UNIVERSITY OF CAPE COAST

PERCEIVED RISK AND OCCUPATIONAL ACCIDENTS AMONG EMPLOYEES IN THE OIL AND GAS INDUSTRY AT THE JUBILEE FIELD IN TAKORADI

GEORGE AYITEY OTOO

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BY

GEORGE AYITEY OTOO

Dissertation submitted to the Institute of Oil and Gas of the Faculty of Social Sciences, College of Humanities and Legal Studies, University of Cape Coast, in Partial Fulfilment of the Requirements for the Award of Master of Business Administration Degree in Oil and Gas Management

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DECLARATION

Candidate's Declaration

I, the author of this work, do hereby declare that this dissertation is solely my handwork except for references made to another people's work which have been duly acknowledged. I therefore wish to state with all honesty that the work is in its original form and has never been presented for the award of any degree in this university or any other institution.

Candidate's Signature: ……………………… Date……………………………

Candidate's Name: George Ayitey Otoo

Supervisor's Declaration

I hereby declare that the preparation and presentation of the dissertation were supervised in accordance with the guidelines on supervision of dissertation laid down by the University of Cape Coast.

Supervisor's Signature: …………………………… Date……………………

Supervisor's Name: Dr. N. Osei Owusu

ABSTRACT

This study aimed at examining the views of the employees on risks and occupational accidents among employees in the oil and gas industry at the Jubilee Field, Takoradi. There were four specific objectives which include to examine the level of awareness of the employees on risks, to examine the perceived occupational risk factors to which employees are exposed in their work environment, to examine the perceived most frequent types of occupational accidents and finally to examine the strategies employed by the management to address the risks and the occupational accidents in the oil and gas industry. The study was quantitative, and it was based on the views of 200 staff from the study area. A self-administered questionnaire was the main research instrument and the results were analysed using the SPSS (22.0 version) software. The findings have revealed that the employees were aware of the risks they face particularly environmental and protection, but little was known about management, political and operational risks. In terms of risk factors, the study revealed that most of the employees had the perceptions that they were more exposed to chemical and psychosocial hazards whilst their perceptions on physical, ergonomical and biological were modest. In the case of the accidents, almost all the employees (98%) were convinced that accidents often take place with the frequent ones being pipeline & gasoline storage area explosions, gas blow out and fuel inhalation. In the light of these finding, it was recommended that management should focus on placing measures to mitigate these risks and accidents with most among them including training, physical activities, and implementation of the OHS Policies.

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DEDICATION

To my children

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CHAPTER ONE

INTRODUCTION

Introduction

This section presents the overview of the study which includes the background to the study, statement of problem, purpose of the study, objectives of the study, hypotheses of the study, significance of the study, delimitation of the study, and organisation of the study.

Background of Study

In recent times, oil and gas industry operations occur in every corner of the globe, in a diverse range of habitats and ecosystems. These operations often place large pressures on the local environment and inhabitants, and as global population growth continues to rise, so too does the demand for useable energy and resources. Consequently, in 2013, consumption and production increased for all fuel types, surpassing previously recorded levels for all fuels except nuclear (Statistical Review of World Energy, 2014). However, the production technology used in the oil and gas industry is characterized by being inherently risky (Viscusi, 2006).

Its application to extractive activities involves hazardous operations such as drilling, casing, cementing and completion of oil wells, pumping oil and gas through pipelines at high pressures, management of production water, and waste storage. These risky operations, if not managed safely, could generate accidents producing large adverse environmental impacts and health threats to human beings (Cavnar, 2010). Common accidents that may occur due to safety failures are oil spills, gas leakages and explosions of faulty equipment (oil rig and platforms). A recent example of a safety failure in the oil and gas industry that produced massive environmental damages is the blowout of the Deep-water Horizon oil rig in the Gulf of Mexico in 2010 (Cavnar, 2010).

According to investigations made by several authors (Cavnar, 2010; Vásquez, 2012) a small breach of safety standards in the completion of the Macondo well generated the death of thirteen workers and one of the biggest oil spills in human history. Over 4 million barrels of oil were spilled in that event, negatively affecting private property, recreational and fishing activities, wildlife, the ecosystems in the Gulf, the stability of local economies, among other adverse consequences.

This case constitutes an example of a safety infringement with a low probability of generating accidents that can produce a catastrophic event. These risks are often not well measured and can even affect the industry as a whole and its regulatory system (Viscusi, 2006). It also illustrates why oil and gas companies' effort to comply with safety standard (henceforth, we denominate it safety effort) needs to be monitored and regulated. Since safety risks associated to oil and gas production may generate social harm such as negative environmental externalities and negative impacts on people's health (including the death of oil workers or citizens near faulty oil infrastructure), there is the need to ensure safety standards in order to regulate the level of risk.

In economic terms, International Labour Organisation (ILO), (2001) estimates that roughly 4% of the annual global Gross Domestic Product (GDP), or

US$1.25 trillion, is siphoned off by direct and indirect costs associated with occupational accidents and diseases such as lost working time, workers' compensation, the interruption of production and medical expenses. Similarly, Adei & Kunfaa (2007) have reported that the cost of accident as a percentage of the GDP for developing countries like Ghana is estimated to be around 7%. The UK's Health and Safety Executive (1997) also estimates that, on an annual basis, accident costs the oil platform 14.2% of its potential output.

However, despite all these studies little is known regarding chronic exposures and health effects faced by the workforce in the industry. Little attention is paid to occupational hazards of the oil and gas workforce which should be of interest because oil-field occupations present high risks. Public health officials and media alike, centring attention around the general population, have overlooked a population likely to have higher exposure rates over longer durations than the general population. Moreover, dialogue and trust between exploration and production companies, governmental organisation s, and the public is strained (Eyayo, 2014). In part, trust has been undermined by media sensationalism, pushing public health professionals to investigate the effects on the general population, while the health hazards faced by the workforce remains underserved. This is because, the level of occupational safety and health in Africa is low compared with the rest of the world (Eyayo, 2014).

In Sub-Saharan Africa public health problems of child mortality, malaria, water quality and HIV/AIDS have overshadowed occupational health problems. However, in today's world, it can be argued that man lives in a "chemical age" as there is hardly any industry that does not make use of it and/or produce chemicals in the work process. Petroleum products are derived from crude oil that occurs as a complex of chemicals, primarily hydrocarbons. This undergoes fractionalization to yield a variety of products for various uses. The petrochemical industry has been cited as a major pollution source, as the industrial processes involved ranged from prospecting for petroleum to refining of the crude and finally the arrival of the finished products. The petrochemical workers are thus exposed to many and varied health hazards, accidents and or injuries with heavy tools and equipment, pipeline explosions, fire and transportation accidents and adverse ergonomic conditions (Aliyu & Saidu, 2011). Therefore, occupational health practice in the oil and gas industry must take cognizance of the known hazards that exists in the locale of operation in order to prevent and control their occurrence. It is against this background that this study was conducted.

