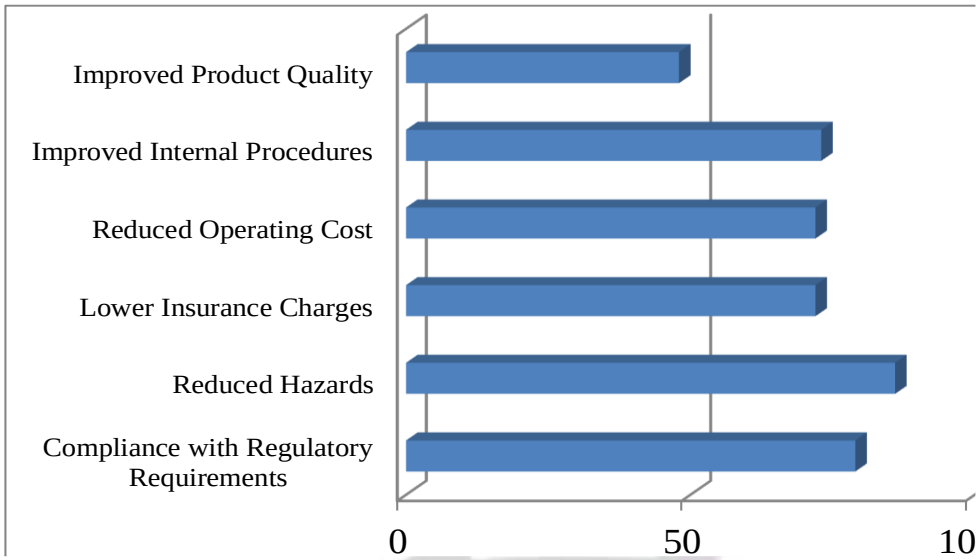


Figure 4.2: Organization's Benefits for Complying with the elements of Standards

Source; Field Survey, 2017

4.2.3: The Rate at which Factors Contribute to the Success of Health and Safety System Design, Implementation and Continuuous Improvement in BOST

The rate at which factors contribute to the success of health and safety system design, implementation and continues improvement in BOST was investigated. The results are presented in Table 4.2. The highest contributing factor was education and training (X=3.79; SD= ±0.409). This followed by use of standard operating procedures (X=3.58; SD=± 0.622) and also employee involvement (X= 3.37; SD= ±0.720). The next contributing factors were top management (X= 3.31; SD= ±1.098) and also all employees awareness of the importance of quality to the organization (X= 3.24; SD=± 1.084). The least contributing factors included employee satisfaction measurement (X= 2.89; SD=±1.197), culture within the organization X= 2.34; SD=± 1.409),

continual improvement (X= 2.20; SD=± 1.073), external linkages with learning centers (X= 2.15; SD=±1.290) and finally government intervention as the lowest contributing factor (X= 1.19; SD=±0.982).

Table 4.2: The Rate at which Factors Contribute to the Success of Health and Safety System Design, Implementation and Continues Improvement in BOST

Descriptive Statistics					
	N	Minimum	Maximum	Mean(X)	Std. Deviation
Education and Training	100	1	5	3.79	.409
Use of Standard Operating Procedures	100	1	5	3.58	.622
Employee Involvement	100	1	5	3.37	.720
Top Management	100	1	5	3.31	1.098
All Employees Awareness of the Importance of Quality to the Organization	100	1	5	3.24	1.084
Employee Reward and Recognition System	100	1	5	3.17	1.129
Employee Satisfaction Measurement	100	1	5	2.89	1.197
Culture within the Organization	100	1	5	2.34	1.409
Continual Improvement	100	1	5	2.20	1.073
External Linkages with Learning Centers	100	1	5	2.15	1.290
Government Intervention	100	1	5	1.19	.982

Source; Field Survey, 2017

4.2.4: Challenges Encountered during the Implementation and Continuous Improvement of Safety Management System

The respondents were asked to indicate challenges encountered in the course of implementing a safety management system. Components of safety management systems according to Gallagher include (2000) safety policy (policy statement, organizational structure, procedures), safety risk management (hazard identification, risk assessment, risk mitigation and tracking), safety assurance (internal audits, external audits, corrective action), and safety promotion (culture, training,

communication). The results are illustrated on Figure 4.3. According to the data, 86% of the respondents indicated they encountered lack of access to adequate information as a challenge during the implementation of the safety management system. Next to this was lack of technical knowledge and skills of employees with 72% of the respondents indicating this as a challenge encountered during the implementation of a safety management system. Also, 65% claimed blame culture of the organization was the challenged they encountered during the implementation of a safety management system while 59% indicated employees resistance to change as the challenge they encountered. 41% claimed they encountered lack of government support and high cost of education and training respectively as challenges they encountered during the implementation. For 35%, their challenge encountered was lack of awareness of requirements. 14% also indicated their challenges as inappropriate infrastructural capabilities for validating and verifying the safety system and also high cost of development and implementation of the safety system respectively.

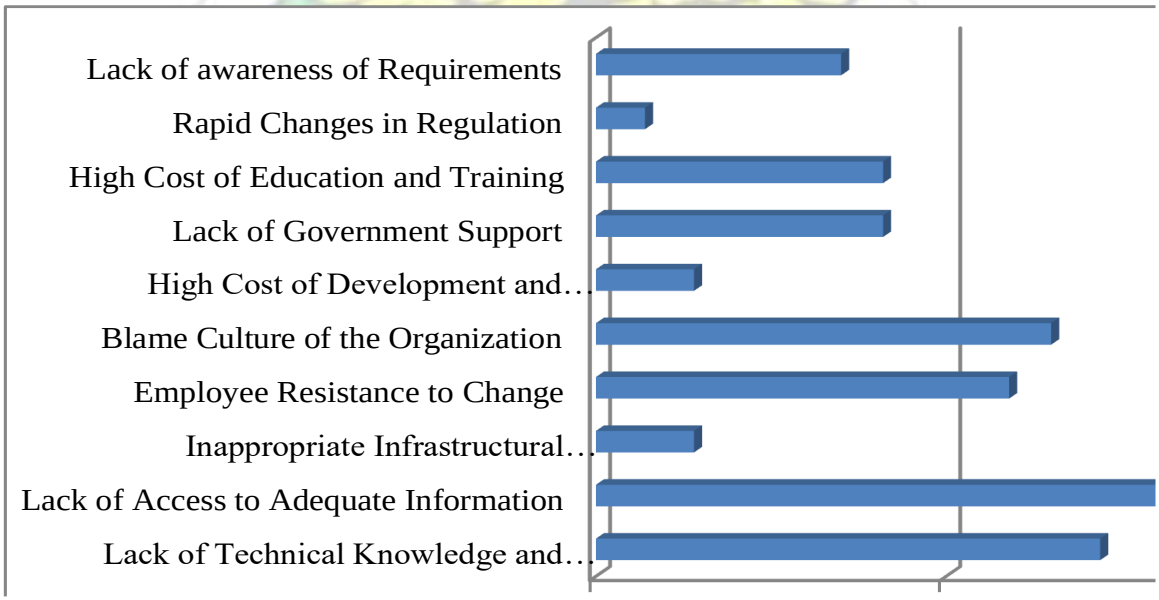


Figure 4.3: Challenges Encountered during the Implementation and Continuous Improvement of Safety Management System

Source; Field Survey, 2017

The study of the view that the number of years one worked with the company can influence the type of challenges the person will encounter during the implementation and continuous improvement of safety management system. Therefore the challenges encounter during the implementation and continuous improvement of safety management system was compared with the number of years one worked with the organization and the results are illustrated on Table 4.3. It is observed from Table 4.3 that out of the 93% of the respondents who encountered lack of technical knowledge and skills of employees as a challenge, the majority representing 66% had worked with the organization for the past 4-6 years while 21% worked with the company for the past 7-10 years. Only 13% worked the company between 1-3 years. Also, out of the 83% of the respondents whose challenge was lack of access to adequate information, the majority representing 38% worked for the company for the past 4-6 years. Also, 32% of them worked with the company for the past 7-10 years while 22% also worked the company between 1-3 years. Only 8% worked the company for the past 11 or more years. All the respondents whose challenges were rapid changes in regulation and lack of awareness of requirements have all worked with the company for short period of between 1-3 years. Again, the majority of the respondents whose challenges were lack of government support (79%), high cost of training (83%) and employees resistance to change (34%) also worked with the company for a short period of between 1-3 years.