Accordingly, the aim of this study was to identify and assess the occupational health hazards and their management among employees at the Jubilee Oil Field in Takoradi and recommend management protocols that would control and prevent these hazards from impacting on the health and well-being of the workers.

Problem Statement

The human, social and economic costs of occupational accidents, injuries and diseases and major industrial disasters have long been caused for concern at all levels from the individual workplace to the national and international. Measures and strategies designed to prevent, control, reduce or eliminate occupational accidents and risks have been developed and applied continuously over the years to keep pace with technological and economic changes (Bayire, 2016). Despite these efforts, risks and occupational accidents in the oil and gas industry are still too frequent and their cost in terms of human suffering and economic burden continues to be significant (Bayire, 2016).

Ghana’s oil and gas industry are one of these industries recently experiencing work-related fatalities, injuries and asserts loss (Ocloo, 2017; Tetteh, 2017). Studies by Amorin, & Broni-Bediako, 2013; Hystad, Bartone, & Eid, 2014; Sjöberg, 2000) have found that workers in this critical industry operate in highly risky environments, with multiple technological, human and environmental challenges which have potential severe consequences to their lives, asserts loss and environmental pollutions. Thus, occupational accidents are common problems among workers on oil rigs, and while there are both international and national regulations regarding best practices, many of the risks these corporations face are site specific, requiring detailed background research and precautionary measures that cannot be solved using a generalized framework.

However, while risks and occupational accidents of the oil and gas workforce are of interest little is known regarding the perceptions of employees. Indeed, most of the studies that have been conducted on risks and occupational accidents are mostly on the management aspects (Aliyu & Shehu, 2006; Asogwa, 2007; Alli, 2008). In a way, while the study of workers’ perceptions is important, as individuals are responsible for the risks perceived in the work environment, little is known about the perceptions of the employees in the oil and gas industry (Barnett & Breakwell, 2001), It is on this basis that this study is conducted.

Purpose of the Study

The purpose of this study is to assess the perceived risks and occupational accidents among employees in the oil and gas industry at the Jubilee Field, Takoradi. The main objective here is to get a better understanding of the views of the employees on the occupational health hazards confronting them as well as the management strategies used in minimizing the various hazards.

Research Objectives

Specifically, the following were the objectives of the study:

1. Examine the level of awareness of the employees on risks in the oil and gas industry
2. Examine the perceived occupational risk factors to which employees are exposed in their work environment in the oil and gas industry
3. Assess the most frequent types of occupational accidents as perceived by the employees in the oil and gas industry.
4. Examine the strategies employed by the management to address the risks and the occupational accidents in the oil and gas industry at the Jubilee Field, Takoradi.

Research Questions

Based on the objectives, the following were the research questions of the study:

1. What is the level of awareness of the employees on risks in the oil and gas industry?
2. What are the perceived occupational risk factors to which employees are exposed in their work environment in the oil and gas industry?
3. What are the most frequent perceived types of occupational accidents in the oil and gas industry?
4. What are the strategies employed by the management to address the risks and the occupational accidents in the oil and gas industry at the Jubilee Field, Takoradi?

Significance of the Study

The oil and gas industry by the nature of its activities both in the offshore and onshore bases is characterized by risks of varying dimensions. This makes business operations very uncertain in the industry. However, good risk management will provide opportunities to use resources in a way which has the best effect on safety and economics. That calls for a firm understanding of how good risk management can be conducted in practice. Therefore, this research was designed to provide a better understanding of the nature and dynamics of employees' perceptions of the risks associated with major hazard sites in the light of current policy developments and debates on the hazards faced by workers in the oil and gas industry.

In effect, this study will contribute to a better comprehension of risk factors inherent in oil and gas production. It will also help policy makers as well as other stakeholders to be aware of the various techniques of risk management needed to be developed within the industry. Additionally, the presented results could be used to improve or create an effective risk management plan to prevent the frequency of this type of events. Consequently, management would be able to get information for decision-making to improve their risk analysis plan which would focus in prevention and mitigation, through new technologies or procedures that might be applied.

Finally, from theoretical perspectives, the study could potentially be valuable to several academic fields of investigation, including both private and public education and research in business development and management. The research study can also be the basis for understanding conceptual issues on Occupational health hazards and thus become a scholarly document for further studies by students who may have the interest in this arena.

Scope of Study

The research study examined the perceived risks and occupational accidents with the analysis in the study limited to only employees in the Jubilee Field in the Oil and Gas industry at Takoradi. In addition, it includes the risks factors associated with the hazards and the risk management strategies used in mitigating the impact of the hazards on the health and well-being of the workers.

Limitations

Although the study has its strengths, there were several limitations of the study. In the first place, this study researched the health hazards and the analysis contained in this study are limited to only employees in the Jubilee Field in the Oil and Gas industry at Takoradi, which is a small representation of all the employees in the industry in Ghana. This may limit the inferences that can be drawn from this study as their views may not be applied to all the employees in the industry.

The second concerns the single case study that was made. In recent times, where the oil and gas industry are booming, different organisation s are compelled to implement necessary actions to mitigate and manage occupational hazards. With hindsight, it may have been appropriate to compare the data with a comparable size organisation, which would have been easier to know the extent of the hazards in the industry. As it is now, with a single case study, there is no comparable case and, as such it is difficult to know the magnitude of the hazards. Thus, although it would have been difficult to achieve the goal of this study considering the time limitation of only one year, nonetheless, having a comparative study would have been a better way of understanding issues, like risks, the extent of employees' awareness with occupational hazards, including the various strategies adopted to minimize the risks.

Another is about time and resources constraints, which might have affected the quality of the study. For instance, in the course of the study, concerns were raised from the employees about possible introduction of multi-source feedback from the management which they think could be effective in ensuring successful occupational hazards minimization. With this revelation, it could have been better if a follow up was made to understand these lines in significant depth, but time and resources prohibited this.

Finally, with hindsight, a mixed method (that is, both qualitative and quantitative methods) could have been adopted with more interviews conducted, which would have provided an in depth understanding of issues. Although this would have proved extremely time consuming, an interview with the managers in higher positions, like the senior employees, would also have been useful, to more understand the rationale behind the current strategies and how results and strategic goals could be achieved.

Organisation of the Study

The whole work is divided into five chapters, with each of them dealing with an area. Chapter one covers the introduction which looks at the background of the study, statement of the problem, objectives of the study, research questions, significance of the study, scope of the study, and organisation of the study. Chapter two focuses on the literature review with the works of some authors relating to occupational health hazards, bearing in mind the objective of the study. Chapter three provides information on the methodology for the study. It looks at the study design, the study population, and the sampling techniques used. It also provides information on the method of data collection and analysis procedures.

The fourth chapter reports on the findings obtained and discussions on those findings. It describes the background of the respondents, the issues relating level of awareness of the employees on occupational health hazards in the oil and gas industry, the most dominant occupational health hazards perceived by the employees, the occupational health diseases associated with the various occupational hazards and the perceived strategies used for the management of the occupational hazards in the oil and gas industry. The concluding chapter, which is chapter five, summarizes the salient trends and ends with suggestions and recommendations necessary for the attainment of safety in the industry.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter serves as the foundation for the development of this study. The purpose of this chapter is to review the relevant literature on risk and occupational accidents. The first section focuses on the theory underpinning the study. This will be followed by the discussions on the concepts of risk and occupational accidents in the oil and gas industry. The second section focuses on, the various occupational risk factors as well as the various occupational risk management strategies employed by management in the industry to address occupational hazards. Finally, the last section deals with the empirical studies on risk perception and occupational accidents.

Theories Underpinning the Study

In the context of this study the theories that will underpin it will include: Risk Compensation and Risk Homeostasis Theory and Rational Choice Theory. These are discussed in detail below:

Risk Compensation and Risk Homeostasis Theory

Scientific understanding of risk compensation behaviour is based on risk homeostasis theory, first proposed by Wilde in the 1970s, and later refined by Adams and other scholars (Wilde, 1998; Hedlund, 2000). According to Wilde, (1998) activities that affect our health, safety, and security have both potential costs and expected benefits. Risk homeostasis theory posits that for every activity, "people accept a certain level of subjectively estimated risk to their health, safety, and other things they value, in exchange for the benefits they hope to receive from that activity (transportation, work, eating, drinking, drug use, recreation, romance…" p.5). Wilde calls the level of acceptable risk the "target risk level," which differs for each individual and may change, for example, due to time, experience, or social influences. Adams (2006) has added complexity to this model, noting that our propensity to take risks also changes depending on the potential rewards, and that our perceptions of risk are affected by our experience.

According to risk homeostasis theory, we continually modify our risk-taking behaviours (within our ability to do so) so that our perceived risk approaches our individual target risk level. That is, we decide how much danger we find acceptable, and we make behavioural choices that we believe will bring us closer to that level of risk-similar to the way a thermostat activates heat or air conditioning when the temperature deviates from the chosen set-point (Wilde, 1998). When we feel excessively safe and see potential benefits in behaving more riskily, we will increase our risk-taking to capture those benefits. For instance, instead of wearing a seatbelt and driving slowly, we may choose to wear a seatbelt and drive faster to gain the value of arriving quickly.

Similarly, when we perceive unacceptably high levels of risk, we decrease our risk-taking and engage in more risk-avoidant behaviour. For example, to pose a counterpoint to the landmark seatbelt study, drivers who are accustomed to seatbelt use may drive more slowly in a car without seatbelts (Adams, 2006). Over time, we aim for a level of perceived risk that is consistent with our target level. Risk homeostasis theory does not suggest that we succeed in keeping our risk constant, but rather posits that we adjust our behaviour in the direction of the level where we perceive the most desirable balance between risks and benefits. The term "risk compensation" is used to describe a change in risk-taking behaviour as a response to an intervention (usually a new health or safety technology); other names for this dynamic include "risk adaptation" and "offsetting behaviour."

Modem views of risk compensation theory have recognized complexity in these effects; an "extreme view" of risk homeostasis theory, which would predict complete offsetting and dismiss motivations other than the desire to keep risk constant, is now disfavoured Hedlund, (2000). In a review of this literature Hedlund has identified four factors that must be present to provoke a risk compensation response to a health or safety intervention: (1) the intervention must be visible because an unnoticed change will not influence risk perceptions; (2) the intervention must have some effect on the individual; that is, it must give rise to the perception of protection; (3) the individual must have a motivation to increase his risk-taking-he will not take more risks just for the sake of maintaining a constant target risk level; and (4) the individual must have sufficient control and opportunity to adjust his behaviour, which is particularly relevant given the social context of many health and safety behaviours. Each of these four conditions is complex, and there is room for extensive variation across individuals, across different health and safety products, and over time. This framework is also flexible with regard to the target risk level; individual preference for risk may also change for any number of reasons.

Rational Choice Theory

The second theory underpinning this study is the rational choice theory. This theory has for a long time been a dominant paradigm in economics, but this has in the last few decades moved to other disciplines such as Sociology and Political Science (Green, 2002). Traditional economic theory put forward the “rational man” who is perceived to obtain information on the relevant aspects of his environment and if not complete information, at least at an acceptable level of information. The “rational man” is also seen to be well organized and has a solid system of preferences, which makes him able to weigh up the alternatives available to him. Based on this information, he is then able to choose the alternative that best suited his preferences (Green, 2002).

Rational choice theory is therefore used as a tool, making it possible to understand the behaviour of humans. Normally rational choice theory starts with a consideration of the behaviour of a decision-making unit (Green, 2002), in the case of this research this unit consists of international oil and gas companies. In this environment, a major part of the daily work of business managers in both international and national oil and gas companies is to make decisions and find solutions to problems that may arise. These can range from new petroleum laws affecting a company´s interest in a given country, to security questions regarding terrorism. In this case, it is up to the managers to decide on the problems that need attention. They must evaluate and choose the best alternative and decide what actions must be taken to reach the company’s goal. Examples of this can be expanding to new regions, increasing production, making the company more profitable or/and ensuring the safety of the employees. Actions, like agenda setting, determining goals, and coming up with a plan of action, are generally referred to as problem solving, while evaluating and choosing are generally referred to as decision making (Simon, 1983).

Conceptual Review

The Concept of Risk

From the point of view of many experts, the definition of risk compromises multiple facets and strongly depends on the individual perspective. Furthermore, it is widely acknowledged that risk can be conceptualised from many different perspectives, including technical, economic and psychological points of view (Glendon, Clarke, & McKenna, 2006). According to Slovic (2000) the concept of risk is subjective and invented by humans in order to understand and handle the many hazards and uncertainties of life. He furthermore emphasises hazard as real, but claims no such thing about risk, which is established as neither real nor objective as all evaluations of risk are founded upon theoretical models (Renn, 2008).

According to Renn (2008) risk is a complex concept that has instigated many debates in various academic disciplines. Furthermore, he emphasises that perspectives and classifications on how to describe and understand risk in general originate from scientific theories. In addition, he claims it is possible to argue that all risk concepts have one element in common: the distinction between reality and possibility. Lax (1983) argues that risk by itself is often used to refer to a "*change of injury, damage, or loss, compared with some previous standard"* (p.8). Chicken

(1996) supplements this definition and defines risk as "*the manifestation of doubt regarding the frequency and consequences of undesirable events*…" (cited in Brink, 2004:17). In addition, there are a number of very broad definitions of risk: for example, Bremmer & Keat, (2009) see risk to be "*the probability that any event will turn into measurable losses"* (p.4). According to Hough (2008), risk refers to uncertainty concerning a particular event and the consequences of this event.