A chi-square test for significance between challenges encountered during the implementation and continuous improvement of the safety system and the number years worked with the organization was conducted and the results as presented in Table 4.4 was significant at $p < 0.000$.

Table 4.3: Cross Tabulation of Challenges Encountered during the Implementation of Safety Management System and Number of Years Working BOST

Challenges Encountered during the Implementation and Continuous Improvement of the Safety Management System		Number of Years Working the Company				Total
		1-3	4-6	7-10	11+	
Lack of Technical Knowledge and Skills of Employees	Count	12	61	20		**93**
	%	13	66	21		**100**
Lack of Access to Adequate Information	Count	19	33	27	7	**86**
	%	22	38	32	8	**100**
Inappropriate Infrastructural Capabilities for Validating, Verifying the Safety System,	Count	7	7			**14**
	%	50	50			**100**
Employees Resistance to Change	Count	20	19	13	7	**59**
	%	34	32	22	12	**100**
Blame Culture of the Organization	Count	19	33	13		**65**
	%	29	51	20		**100**
High Cost of Development and Implementation	Count		14			**14**
	%		100			**100**
Lack of Government Support	Count	27	7			**34**
	%	79	21			**100**
High Cost of Education and Training	Count	34			7	**41**
	%	83			17	**100**
Rapid Changes in Regulation	Count	7				**7**
	%	100				**100**
Lack Awareness of Requirements	Count	35				**35**
	%	100				**100**

Source; Field Survey, 2017

Table 4.4: Chi-Square Test for Significance between Challenges Encountered during the Implementation Safety Management System and Number of years working with BOST

Test	Value	df	**Asymp. Sig. (2-sided)**
Pearson Chi-Square	273.000[a]	39	.000
Likelihood Ratio	224.747	39	.000
N of Valid Cases	100		

a. 55 cells (98.2%) have expected count less than 5. The minimum expected count is .42.

Source; Field Survey, 2017

4.2.5: Support Derived from Sector Bodies and Associations

The study investsigated the support derived from sector bodies and associations. The results as presented in Figure 4.4 shows that 72% of the respondents indicated they get support in education and training related to safety. Also, 58% obtain support in

technical guidelines on developing, implementing and maintaining safety management systems. Again, 21% and 13% derive support from financial support to implement and maintain safety system and Sector Trends and Other Information Related to Safety respectively. However, 28% derive no support.

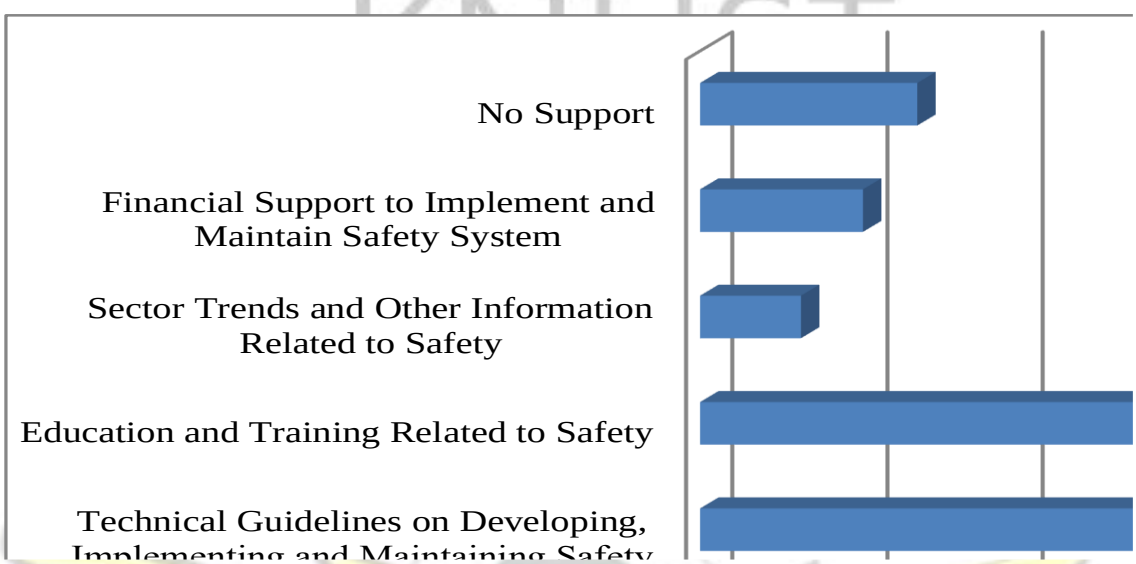


Figure 4.4: Support derived from Sector Bodies and Associations

Source; Field Survey, 2017

4.3: Tackling Challenge

The most important thing being done to tackle the topmost challenge was investigated. The majority of the respondents representing 35% indicated no knowledge of tackling their topmost challenge. However the most important things being done to tackle the topmost challenge included education and training, in-house training for employees and stakeholders, interaction with staff, meetings and facilitating workshops, organizing programs to address challenges, organizing safety meetings and discussions for stakeholders, employee durbars and taking permit before maintaining or repair works.

4.3.1: Management Responsibility

From the data gathered, the majority of the respondents representing 52% indicated that management responsibility is to see to it that safety management system is developed by a consultant. Also, 48% indicated that management responsibility is to see to it that safety system is developed jointly by a consultant and the organization.

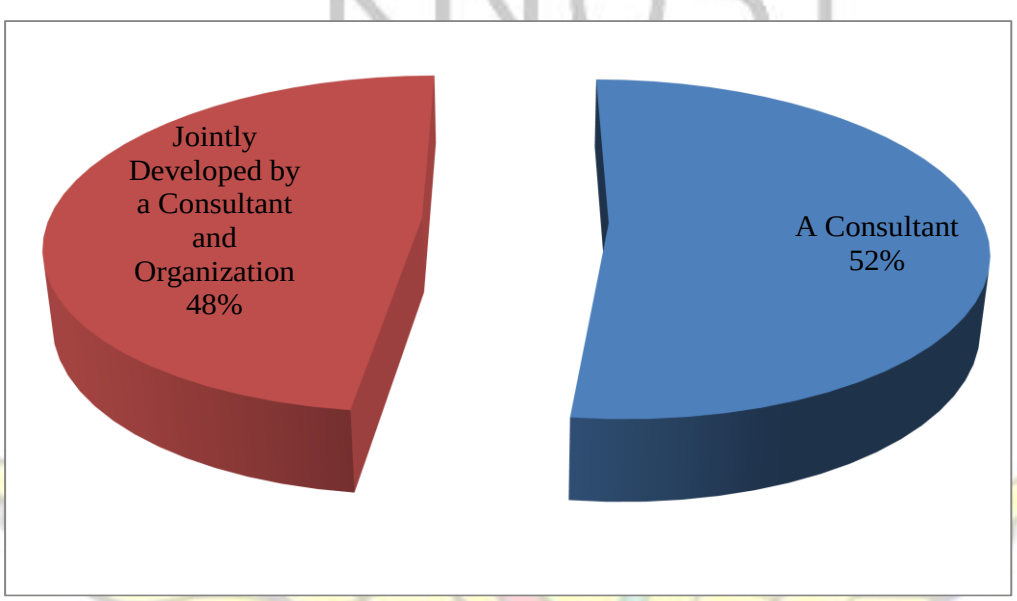


Figure 4.5: Management Responsibility

Source; Field Survey, 2017

4.3.2: Means of Communicating Safety Policy Requirements to Employees

The study investigated the ways the organization communicates safety policy requirements to employees and the results are presented in Figure 4.6. Several means of communicating safety policy requirements are adopted. All the respondents indicated safety policy requirements are communicated to them through the organization of periodic in-house training programs for employees. Again, 93% indicated safety policy requirements are also communicated through the use of visual aids while 72% indicated the communication is done through incorporating policy requirements into standard operating procedures. For 65% and 4% communication is

done through incorporating policy requirements into job description and also sending employees on periodic external training programs respectively. Only 20% claimed they are communicated to through involving employees in the development of the safety management system.