Aven & Vinnem (2007), on the other hand consider risk to be the combination of the probability and consequence of an uncertain future event.
Thus, risk is equally associated with potential negative and positive outcomes, by including both downside and upside risks, the Aven & Vinnem (2007), adopt a broad risk definition that differs from the prevailing public opinion and contrasts with the exclusive association of risk with negative consequences. According to Martel (2004), the public exclusively associates the term "risk" with loss, while profits are neglected. This broad definition of risk has gained increasing interest in recent years across a broad range of industries and has been employed in several industry documents.

The nature of risk in the oil & gas industry and the fact that upside and downside risks are intrinsically tied to each other means that the concepts 'risk' and 'uncertainty' have at times been used as synonyms or have been seen as closely related concepts where they represent different levels of intensity or impact. From the point of view of Hough, (2008) the difference between risk and uncertainty has normally been based on outcome probability and is in fact seen as indicating two levels of uncertainty: that is, instances where the outcome probabilities are known and instances where these probabilities are unknown. As a result, Hough, (2008) argues that the term 'risk' should be used in situations where the probable outcomes are uncertain and where the outcome is to some extent unknown and will lead to negative outcomes. This implies that if one is able to manage these uncertainties properly the possibility to exploit them becomes a reality (Brink, 2004).

Often the meaning of the word hazard and risk can be confusing as definitions often combine hazard with the term risk. Actually, hazard and risk are quite different. A hazard is any source of potential damage, harm or adverse health effect on something or someone (Glendon, Clarke, & McKenna, 2006). Basically, a hazard is something that can cause harm or adverse effects such as to individuals as health effects, to the environment or to organisation s as property or equipment damage. Some examples are: a lit cigarette, a wet floor, direct exposure to the sun, or exposure to toxic chemicals. On the other hand, risk is the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard. For example: there is a risk of developing lung cancer from smoking cigarettes, of slipping on the wet floor and breaking a bone, of developing skin cancer from long-term exposure to the sun (Glendon et al, 2006). In the context of this study both can be used interchangeably.

In oil and gas industry, serious downside and upside risks must be balanced, and the conflict between safety and production must be resolved (Battmann & Klumb, 1993). This is because, it has been found out that the main constraints for achieving profitable and competitive production are risks to health, safety and the environment (HSE) (Duijm, et al. 2008). Furthermore, these HSE risks do not only need to be managed but to be competitive, sometimes calculated risks have to be taken. This idea is highlighted by the statement, “Risks do not simply exist, and they are taken, run, or imposed ….” (Glendon, Clarke, & McKenna, 2006). According to International Labour Organisation (ILO), (2017), in the oil and gas industry there are many tasks in which the health and capacity of a worker could have an impact on the safety of a task being conducted or could worsen the health conditions of the worker. Workers who are unable to complete a task safely place themselves and others at risk.

Classification of Risks in the Oil and Gas Industry

Risk in the Oil and Gas industry has a lot of classifications. According to Zhang & Xing, (2011) one of the risks in Oil and gas industry is the Natural environmental risk. This comprises climatic risk and geologic risk. In many cases, climatic risks come from conditions that affect the extent of petroleum operations. For example, there is always great insecurity for borehole operation when it rains or snows, and there is great risk of heat stroke for petroleum operations in very hot weather (Zhang & Xing, 2011).

In terms of geological risk, the factors such as structure and complexity of the petroleum pool, reserves and abundance of the petroleum pool, the nature of the petroleum pool, burial depth of the petroleum pool, initial formation pressure, permeability, active porosity, cave, fault conditions and underground rock hardness are those that affect the progress and quality of petroleum operations (Zhang & Xing, 2011). Added to this, Zheng (2010) said that the environmental protection risk involves the environmental pollution caused by the operations. These necessitate oil & gas enterprise to comply with relevant environmental regulations and policies and invest some money to treatment. If the petroleum enterprise creates environmental pollution because of its failure to take treating measures, it will be fined or even be ordered to suspend work, and petroleum operations will face the risk (Zheng, 2010).

Another risk is the engineering risk which embodies exploration, development and construction risks (Zheng, 2010). In respect to exploration risk, certain factors such as improper use of exploration methods, inaccurate interpretation of seismic data and inaccurate positioning of the exploration wells in the exploration process may cause losses to the industry. On the other hand, development risk are those factors such as inappropriate mining method, delay in progress, engineering design changes and technical problems in the development process may cause losses to the petroleum enterprise (Zheng, 2010). For example, there are big security risks for petroleum operations due to incorrect understanding of the stratum, causing damage, formation pressure too high, lack of well control awareness and many other factors. With the construction risk, it involves the loss caused by factors such as technical deficiency, unmatched equipment and extended construction period during the process of constructing surface matching construction.

The third risk is the Management risk which embodies Human resource risk, organisation risk, operating equipment risk and dispute risk (Zhang & Xing, 2011; Zheng, 2010). According to these experts, human resource risk involves factors such as the overall quality, operational level, cultural level, age composition of employees and the overall quality, management ability, leadership and charisma of managers that can affect the operations. The organisation risk are the factors such as unreasonable organisational mechanisms, inappropriate staffing, and irrational allocation of responsibilities that affect the operations.

In addition, organisation risk can occur because of different understanding, attitudes and actions of the sectors of the operations. This kind of risk can also affect the operating period, thereby affecting the economic efficiency of enterprise. The operating equipment risk, however, involves the operating equipment management that affect expected return in the process of petroleum operations. In the process of oil and gas exploration and development, operating equipment is one of the necessary equipment to improve the yield of oil wells, which runs directly affect the progress of the petroleum operations (Zhang & Xing, 2011).

In the case of dispute risk, it comes about since the farmer's fields surround oil wells, so construction operations often subject to farmers. Every oil dispute between staffs and farmers involves many compensation expenses, and every oil dispute seriously affects the progress of the construction of wells. This causes petroleum operations great economic losses (Zhang & Xing, 2011). Besides, experts like Zhang & Xing (2011), Zujian (2007) have noted that there is an economic risk which include financial, market and Economic policy risks. With respect to financial risk, it is said that petroleum operations have a long cycle, wide geographical distribution, a large number of employees and a large amount of funds, so the petroleum enterprise often face uncertainty such as financing, fund turnover, interest and exchange rate in the course of the operations (Zujian, 2007).

Also, in the case of market risk, it is known that changes in the external economic environment and the uncertain market lead to a loss of petroleum operations. For example, factors such as rising work-over material price and fuel prices can lead to higher work-over costs, and that can lead to decreased effectiveness of petroleum operations (Xiaoguang, 2001). The economic policy risk involves the tax imposition which is an important means for state to control oil and gas production and supply and demand, and directly influence the level of profits of petroleum enterprise. At present, oil and gas taxes generally include value added tax, consumption tax, corporate income tax, business tax, urban construction tax, education surtax, resource tax, the mineral exploration right user's fee, mineral exploration right purchase price, mineral resources compensation fee, property tax, land use tax, tariff duties and stamp duty and other taxes (Sunzhu, 2008). In addition, petroleum enterprise also assumes implicit taxes, including the coordination costs of workers and peasants, river maintenance costs, road bridge compensation, comprehensive management costs, security guard costs, build projects and direct losses of stolen oil, gas and water. These costs and changes in national economic policy will bring benefits of oil construction operation to the uncertainty (Yingfen. 2008, Xiaoguang, 2001).

Finally, according to Brink, (2004) another risk faced by oil and gas industry is the Political risk. This is the risk recognised as factors caused by government policy (in) action or reaction, can to some extent be managed, if not avoided‖ (Brink, 2004). Frynas & Mellahi, (2003) also see political risk to imply some ability to form a judgement (if only subjective) about the probability of different types of instability and to take all reasonable precautions against it In fact, Political instability is a political risk factor, and political risk and Political instability are not mutually exclusive. They relate to each other in that instability can be seen as a factor of political risk. The biggest difference, however, is that political instability is a property of the environment, while political risk is a property of a firm (Kobrin, 1979).

For example, within a country, the religious tensions resulting from political instability stem from and belong to the environment, while the level of political risk that is experienced because of these tensions belongs to the firm. Political instability, stemming from changes in government, riots, policy changes or implementation of policy gets a great deal of attention in global affairs and is often the reason for corporations not investing in a country. For example, an accident with significant loss of life or environmental damage may contribute to political instability. Instability in the region would increase on-the-job risks and safety concerns and with such a high sensitivity to, "political instability", it is possible that inexperienced international enterprises have missed business opportunities because they have perceived more political risk than existed. (Robock 1971).

Types of Risk Factors in Oil and Gas Industry

In the Oil & Gas industry, employees, during their workday, are exposed to various occupational risks generated by chemical, physical, biological, Behavioural, Psychosocial, physiological and Mechanical/Ergonomics risk factors (ILO, 2017).

Physical Hazards

These hazards involve agents in the work environment. A physical hazard is a factor within the environment that can harm the body without necessarily touching it. These physical hazards are often said to be less important than chemical hazards, but this is not so as they can and do cause several health problems, injuries or even death. The nature of physical agents is wide and should not be underrated but the main ones capable of causing occupational disorders and injuries are: noise, illumination, vibration, and radiation (ionizing and non-ionizing), microclimatic conditions in the case of extreme heat and cold, (WHO, 2002; ILO, 2017).

According to Moran, Erlich & Epstein, (2007), workers may be at risk of heat stress when exposed to hot environments or extreme heat. This can result in illnesses including heat stroke, heat exhaustion, heat syncope, heat cramps and heat rashes, or death. Heat also increases the risk of workplace injuries such as those caused by sweaty palms, fogged-up safety glasses or dizziness, and may reduce brain function responsible for reasoning ability, creating additional hazards. Heat stress can be reduced by modifying metabolic heat production or heat exchange by convection, radiation or evaporation. Although most healthy workers will be able to acclimatize over a period, some workers may be heat intolerant. Heat intolerance may be related to many factors; however, a heat tolerance test can be used to evaluate an individual's tolerance, especially after an episode of heat exhaustion or exceptional heat stroke (Moran, Erlich & Epstein, 2007).

Against this background, in Ghana the Labour Code requires employers in Oil & Gas industry to take all the necessary measures according to the operating conditions of a workplace to protect the life and health of workers. Employers are required to establish protective measures, provide information and notify authorities regarding ionizing radiation. Similarly, Ghana's law requires that premises in which work is performed should be ventilated. Premises should be supplied with windows or other openings directly to the outside and which ensure a sufficient natural or artificial ventilation. The atmosphere of workplaces should be free from smells obstructing breathing, from condensation and from hazardous unhealthy and inconvenient pollutants such as steams, gases or dust, (Obeng-Odoom, 2014; Anaman & Asamoah, 2007)

Mechanical/Ergonomics Hazards:

These are risks associated with physical factor within the environment that harms the musculoskeletal system. Ergonomic hazards include, among others, repetitive movement, manual handling, inappropriate workplace/job/task design, uncomfortable workstation height and poor body position (ILO, 2017). Musculoskeletal injuries and back pain are serious problems in the oil & gas industry and represent a major cause of absenteeism (ILO, 2017). Although lumbar injuries may occur as a result of a single event, they are usually a cumulative effect of many episodes of improper postures, movements, weights, and forces that cause progressive wear and tear over time

In this regard, in the oil and gas industry, in Ghana, employers must ensure that no worker is exposed to manual handling of loads without being informed about the damage that they can cause to his/her health and the preventative measures to be taken. The employer must ensure the health surveillance of workers exposed to risks, giving attention to those who perform monotonous or cadenced work. The law requires worker to have enough free space where he/she may work without any risk for his/her safety and health. Workplaces and premises for workers shall have, as far as possible, natural lighting and shall be supplied with adequate artificial or electric lighting to ensure good vision to workers. Similarly, the law requires that there shall be provided suitable seats for the use of workers whose work is carried out while sitting continuously or intermittently (ILO, 2017; Anaman & Asamoah, 2007)

Biological Hazards

Biological hazards are organic substances that pose a threat to the health of humans and other living organisms. They include pathogenic micro-organisms, viruses, toxins, spores, fungi and bio-active substances. These hazards may often expose employees to diseases such as hepatitis B, hepatitis C viruses and tuberculosis infections, asthma and chronic parasitic diseases (WHO, 2013). Communicable diseases are infectious diseases transmissible from person to person by direct contact with an affected individual or the individual's discharges or by indirect means. Oil and gas workers often work in confined areas for extended periods of time, which presents the risks of exposure to communicable diseases including Ebola, flu, hantavirus, hepatitis B, HIV and AIDS, measles, Methicillin-resistant Staphylococcus aureus (MRSA), pertussis, rabies, sexually transmitted diseases, shigellosis, and tuberculosis, (ILO, 2017).

In this sense in Ghana, the law obliges the employer to ensure that no worker is exposed to the action of biological agents without being informed about the damage that they can cause to his/her health and the preventative measures to be taken. The employer must ensure health surveillance of workers exposed to risks and appropriate measures shall be taken in all workplaces where hazardous materials are produced, handled, used, stored or transported (ILO, 2017; Anaman & Asamoah, 2007).