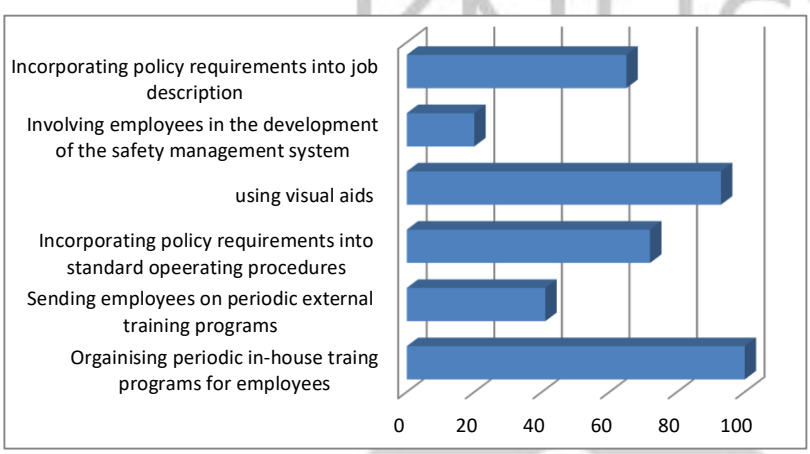


Figure 4.6: Means of Communicating Safety Policy Requirements to Employees

Source; Field Survey, 2017

4.3.3: Mode of Motivating Workers to Comply with Health and Safety Standards

The data revealed that a number of ways are use in motivating workers to comply with health and safety standards (see Figure 4.7). The majority of the respondents representing 32% claimed they are motivated through Human Resource Awards. Also, 21% indicated they are motivated by Human resource reports while for 7% they are motivated through incentives. Again 6% each are motivated through awards for complainers and organizing safety meetings respectively. However, as much as 28% claimed they are not motivated at all.

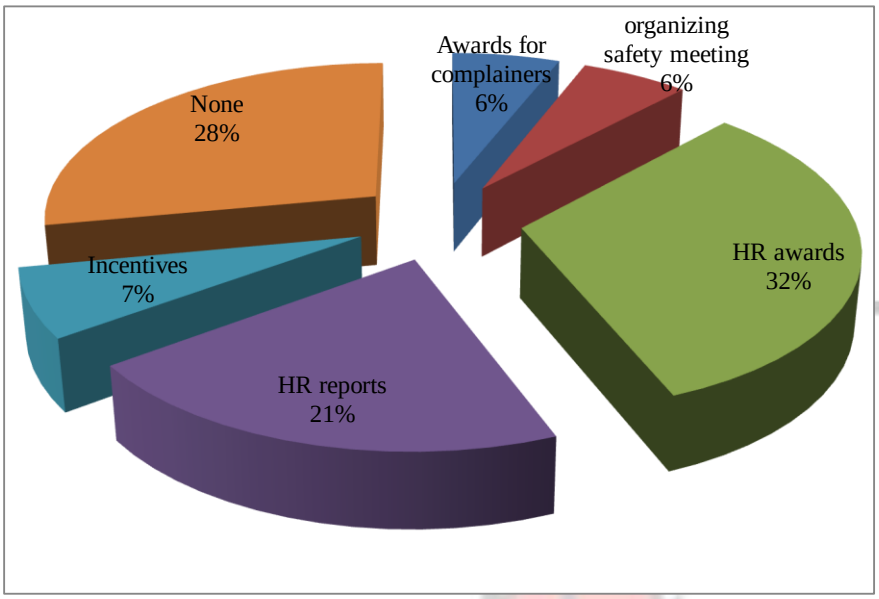


Figure 4.7: Mode of Motivating Workers to Comply with Health and Safety Standards

Source; Field Survey, 2017

4.3.4: Mode of Monitoring Compliance to Health and Safety Standards Implementation

The study also investsigated the mode of monitoring compliance to health and safety standards implementation (see Figure 4.7). The majority representing 35% had no idea as to how compliance to health and safety standards implementation is monitored. However, 26% indicated the monitoring is done through Human Resource Reports. Also, 19% claimed the monitoring is done through the safety attitudes of employees while 14% also indicated the monitoring is done through observation by OHSSE Department. Only, 6% claimed the monitoring is done through organizing fire drill every month.

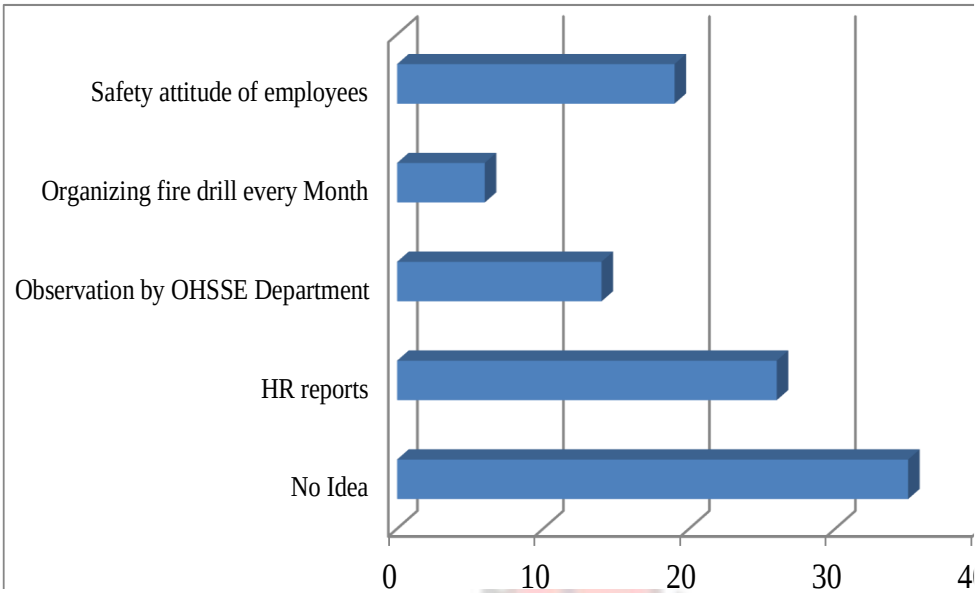


Figure 4.7: Mode of Monitoring Compliance to Health and Safety Standards Implementation

Source; Field Survey, 2017

4.4.1: Review Practices that Relate to the Organization

Majority of the respondents representing 86% (see Table 4.5) indicated review emergency preparedness (X= 3.65; SD= ±1.038) is a practice that is more frequently related to the organization. However, review safety management system (52%) (X= 1.57; SD= ± 1.833), review employees training needs (52%) (X= 1.23; SD= ± 1.483) and review validation and verification procedures (59%) (X= 1.02; SD= ± 1.378) were practices less frequently related to the organization.

Table 4.5: Review Practices that Relate to the Organization

Practice	Less Frequently	Once a Year	Twice a Year	Three Times a Year	More Frequently	Mean (x)	Std. Deviation
Review Emergency Preparedness	7			7	86	3.65	1.038
Review Pre-requisite Programs	34	14	7	38	7	1.70	1.446
Review Safety Management System	52	7	7		34	1.57	1.833
Review Employees Training Needs	52	7	21	6	14	1.23	1.483
Review Validation and Verification Procedures	59	7	14	13	7	1.02	1.378

Source; Field Survey, 2017

4.4.2: Equipping Personnel with Knowledge and Skills Required to Design and Implement Safety Management System

All the respondents indicated that their safety management system is designed and implemented in-house (see Figure 4.8). However, 67% and 46% also indicated the system is designed and implemented through on the job training and mentoring respectively. Only 34% indicated the system is designed and implemented through external training centers.