Chemical Hazards

Hazardous chemicals in the workplace are substances, mixtures and materials that can be classified according to their health and physio-chemical risks and dangers. Such hazards include skin irritants, carcinogens or respiratory sensitizers that have an adverse effect on a worker's health as a result of direct contact with or exposure to the chemical, usually through inhalation, skin contact or ingestion. Several factors can affect the injuries caused by chemical hazards in the workplace. These factors include the toxicity and physical properties of the substances, work practices, the nature and duration of exposure, the effects of combined exposure, the routes of entry to the body, and the worker's susceptibility (ILO, 2017). The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) brings together effective systems to improve safety of management of chemicals across borders. Chemical hazards particularly relevant to oil and gas workers include:

- Hydrogen sulphide (H2S) which is often found in oil and natural gas deposits, and in some mineral rocks, and can irritate lungs, throat, nose and eyes. With high levels of H2S, poisoning can be quick and fatal with little warning.

- Drilling fluids: During drilling, a high volume of drilling fluids is flown through the well and into systems that are open, partially enclosed or completely enclosed at elevated temperatures. When those fluids are agitated, as they are during part of the recirculation process, workers may suffer significant exposure and subsequent health effects.
- Silica: Silica is a fundamental component of sand and rock. Prolonged breathing of fine crystalline silica dust will cause silicosis disease. The particles are deposited in the lungs, leading to thickening and scarring of lung tissue causing employees to suffer shortness of breath, severe coughing and weakness. These symptoms can become worse over time and induce death (ILO, 2017).

In Ghana, the law requires employers to ensure the health surveillance of workers exposed to risks. The law requires employers to take special precautions for the protection of workers who perform works that have chemical association. Due to the random character of effect, the only effective control strategy is primary prevention that eliminates exposure completely, or that effectively isolates the worker from carcinogenic exposure (WHO, 2013)

Psychosocial Hazards:

Psychosocial hazards comprise of the psychological and social hazards. Psychological hazards are caused when time and a work pressure has become more prevalent during the past decade. Monotonous work, work that requires constant concentration, irregular working hours, shift-work, and work carried out at risk of violence, isolated work or excessive responsibility for human or economic concerns, can also have adverse psychological effects. Psychological stress and overload have been associated with sleep disturbances, burn-out syndromes and depression. Epidemiological evidence exists of an elevated risk of cardiovascular disorders, particularly coronary heart disease and hypertension in association with work stress.

Severe psychological conditions (psychotraumas) have been observed among workers involved in serious catastrophes or major accidents during which human lives have been threatened or lost. Social conditions of work such as gender distribution and segregation of jobs and equality (or lack of) in the workplace, and relationships between managers and employees, raise concerns about stress in the workplace. Many service and public employees experience social pressure from customers, clients or the public, which can increase the psychological workload (WHO, 2013; ILO, 2017). Psychological problems may result from the physical isolation of exploratory sites and their remoteness from base camps, and the extended work periods required on offshore drilling platforms. Some workers cannot handle the stress of working offshore at a demanding pace, for extended periods of time, under relative confinement and subject to ever-changing environmental conditions.

In this sense, risks to psychological health at work may arise from organisational or personal factors, with the major factors being poor design of work and jobs, poor communication and interpersonal relationships, bullying, occupational violence and fatigue. Risks to psychological health due to work should be viewed in the same way as other health and safety risks and a commitment to prevention of work-related stress should be included in an organisation 's health and safety policies. Workers who make use of drugs or alcohol often do so in the misperception that they help to reduce the stress of work, or for mood adjustment, performance enhancement, helping to get over peer pressures, or socializing. However, substance abuse generally leads to increased chances of accident, increased absenteeism, and lower productivity and general performance of the company. Measures for improving the social aspects of work mainly involve promotion of open and positive contacts in the workplace, support of the individual's role and identity at work, and encouragement of teamwork (ILO, 2017).

Risk Management and Mitigation

Risk management is one of the most important objectives of oil and gas companies with investments all over the world (Miller, 1992). In today's global marketplace it is crucial that international companies and investors consider the various risks involved when making investments. Haendel (1979) defines risk management as "*identifying risks, assigning a value to them, anticipating losses, and making objective decisions about what steps to take before losses occur so that they have the least impact on the operations of the enterprise*" (p.135).

According to Breakwell (2007) risk management is concerned with managing circumstances created by the company itself as well as external hazards that might damage the company as a whole. In general, "*the purpose of risk management is to ensure that adequate measures are taken to protect people, the environment and assets from harmful consequences of the activities being undertaken, as well as balancing different concerns, HES (Health, Environment* *and Safety) and costs. Thus, risk management includes measures both to avoid occurrence of hazards and reduce their potential harms*." (Aven & Vinnem, 2007)

Based on this definition, it can be noted that besides its emphasis on risk prevention, this definition also introduces costs and benefits to the risk management equation. However, from the point of view of Kletz (2003), risk management must not be designed to prevent every imaginable risk. Rather, a balanced approach that allows for safe and profitable operations should be taken. Such a risk management approach can best be summarised by the acronym "ALARP", which stands for "As Low as Reasonably Practicable" (Kletz 2003). It implies that the risks should be compared with their corresponding mitigation costs and that, following this analysis, they should be reduced to a reasonably low level. In line with this concept, risk management must be a structured, continuous process of managing risks (Tompa, Dolinschi, & Oliveira, 2006). The suggested core steps of such a structured, continuous risk management process (RMP) must consist of risk identification, risk analysis, risk evaluation, risk treatment and risk monitoring (Andersen, 2008). These steps are essential to every modern RMP and have largely been implemented in the oil and gas industry on an industry-wide basis (Sutton, 2007).

To manage risk, organisations need to develop strategies that can be used to locate the variety of elements that comprise hazards (Reason, 1997). Risk management strategies are usually developed by identifying problem and problem areas that correspond with a company's objectives. Probability assessments of different risk aspects are then carried out, which present a variety of different solutions. The organisation then decides which actions to initiate, implements them and evaluates the results (Breakwell, 2007). Since protection of health, safety and the environment are a collective responsibility risk management strategy should be integrated within all areas of an organisation. Thorough planning, organising, implementation and control of the various hazards are required (Wentz, 1998).

Strategies and Measures

According to Leoni, (2010), one of the strategies often adopted is the use of risk communication (RC) tools. Risk communication here can be understood as an interactive process of exchange of information and opinion among individuals, groups, and institutions (Leoni, 2010). This leads itself to ensuring collective agreements which International labour standards recognize that collective agreements are an important element of occupational health and safety (OSH). Such strategy could contain precise provisions to ensure compliance with OSH in the oil and gas industry, including the prevention of occupational accidents and diseases, the use of individual and collective protective equipment, and measures on ventilation, light and safety signs, among others. Risk communication can also help promote changes in individual and collective behaviour through the use of public participation and conflict resolution (Leoni, 2010).