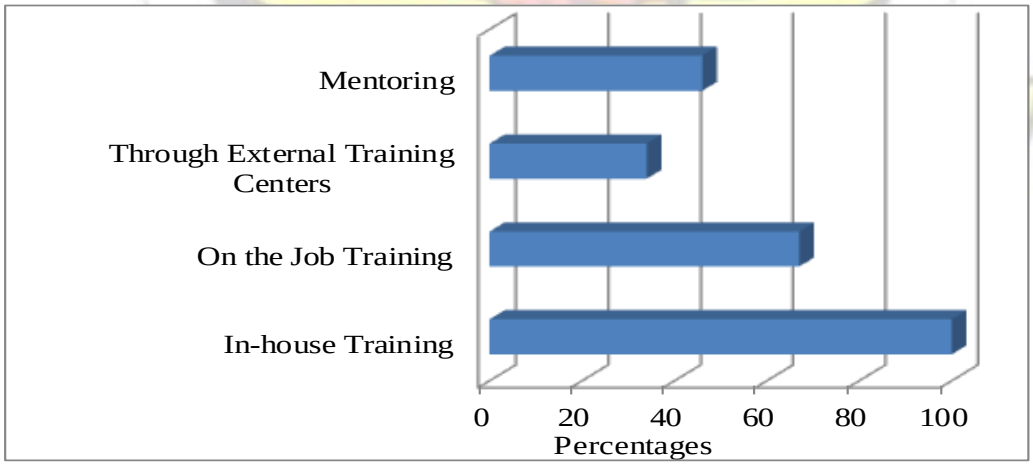


Figure 4.8: Equipping Personnel with Knowledge and Skills Required to Design and Implement Safety Management System

Source; Field Survey, 2017

4.4.3: Practices Employees are Trained in

Majority of the operation staffs representing 82% are trained in good operational practices. Others in addition to the good operational practices are also trained in personal protection (20%) and also basic documentation (41%). The majority of the administrative staff representing 21% are trained in personal protection. In addition, some are trained in good operational practice (6%), spillage management procedure (6%) and industry facility management (12%). Also, the majority of supervisors representing 35% are trained in industry facility management. In addition, others are trained in good operational practice (6%), personal protection (19%), spillage management procedure (33%) and basic documentation (34%). For the maintenance staff, the majority representing 55% are trained in spillage management procedure. In addition, others are trained in good operational practice (6%), personal protection (6%), basic documentation (6%) and industry facility management (13%). Also, the majority of the health and safety staff representing 40% are trained in industry facility management. Others are also trained in personal protection (34%), basic documentation (19%) and spillage management procedure (6%). This is illustrated in Table 4.6.

Table 4.6: Practices Employees are Trained in

Practice	Operations Staff	Administrative Staff	Supervisors/ Team Leaders	Maintenance Staff	Health and Safety Staff
Good Operational Practice	82	6	6	6	
Personal Protection	20	21	19	6	34
Basic Documentation	41		34	6	19
Spillage Management Procedure		6	33	55	6
Industry Facility Management		12	35	13	40

Source; Field Survey, 2017

4.4.4: Mode of Determining the Learning Needs of Employees Relevant to Health and Safety

The determination of the learning needs of the company regarding the implementation of health and safety standards was investigated and the results are presented in Figure 4.9. It is observed from Figure 4.9 that the majority of the respondents representing 86% indicated their learning needs are determined through performance appraisal. However, 72% also indicated their learning needs are determined through job or task analysis while 52% also indicated their learning needs are determined through organizational analysis. Observing individual employees at work (27%) and asking employees to suggest their learning requirements (21%) were other ways employees learning needs were determined (se Figure 4.9).

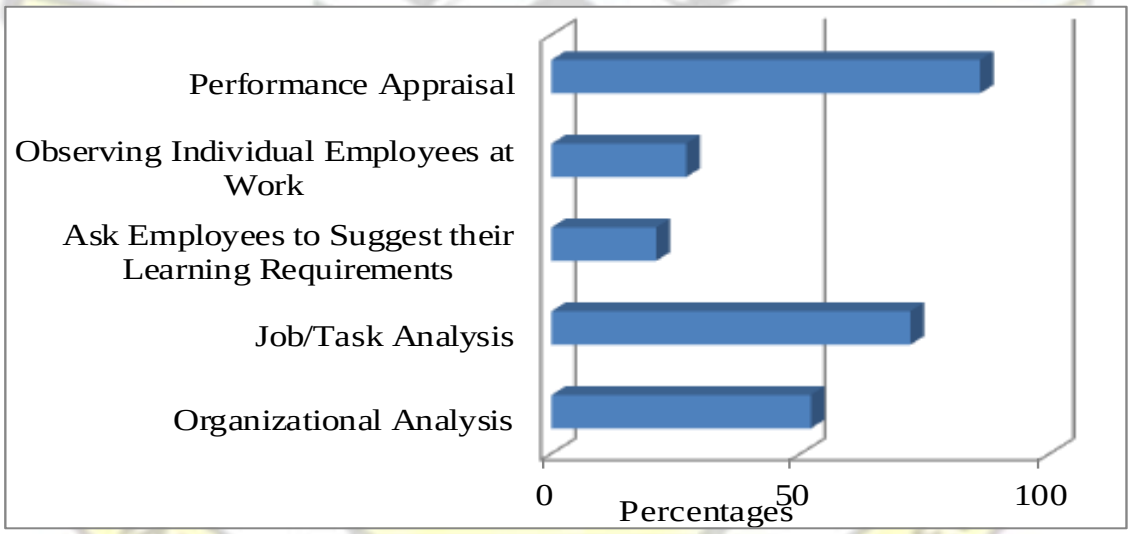


Figure 4.9: Mode of Determining the Learning Needs of Employees Relevant to Health and Safety

Source; Field Survey, 2017

4.4.5: Planning and Realization of Safety Procedures

The study investigated the planning and realization of safety procedures in the company. From Figure 4.10, the majority of the respondents representing 93% indicated the planning and realization of safety procedures is based on incorporating safety requirements into the operational procedures. Also, 73% each claimed this is through incorporating safety requirements into layout and equipment and also measuring key performance indicators regularly. 72% also indicated is by incorporating safety practices into operational and maintenance a procedure, while 59% also claimed is by using self-assessment schemes to verify and validate safety management system. Other respondents representing 38% claimed planning and realization of safety procedures can be achieved through the use of process audit techniques to assess internal processes. 13% indicated this could be achieved through the use of process control techniques to monitor internal processes and also the use of second party auditors to verify and validate safety management systems respectively. Only 7% indicated planning and realization of safety of safety procedures could be achieved through the use of third party auditors to verify and validate safety management systems.

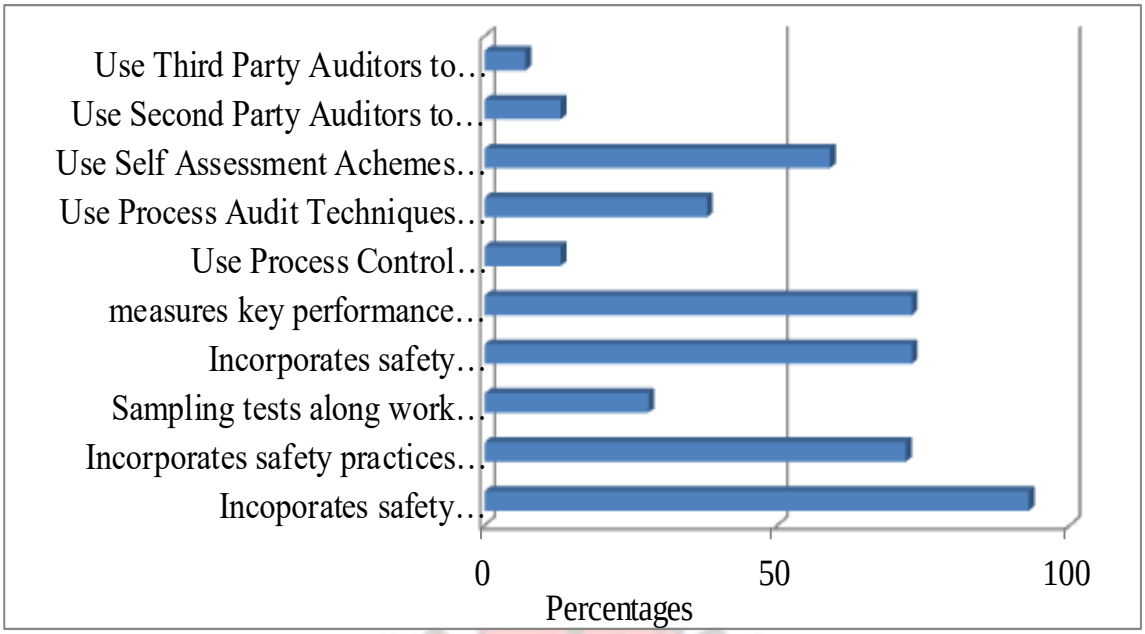


Figure 4.10: Planning and Realization of Safety Procedures

Source; Field Survey, 2017

4.5: Analysis and Discussion

4.5.1: Motivation and benefits of complying with the elements of Safety Standards

It is evident from the study that, several motivational factors facilitated the respondents' compliance with the element of safety standards. However, regulation requirements and enhanced hazard management were particularly more motivating aside product quality improvement, insurance requirements and prospects of operational cost reduction. Regulation requirements enhance safety management and has been considered relevant as a result of the perceived degree of assurance it provides for the protection of the public (Mensah and Julien, 2011). Effective regulations towards effective safety management if adhered to, have the potential of reducing and enhancing hazards management. Other motivational factors that were

not highly motivating but were equally considered important factors included administrative policy involving punishments and rewards as well as avoiding liability. Differently from the way the results considers Punishment and rewards, the literature rather consider these factors as highly motivational. For instance, Evelyn, Florence and Derrick (2005) classified motivation into positive reinforcement and negative reinforcement. Positive reinforcement is where the employees are given monitory rewards, bonuses and job promotions to motivate them to perform their jobs in a safe manner. On the other hand, negative reinforcement is where the employees are criticized, punished and threatened to motivate them to also carry out their jobs in a safe manner. Again, Zin and Ismail (2012) posited that reinforcement on positive motivation is more encouraged by many safety practitioners to maintain and improve employees good safety behavoiur. Also, Vrenderburgh (2002) insist that carrying out incentives schemes is the surest way to achieving employees' safety improvement and also to get them to change their behavoiur towards safety compliance.

The study revealed some benefits that can be derived by complying with safety standards. The highest benefit that can be derived from complying with safety standards is the reduction in hazards followed by compliance with regulatory requirements. That aside, improved internal procedures, lower insurance charges and reduced operating cost are other benefits that can equally be derived from complying with safety standards. The least benefit is improved product quality. These benefits as articulated are consistent with assertions made by researchers. For instance, compliance with safety standards according to USEIA (2014) reduced costs associated with accidents and incidents and also improves regulatory compliance. Wyoming Oil and Gas Industry Safety Alliance (WOGISA) (2014), also assert that

compliance with safety standards facilitate regular risk assessment process which leads to frequent tracking and monitoring of health and safety indicators.

4.5.2: The Rate at which Factors Contribute to the Success of Health and Safety System Design, Implementation and Continuous Improvement in BOST

A number of factors were observed to have contributed to the success of health and safety system design, implementation and its continuous improvement. Of all the factors, education and training were rated higher and were next to standard operating procedures as well as employee involvement. Effective safety education and training is important and can get employees to determine potential accidents, how to prevent accidents and potential hazards that are involved in their jobs (Zin and Ismail, 2012). Hence, training and education programs play a significant role in enhancement of safety compliance and also increase safety awareness (Ghani et al., 2010) and change behaviour of employees (Wong et al., 2000). Insufficient safety training and education of employees are general root cause of accidents in various organizations because they lack the knowledge, education and skills to recognized potential hazards (O'Toole, 2002). Komaki, Heinzmann and Lawson (1980) study between vehicles maintenance employees found that safety training have strong linkage to employees' safety behaviour improvement. According to Hopton (1969), trainings aimed at workers and operator would not only reduce accidents, but may also reduce costs and save lives.

Also top management and employees awareness of the importance of quality to the organization were equally important contributing factors to the success of health safety system design, implementation and its continuous improvement. Management commitment to safety is agreed as the main significant factor that can lead to

significant safety compliance (Zin and Ismail, 2012). According to them, the top management should be seen to be actively leading the organization and the rest of the employees towards the achievement of the organization's safety goals. This way, the organization and any other person that matters would have realized how serious safety issues are considered within the organization. In support of this Jaselski et al., (1996) indicates that commitment and support by top management would significantly drive up the performance of safety. Therefore the contributions of the management to the realization of safety cannot be under estimated.

Other contributing factors that were least considered in their order of significance included, employee satisfaction measurement, culture within the organization, continual improvement, external linkages with learning centers and government intervention which was particularly the lowest contributing factor.

4.5.3: Challenges Encountered during the Implementation and Continuous Improvement of Safety Management System

Most of the respondents indicated poor communication as their serious challenge stifling the implementation and continuous implementation of safety management system. However, Zin and Ismail (2012) postulated that poor communication is the reason for many accidents in various industries. It is therefore very dangerous for the workers of BOST to have poor communication as one of the challenges hindering the implementation and continuous implementation of safety management systems. Effective communications is an essential consideration to safe and efficient workplace. Visions about work safety as well as values are mostly conveyed by leaders to employees through interaction and communication (Ismail, 2007). Also,

effective communication can help in the understanding of common organizational goals and a means to achieving such goals including goals on safety issues.

Another serious challenge highlighted includes lack of technical knowledge and skills of employees to be able to implement safety management systems. Technical knowledge and skills can be attained through effective training and retraining and it is very significant for the implementation of safety management systems. Training has been proven to have the ability to positively influence employee performance through the development of employee knowledge, skills, ability, competencies and behaviour towards the implementation of safety management systems (Appiah 2010). Employers in oil and gas industry must ensure that the suitable environments are provided for utmost skill acquisition to enable the smooth implementation of safety management systems.

Other considerable barriers hindering the implementation of safety management systems in BOST Kumasi were the blame culture and also employees' resistance to change. It is often said that change is resisted when it is not familiar to an existing culture or the when the change is hastened. However, change on safety management is expected to normally yield immediate results and as result sometimes hastened in its implementation. The resistance of change by the employees of BOST could be based on these assertions. Fine et al (2004) however have a different view about employees resisting change on safety compliance. The findings indicates that many employees resist change on safety compliance based on the perception that the change will have no benefit to the organization, and that the implementation of the change might be time consuming and also the feeling that it is the not the employee's responsibility to implement the change. It is possible that the employees of BOST

share in the views of Fine et al (2004) and hence their resistance to change on the implementation of safety management systems.

A test for significance between the number of years one work with the organization and the challenges likely to be encountered during the implementation and continues implementation of safety standards was observed to be significant. The number of years the respondents worked with the company ranged between 1 to 11 or more years. The majority of the respondents who encountered challenges during the implementation and continuous implementation of safety standards were found to be within the range of 1 to 6 years of working experience. Only few were found to be within the age range of 7 to more than 11 years. This means years of experience at work has a greater influence on the implementation and continuous implementation of safety standards.

4.5.4: Support Derive from Sector Bodies and Associations

Support in any form from sector bodies towards the implementation of safety standards is considered very relevant in safety studies. For instance, they play in significant role in ensuring the achievement of successful implementation of safety standards through innovative strategies (Salem et al., 2005; Hudson 2007). In this study, support was provided in the form education and training related to safety, technical guidelines on developing, implementing and maintaining safety management systems in addition to financial support to implement and maintain safety systems.

4.5.5: Tackling Challenge

The company relied on the education and training provided for by sector bodies to tackle most of the safety implementation challenges. Based on this same education,

in-house education and training in addition to workshops are also organized for employees and stakeholders to upgrade their knowledge in safety implementation. These were all part of the ways the company tackled challenges encountered during the implementation and continuous implementation of safety standards within the company. Alinaitwe (2009) and Abdullah *et al.*, (2009) highlighted the significance of education and training towards the implementation of safety standards and concluded that high level of illiteracy and lack of training can stale good policies put forwards towards enhancing the implementation of safety standards.