Another strategy, according to Zujian (2007) is to classify different risk factors that the oil and gas workers are exposed to by the use of occupational hygiene and safety standards provided by the authority. This involves the obligations of employers and employees to create a safe work environment, organisation of hygiene and safety at the level of the enterprise, institution and

State, procedures for settlement of disputes in this matter, and responsibility for breaches of established standards. Additionally, more stringent requirements for timely reporting on operations and accidents might be required, as well as risk mitigation plans for critical operations such as drilling. Oil and gas companies need to ensure that vital documents, including approvals for drilling, building, and maintaining wells, are available throughout the enterprise and across enterprise boundaries to minimize risk and ensure regulatory compliance (Leoni, 2010).

From technological perspectives, Bigliani (2013) argues that management in oil and gas industry must adopt techniques of which the first is to have condition-based monitoring. This implies placing sensors to measure various conditions (temperature, vibration, etc.) to detect situations that may indicate potential equipment failure. The use of more sophisticated systems that have alerting capabilities and are integrated with enterprise asset management applications that can automatically generate inspection or work orders. Another one is to have predictive maintenance. Predictive maintenance goes beyond condition-based maintenance in applying advanced analytics to predict potential equipment failures, providing enough notice to procure complex non-commodity replacement equipment (Yingfen, 2008). Finally, there should be criticality-based maintenance. This technique informs decisions on maintenance strategy by identifying which assets are critical to the process and what the process impacts would be if the asset were to fail. Criticality-based maintenance also informs procurement strategy so that inventories, and the costs associated with keeping them, are reduced but not at the expense of increased downtime (Bigliani, 2013).

Another technological strategy is to use of cyber security policy design and execution (Bigliani, 2013). This is one of the most basic elements to guarantee information security which is to have an enterprise information security architecture applied to all the data, systems, processes, and people. This helps in tracking from the business strategy to individual security technologies. Thus, in order to lower risks, improve collaboration, and ensure compliance, companies in the industry need to be able to handle all the information concerning their exploration and ongoing production from every well. They need to be able to review/approve, attribute, and retrieve well file correspondence and other documents that are critical for regulatory and legal compliance (Yingfen, 2008).

Oil and gas companies need business-critical information to be quickly retrievable. In essence, they need an enterprise-wide IT solution (including international branches) capable of managing all structured and unstructured content associated with planning, operating, and maintaining oil wells. That should include the design/construction of well facilities, major modifications, refurbishments, and eventual decommissioning. The same for midstream and downstream activities (Zujian, 2007). Furthermore, other experts (Frigo, & Anderson, 2011; Zujian, 2007) suggest that there should be risk awareness among employees. According to them workers within the industry must have a high risk of consciousness and a sense of crisis, and analysis the various risks faced, and take a proactive approach to resolve risk and control risk. Once all employees establish the strong sense of risk, the enterprise can take rapid action when it is facing major unexpected event, which can greatly reduce the possibility of loss (Frigo, & Anderson, 2011, Zujian, 2007).

According to ILO, (2017), there should be an emergency preparedness plan. Often, it has been realized dealing with potentially vast and serious incidents has remained a challenge for the oil and gas industry in SSA countries, where there is an evident lack of emergency response structures and technical competence, as well as inadequate legal and regulatory frameworks. Therefore, training personnel for emergency preparedness is critical for saving lives, putting out fires, managing evacuations and other rescue procedures. As a requirement for working in offshore installations, workers should pass several required safety and offshore survival courses and training sessions to acquire accredited safety certificates. Emergency preparedness also entails periodic testing/training on response to various emergency scenarios.

Added to this strategy is the strategy of educating and ensuring safety habits adopted by the employees. According to statistics, 70% -80% of the enterprise accidents are caused by human operator error or illegal operation (Zujian, 2007). Therefore, the management should enhance the education of employees, and from time to time carry out inspection and advocacy in various ways. For example, the management could use these methods such as posters, quiz contests, and technical competition to enhance the safety knowledge, and affix obvious signs or instructions on the wall or machine in accident-prone areas, and hold regular accident exercise (Zujian, 2007).

Also, for safety supervising and managing system, management should strengthen supervisory and inspection of job site safety, and see anti-illegal as the focus of the content of safety management, and strictly implement licensing system of special operations such as fire, breaking ground, high-lift operation, into the limited space and temporary electricity utilization. In this case, the management can set up team of safety supervisory and inspection that is composed of the experienced older workers. The team should carry out production supervision and divide the responsibility to specific individuals. There should be a clear division of responsibilities from the leadership to staff.

Frigo, & Anderson (2011) also suggest that to ensure quality in safety habits, management should improve the system of penalty for violation of safety regulation to make a clear definition of various types of acts in violation of regulations. Safety supervisors should be responsible, and they must strictly deal with acts in violation of regulations to form a strong safety climate. Therefore, the management should focus on monitoring the safety programme development, implementation of risk identification measures, and the labour discipline at the job site and to make the safety management further specification (Zujian, 2007).

With regards to personnel mechanism, it is suggested by experts (Yingfen, 2008; Xiaoguang, 2001) that oil and gas management should develop human resources planning to use pioneering personnel. In the daily management of the enterprise, it should establish the distribution system with responsibility, power and benefits, and the incentive mechanism for talent under which talented people can be put to the best use and be prepared for both promotion and demotion to promote competition among employees in the adoption of safety habits.

Thus, for fine management quality control system, oil and gas management should establish a strict quality assurance system and quality responsibility system, to clarify their respective responsibilities and strictly control all aspects. In the whole process of management, according to Zhang & Xing (2011), there should be an establishment of quality objectives according to the conditions of operating team and the characteristics of the construction and then prepare construction design combined with quality objectives to develop specific plans and measures of quality assurance. Management should strengthen quality accident management, pay attention to the report, investigation and treatment of the accident and analyse the mass loss in time to reduce accidents Zhang & Xing (2011).

In addition, experts like Kamp & Bansch (1998); Koehn and Datta (2003); Taylor, Easter & Hegney (2004) have suggested the implementation of health and safety integrated management systems. On this research suggests integrating the health and safety management function of a business with other management functions could enhance the overall performance of the business. Besides the benefits to be derived from such an integrated management system, Gibb & Ayoade (1996) have pointed out that many management systems, especially health and safety, environment and quality have many identical elements. For instance, policy, training of personnel, auditing, responsibility for task and controls are common elements in all three areas of management.