4.5.6: Management Responsibility

According to Hudson (2007), in every organization, the management is responsible for the achievement and successful implementation of innovative strategies including strategies on the implementation of safety standards. In this study, management is directly responsible for the development of safety management systems. They do this either through solely a consultant or jointly with the organization.

4.5.7: Means of Communicating Safety Policy Requirements to Employees

According Weick and Sutcliffe (2001) communication failure is one of the major causes of accidents in various organizations. Communicating safety policy requirements is very relevant in any organization. In the findings of Walters (2004), they concluded that the quality of communication especially between supervisors and team members is significantly related to employees' safety commitment which lowers accidents rates. In this study, communication is mostly done in various forms; by organizing periodic in-house training programs for the employees, the use of visual aids, incorporating policy requirements into standards operations procedures and job description. The use of all these mode of communication shows how communication

is relevant in the implementation of safety standards in BOST-Kumasi. According to Vinodkumara and Bhasib (2010) regular communication about safety issues between managements, supervisors and workforce is an effective management practice to improve safety in workplace.

4.5.8: Mode of Motivating Workers to Comply with Health and Safety Standards

Motivation is a safety management tool. It is used by most employers to increases the awareness, interest and willingness of the employees for better safety performance (Vinodkumara and Bhasib, 2010). The findings of the study are consistent with the conclusions of Vinodkumara and Bhasib, (2010). Various forms of motivation are carried out in BOST-Kumasi to whip up their commitment to safety. Employees are normally motivated through the Human Resource Awards, Reports and also through the use of incentives.

Compliance to health and safety standards implementations is often monitored. This is done by using the human resource reports alongside carrying observations of the attitude of the employees towards safety implementation. It is usually based on these reports and the attitudes that rewards are given to deserving employees.

4.5.9: Review Practices and Equipping Personnel with Knowledge and Skills Required to Design and Implement Safety Management System that Relate to the Organization

The company has many practices that are often reviewed to support the implementation of safety standards. Emergency preparedness is particularly more frequently reviewed. However, safety management system, employees training needs and validation and verification procedures are less frequently reviewed.

Through the review process, the employees are often equipped with knowledge and skills required to design and implement safety management system. This is done through the designing and implementation of safety management systems in-house. On the job training and mentoring are the means used in equipping employees on the designing and implementation of safety management systems. The training is offered based on the sector an employee is engaged in. For instance, operation staffs are mostly trained in good operation practices in addition to personal protection. The training for administrative, supervisory and the health and safety staffs are focused on personal protection, industry facility management, operational practices and spillage management procedures. The supervisory and health and safety staffs are also trained in basic documentation. All these training are offered in-house and through mentoring. However, Mensah and Julien (2011) posit that in-house training of personnel poses a serious challenge to safety standards since in-house trainers are employees within the organization and may not have diverse knowledge on safety standards to share with the rest of the employees.

4.5.10: Mode of Determining the Learning Needs of Employees Relevant to Health and Safety

Training workers to maintain a healthy working environment is an investment that can pay back in million folds. However, before offering the training, it is significant to first determine the needed training that is required for the workers to be able to maintain that healthy working environment (Chang and Yeh, 2005). One of the surest ways of determining the training needs of employees can be done through performance appraisal. This was certainly the major way BOST in Kumasi determines the training needs of its employees. In addition, task analysis, observing individual

employees at work and asking employees to suggest their training needs were auxiliary to performance appraisal.

4.5.11: Planning and Realization of Safety Procedures

Planning is one of the best ways to achieving results including results on safety related issues. It is based on this that this study investigated the planning towards the realization of safety procedures at BOST. The planning and realization of safety procedures at BOST is based on several factors, however, the findings indicate that incorporating safety requirements into operational procedures is a major way of planning towards the realization of safety procedures. Other planning activities that were also considered significant included; incorporating safety requirements into layout and equipment, measuring key performance indicators regularly, by incorporating safety practices into operational and maintenance procedures and using self-assessment schemes to verify and validate safety management system. Other minor ways of planning to realizing safety procedures include through the use of process audit techniques to assess internal processes, the use of process control techniques to monitor internal processes and also the use of second party auditors to verify and validate safety management systems.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.0: Introduction

Oil and gas industry is a major contributor economic growth in most oil and gas producing countries. However, the industry is bedeviled with safety issues as more occupational accidents and injuries dominate the news headlines globally. Interruption in oil production caused by fires and accidents easily lead to huge economic losses and potential hazards to humans and the environment. The increase in occupational accidents is possibly due to lack of attention given to safety performance, safety procedures and improvement of methods to prevent accidents and injuries. It could also be due to lack of knowledge, training, lack of supervision, and lack of rules implementation. This study is focused on an assessment of occupational health and safety standards at bulk oil storage and transport company ltd (BOST) Kumasi Terminal. Based on the findings of the study, this chapter provides a summary of the major research findings on an assessment of occupational health and safety standards at bulk oil storage and transport company limited (BOST) Kumasi Terminal. The chapter also suggested some recommendations to inform policy.

5.1: Summary of Major Findings

The study investigated the organization's motivation for complying with the elements of safety standard. Of all the motivational factors that enabled the company to comply with safety standards, regulatory requirements and enhanced hazard management was the major contributory factor. The company, according to the respondents is equally highly motivated by product quality improvement, insurance requirements and prospects of operational cost reduction. The least motivating factors included

administrative policy involving punishment and rewards and prevention of liability claims.

The study revealed that the company benefited from complying with safety standards. The major benefit derived from complying with safety standards included the reduction in hazards and compliance with regulatory requirements in addition to improved internal procedures. Other benefits included lower insurance charges as well as reduced operation cost and also improved product quality.

The study also investigated the rate at which factors contribute to the success of health and safety system design, implementation and continues improvement in BOST, Kumasi. The highest contributing factor was education and training followed standard operating procedures and employee involvement. Other factors included top management, employee awareness of the importance of quality to the organization. The least contributing factors were employee satisfaction measurement, culture within the organization, continual improvement, external linkages with learning centers and finally government intervention as the least contributing factor.

The findings of the study revealed some challenges encountered during the implementation and continuous improvement of safety management system. The most encountered challenges were lack of access to adequate information, insufficient technical knowledge and skills of the employees, blame culture of the organization, employees' resistance to change and also lack of government support. The least encountered challenges included lack of awareness of safety requirements and inappropriate infrastructural capabilities for validating and verifying the safety system and also high cost of development and implementation of the safety system. The findings also revealed significant relationship between years of work experience and

the challenges encountered during the implementation and continuous improvement of the safety management system. Study further revealed that employees who have worked with the company for the past 4-6 years were mostly the ones highly challenged by all the challenges encountered during the implementation and continuous improvement of the safety management system. Only few of the employees who worked the company for the past 1-3 years, 7-10 years and 11 years and above also encountered challenges during the implementation and continuous improvement of the safety management system.

The study shows that a number of benefits including education and training related to safety, technical guidelines on developing, implementing and maintaining safety management systems, were derived from various sector bodies. Other benefits also included financial support to implement and maintain safety system and sector trends and other information related to safety.

The findings revealed that the company had ways of tackling challenges encountered. The topmost challenge was tackled through education and training, in-house training for employees and stakeholders, interaction with staff, meetings and facilitating workshops, organizing programs to address challenges, organizing safety meetings and discussions for stakeholders, employee durbars and taking permit before maintaining or repair works.

The findings suggested that Management performs two major responsibilities; seeing to the development of safety management system and also seeing to it that the system is jointly developed by a consultant and the company. The company is able to communicate safety policy requirements to employees in various forms. The major way of communicating safety policy requirements is through the organization of

periodic in-house training programs for the employees. The use of visual aids and incorporating policy requirements into standard operating procedures as well as job description are also significant ways of communicating safety policy requirements. Sending employees on periodic external training programs and involving employees in the development of the safety management system were less considered as a means of communicating safety policy requirements.

The study investigated mode of motivating workers to comply with health and safety standards. The findings suggest that the major mode of motivating workers to comply with health and safety standards is through the human resource awards. The human resources reports in addition to incentives and giving awards to complainers as well as organizing safety meetings were equally highly motivating for workers to comply with health and safety standards.

The company has ways of monitoring compliance to health and safety standards implementation. However, the majority of the respondents were not in the known as to how compliance to health and safety standards implementation is monitored. Others however suggested monitoring is usually done through human resource reports, safety attitudes of employees, observation by OHSSE department and by organizing fire drill every month. The company usually reviews practices that relate to the company. The major review practice is emergency preparedness. That practices that are often usually reviewed include safety management system, employees training needs, and validation and verification procedures.

An investigation was also carried out to ascertain how personnel are equipped with knowledge and skills required for designing and implementing safety management system. The findings suggested that safety management system is developed in-house.

However, other respondents claimed the system is designed and implemented through on the job training and mentoring while others also suggested that the system is designed and implemented through external training centers.

The majority of the operations staffs were observed to be trained in good operational practices, personal protection basic documentation. The administrative staffs were also trained in personal protection, good operational practice, spillage management procedure and industry facility management. The supervisory staffs were also trained in industry facility management, good operational practice, personal protection, spillage management procedure and basic documentation. For the maintenance staff, the majority were trained in spillage management procedure, good operational practice, personal protection, basic documentation and industry facility management. The majority of the health and safety staffs were trained in industry facility management, personal protection, basic documentation and spillage management procedure. Priority given to the practices employees are trained vary from department to department.

There were several ways employees learning needs relevant to health and safety are determined. The major way is through performance appraisal. Others ways included job or task analysis, organizational analysis, observing individual employees at work and asking employees to suggest their learning needs

The study investigated the planning and realization of safety procedures in the company. The findings suggested the majority of the respondents indicated the planning and realization of safety procedures is based on incorporating safety requirements into the operational procedures. Also, others claimed it is through incorporating safety requirements into layout and equipment and also measuring key

performance indicators regularly. Others further claimed it is by incorporating safety practices into operational and maintenance procedure, and also by using self-assessment schemes to verify and validate safety management system. Again, other respondents claimed planning and realization of safety procedures can be achieved through the use of process audit techniques to assess internal processes, through the use of process control techniques to monitor internal processes and also the use of second party auditors to verify and validate safety management systems.

5.2: Conclusion

The findings of the study revealed that regulatory requirements and enhance hazard management is a major motivating factor for complying with elements of safety standards. There are however other motivating factors which include product quality improvement, insurance requirements, prospects of operational cost reduction, administrative policy involving punishment and rewards and prevention of liability claims. The study also revealed that reduction in hazards and compliance with regulatory requirements are the major benefits derived from complying with safety standards apart from low insurance charges, reduced operational cost and improved product quality.

According to the findings of the study, the highest contributing factor to the success of health and safety system design, implementation and continuous improvement in BOST, Kumasi was education and training followed by standard operating procedures and employee involvement. Other factors included top management, employee awareness of the importance of quality to the organization in addition to employee satisfaction measurement, culture within the organization, continual improvement,

and external linkages with learning centers and finally government intervention as the least contributing factors.

The findings of the study further revealed that lack of access to adequate information, insufficient technical knowledge and skills of the employees, blame culture of the organization, employees' resistance to change and also lack of government support were the major challenges encountered during the implementation and continuous improvement of safety management system. The least challenges however included lack of awareness of safety requirements and inappropriate infrastructural capabilities for validating and verifying the safety system and also high cost of development and implementation of the safety system. Years of work experience was significantly related with the challenges encountered. Respondents who worked with the company for the last 4-6 years were those highly challenged.

The study also gathered that various sector bodies provide some support for the company. These supports were in the form of education and training related to safety, technical guidelines on developing, implementing and maintain safety management system in addition to financial support which help in the implementation and maintenance of the safety management system..

Education and training, in-house training for employees and stake holders, interaction with staffs, meetings and facilitating workshops, organizing programs to address challenges, employee durbars and taking permit before maintaining or repair works were the major ways of address the company's topmost challenges.

It was revealed that management performs two major responsibilities; seeing to the development of safety management system and also seeing to it that the system is jointly developed by a consultant and the company. The major way of communicating

safety policy requirements is through the organization of periodic in-house training programs for the employees, the use of visual aids, incorporating policy requirements into standard operating procedures as well as job description, sending employees on periodic external training programs and involving employees in the development of the safety management system.

The study revealed workers were motivated through human resource awards and reports in addition to incentives, awarding complainers and organizing safety meetings. Compliance to health and safety standard implantation is monitored through human resource reports, safety attitudes of employees, observation by OHSSE department and by organizing fire drill every month. The major review practice by the company is emergency preparedness in addition to safety management system, employees training needs, and validation and verification procedures.

The study further gathered that employees are usually equipped with knowledge and skills required for designing and implementing safety management system which is developed in-house or designed and implemented through on the job training and mentoring or through external training centers. The various departments are usually given specific training with emphasis on the particular training to be received based on the department one is coming from. These training include; good operational practices, personal protection, basic documentation, spillage management procedure and industry facility management. The major way of determining the training needs of the employees is through performance appraisal. However, job or task analysis, organizational analysis, observing individual employees at work and asking employees to suggest their learning needs were other ways to determine the training needs of the employee.

The findings revealed that the planning and realization of safety procedures is based on several factors; incorporating safety requirements into the operational procedures and also into layout and equipment, measuring key performance indicators regularly, incorporating safety practices into operational and maintenance procedure, and also by using self-assessment schemes to verify and validate safety management system, the use of process audit techniques to assess internal processes, the use of process control techniques to monitor internal processes and also the use of second party auditors to verify and validate safety management systems.

5.3: Recommendations

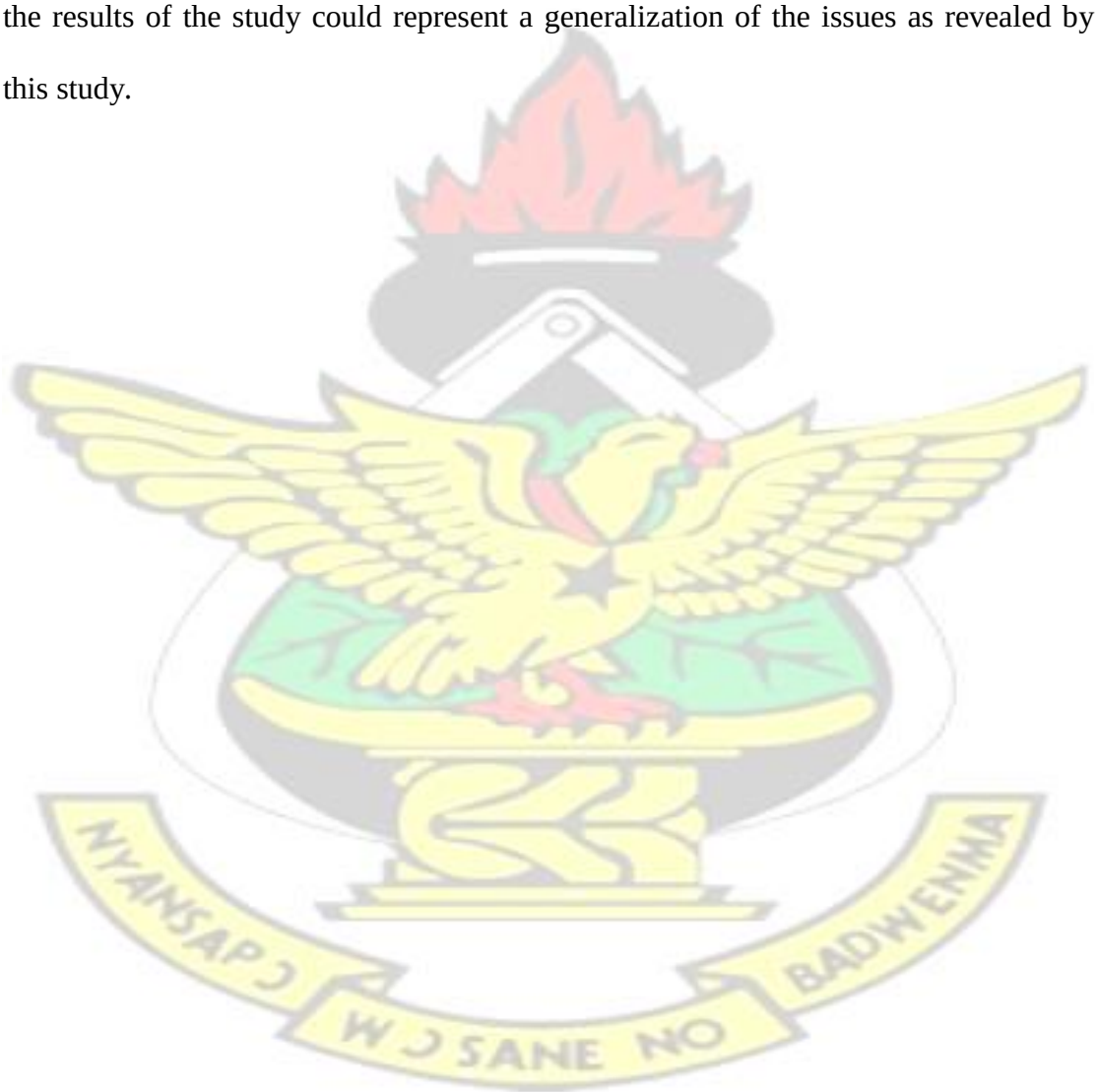
According to the findings regulatory requirement is the major motivating factor for BOST to comply with the implementation of safety standards. Therefore, it is recommended for the various stakeholders to further strengthen the regulatory requirements for the oil and gas industries including BOST as this will further motivate them to comply even more with the implementation of safety standards.

The study also recommend for BOST to consider motivation of employees as a major tool for safety standards implementation. This will increase the awareness, interest and willingness of employees in safety standards implementation. Motivation of employees is an international standard of getting employees to develop interest in the implementation of safety standards.

Based on the findings, the study recommended for BOST to make available adequate information on safety related issues. It is also recommended for BOST to equip their employees with sufficient technical knowledge and skills on safety standards implementation. Inadequate information and insufficient technical knowledge and skills were identified as some of the challenges confronting the smooth

implementation of safety standards in BOST-Kumasi. Therefore, if information and technical knowledge together with skills on safety implementation are made available to BOST employees, they can lead to the smooth implementation of safety standards.

It is also recommended for a further study to be conducted on the implementation of safety standards in the oil and gas industry. This time, the study should consider a wide coverage of various oil and gas industries and not only BOST-Kumasi. This way the results of the study could represent a generalization of the issues as revealed by this study.



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APPENDIX

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI
COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
Questionnaire for BOST Staff

Introduction

This study is intended to investigate…health and safety Standards at BOST to facilitate meeting the requirements for the award of a Master of Engineering Degree in Industrial Operations and Management. The views expressed by respondents or participants will not in anyway be used individually, or to harm their organizations. Additionally, the identity of respondents will not be discussed or disclosed alongside results. Please, answer the following questions to the best of your knowledge.

A. Factors affecting the Implementation of Safety Standards in BOST

1. What is/are your organization's motivation(s) for complying with the elements of standards? (Please tick top five)
   a. Regulatory requirement [ ]
   b. Administrative Policy (Reward and Punishment) [ ]
   c. Product quality improvements [ ]
   d. Prospect of operational cost reductions [ ]
   e. Prevent liability claims [ ]
   f. Insurance requirement [ ]
   g. Enhance hazard management [ ]
2. What is/are your organization's benefit(s) for complying with the requirements of the standards? (Please tick top five)
   a. Compliance with regulatory requirements
   b. Reduced hazards
   c. Lower insurance charges
   d. Reduced operating cost
   e. Improved internal procedures
   f. Improved product quality
   g. No benefit

3. Rate factors in relation to contribution to success of health and safety system design, implementation and continuous improvementin your organization

Factors	Do not Know	Not Important	Moderately Important	Important	Very Important
Education and training					
Top management commitment					
Use of standard operating procedures					
All employees awareness of the importance of quality to the organization					
Employee involvement					
Employee satisfaction measurement					
Employee reward and recognition systems					
Culture within the organization					
Continual improvement					
Government intervention					
Supplier management					
External linkages with learning centers					

4. Which of the following challenges were encountered by your organization during implementation and continuous improvement of the safety management system? (Please tick top five)
   a. Lack of technical knowledge and skill of employees
   b. Lack of access to adequate information
   c. Inappropriate infrastructural capabilities for validating, verifying the safety system
   d. Employee resistance to change
   e. Blame culture of the organization
   f. High cost of development and implementation
   g. Lack of government support
   h. Lack of technical knowledge and skill of employees
   i. High cost of education and training
   j. Rapid changes in regulation
   k. Lack of awareness of requirements

5. What kinds of support does your organization derive from sector bodies and associations?
   a. Technical guidelines on developing, implementing and maintaining safety management systems
   b. Education and Training related to safety
   c. Sector trends and other information related to safety
   d. Financial support to implement and maintain safety system

e. No support

B. Policies put in Place to Address Safety Challenges

6. What is the one most important thing your organization is doing to tackle your topmost challenge?.....
7. Management Responsibility**(**Tick as appropriate)
   a. Our safety management system was developed by a consultant
   b. Our safety management system was developed in house
   c. Our safety management system was jointly developed by a consultant and our organization
8. Which of the following represents how your organization communicates safety policy requirements to employees? (Select all that apply)
   a. Organizing periodic in-house training programs for employees
   b. Sending employees on periodic external training programs
   c. Incorporating policy requirements into standard operating procedures
   d. Using visual aids (e.g. posters, and action plans in employee working areas)
   e. Involving employees in the development of the safety management system
   f. Incorporating policy requirements into job descriptions
   g. Other (please specify).....
9. How does the organization motivate workers to comply with health and safety standards? ……..
10. How does your organization monitor compliance to health and safety standards implementation? .....

C. Effectiveness of the Safety Policy put in Place to Address Safety Challenges

11. Which of these review practices relates to your organization? (Select allthat apply)

Practice	Less Frequently	Once a Year	Twice a Year	Three Times a Year	More Frequently
Review pre-requisite programs					
Review validation and verification procedures					
Review employee training needs					
Review emergency preparedness					
Review safety management system					

12. How does your organization equip personnel with the knowledge and skills required to design and implement a safety management system?(Select all that apply)
    a. In-house training
    b. On the job training
    c. Through external training centers
    d. By hiring
    e. Mentoring
    f. Other (please specify).....

13. Which of the following are employees trained in? (Select all that apply)

	Operations and production managers	Quality managers	Supervisors/team leaders	Other quality staff	Shop floor staff
Good operational practices					
Personal Protection Practices					
Basic documentation procedures					
Scrap management procedures					
Factory facilities management (e.g.layout)					

14. How does your organization determine the learning needs of employees relevant to health and safety? (Select all that apply)
    a. Organizational analysis
    b. Job analysis/task analysis
    c. Ask employees to suggest their learning requirements
    d. Observing individual employees at work
    e. Performance appraisal
    f. Other (please specify).....
15. Planning and realization of safety procedures; Our organization(Select all that apply)
    a. Incorporates safety requirements into the operational procedures
    b. Incorporates safety practices into operational and maintenance procedures
    c. Sample tests along work centres
    d. Incorporates safety requirements into layout and equipment
    e. Measures key performance indicators regularly
    f. Uses process control techniques to monitor internal processes
    g. Uses process audit techniques to assess internal processes
    h. Uses self-assessment schemes to verify and validate safety management system
    i. Uses second party auditors to verify and validate safety management system
    j. Uses third party auditors to verify and validate safety management system
    k. Other (please specify).....