This, therefore, makes it possible to integrate them as a single management system. Proponents of integrated systems argue that such an integrated system will lead to management effectiveness, reduced duplication, elimination of the risk of conflicting responsibilities and harmony of objectives (Douglas and Glen 2000, Scipioni et al. 2001). Kirbert and Coble (1995) explored the integration of health and safety regulations with environmental regulations in the construction industry. Arguing that environmental issues are safety issues, the authors suggest a single administrative procedure for safety and environment via an environmental safety plan. The benefits of such a procedure include fewer processes involved in regulatory agency reviews and workers benefiting from training in both environmental and safety aspects of their work environment.

Finally, according to Okereke (1993), in order to minimize risks, there are various techniques of risk management that can be used. These include, first of all the use of avoidance of risks. This approach seeks to change the conditions that bring about loss · producing events, for example, ensuring good house -keeping in factories by putting in place an effective waste disposal procedure. This approach suggests that "prevention is better than cure" in all cases. The second is the minimization of risks. This approach suggests that risk cannot be totally avoided but can be reduced to a very large extent. This can be done through an effective Health, Safety and Security (HSS) programme. Thirdly, there should be retention of risks. This technique is of the opinion that accidental losses (risks) in business be absorbed or retained internally. This is done by assigning primary responsibility for risk management to a specialized risk management unit in an organisation. Lastly, there should a transfer of risks. This approach suggests that risks in business be shifted to a third party, usually an insurance company. It involves the purchase of insurance policies to pay for losses incurred or sustained by individuals and or businesses.

It has been revealed from literature that risks cannot be totally avoided. Therefore, the three major approaches to the treatment of risks are minimization, retention, and transfer. In a bid to minimize risks, operators in the oil and gas industry must emphasize on health, safety and security (HSS) programme. Foster (2000) however notes that the health, safety and security (HSS) programme can only be effectively used to manage those risks which are internal to the organisation. Those risks arising from the business environment such as social unrest, politico-economic risks, market risks, natural disasters etc cannot be effectively managed based on the HSS programme. He, therefore, suggests that the appropriate technique for managing risks in the oil and gas workplace is to transfer these risks to a third party e.g. an insurance company when necessary. The purpose for an insurance policy is to indemnify or compensate the insured for his financial losses or loss of life, etc. This implies that insurance neither eliminates nor stops a disaster, misfortune or death from happening. What it does, is to reduce the shock from the financial point of view. In other words, an insurance policy serves as a shock-absorber to any person who experiences accidental losses.

Irukwu (1978), states that not all accidental losses (risks) can be transferred to an insurance company. Such risks that cannot be shifted to an insurance company are called uninsurable risks. They may include prolonged natural disaster, potential government actions, etc. The insurers are not willing to accept such risks because they lack relevant statistics of the frequency of occurrence of such risks under what conditions they occur and how much damages that are caused by such risks. Zielag (1999) observes that as a result of the bad omen that bedevilled the insurance industry such as non-payment or unnecessary delays in the payment of claims most operators in the oil and gas industry ·prefer to minimize or retain their business risks rather than transferring such to an insurer or thirty party. For risk retention technique, Bello (1989) asserts that it is only appropriate for the treatment of risks associated with loss of lives resulting to death or permanent disability of employees.

Concept of Occupational Accident

In general, an accident is an undesired and unplanned event that leads to death, personal injuries, damage or loss to property, plant, materials or the environment and/or loss of business opportunity (Ellis, 2003)). According to Hollnagel (2004), an accident is the materialisation of a downside risk and can be seen as a "… short, sudden, and unexpected event or occurrence that results in an unwanted and undesirable outcome. The short, sudden and unexpected event must directly or indirectly be the result of human activity …." (p. 5).

In oil and gas industry, according to Knegtering & Pasman (2009), accidents are never caused by a single event, but rather by a multitude of factors. Different causes identified in the literatures include: ineffective safety management programs (Pitblado & Nelson, 2013), inexperienced workers (Lawyers & Settlements, 2011), risk inherent to the production activity and level of training of workers (Díaz-de-Mera-Sanchez et al., 2015), unique job requirements, labor-intensive, work overtime and hard activities (Roth, 2006), and finally according to Anderson, (2005), inadequate training strategies, poor maintenance priorities, inadequate supervision, failure of effective hazard identification and inadequate auditing.

Overall, the most common contributor with over 70% of all Oil &Gas industry accidents is human error (Bhavsar, Srinivasan & Srinivasan, 2015). Pitblado & Nelson (2013) and Mattia (2013) pointed out that the recent ongoing series of major accidents showed that current safety management programmes and improvement are not sufficiently effective in treating human element appropriately in Oil &Gas industry. However, Bhavsar et al. (2015) indicated that the cognitive challenges faced by operational workers during their interactions with the process and decision making in this industry were behind this high rate. To sum up, Lawyers & Settlements (2011) argued that accidents in Oil &Gas industry typically occur due to worker's carelessness or recklessness. On average, several unsafe acts occur in the Oil &Gas industry before an accident happens (Sneddon, Mearns, & Flin, 2006). When examined individually, these unsafe acts might each appear to be relatively trivial events. However, when they occur in a combined way, they can form a chain of events leading to a catastrophe (Hudson et al, 1998).

Empirical Review

Empirical Studies on Risk Perception and Occupational Accidents

The issue of risk perception and occupational accidents have occupied the minds of scholars for some time and a lot of studies attest to this assertion. For example, in a study by Bloemen et al. (2004) in Brazil, it was found that the perception of chemical risk and the occurrence of accidents involving this risk were present more frequently. This risk perception related to the chemical risk and chemical occupational accident, is due to the raw material that the worker handle in their daily work, for example, gasoline. Regarding chemical risk, a study by

Wiwanitkit, Suwansaksri, Nasuan, (2001) in Thailand, found that urine is a biomarker for benzene exposure in gas station attendants in Bangkok.

Also, Kaufman, Anderson, Issaragrisil, (2009) on risk factors for leukemia in Thailand found that the frequent inhalation of vapors emitted by cars, direct handling of gas pumps and daily exposure to several liters of fuels were indicated as the main factors of exposure. This study documented and reported that chemical occupational accidents are frequent among gas station workers that have longer exposure times. In addition, it was reported that the exposure time was higher in the case of 'eye contact with fuel' chemical occupational accidents.

In terms of occupational accident, Gattás, Cardoso, Medrado-Faria, Saldanha, (2001) found that the absorption capacity of the agent benzene can be increased by contact with the mucosa of the eye and the mouth. Skin contact with fuel was reported by 91.4% of gas station workers, and it is known that there is a potential way for absorption, because of the ability to the fuel (liquid phase or vapor) to permeate the skin, small latency contact and high toxicity, even after brief exposure. Some studies by Li et. al (2009) and Lan et.al (2005) have demonstrated benzene's myelotoxic potential, which is manifested by a decreased number of leukocytes (both granulocytes and lymphocytes) and platelets, lower hemoglobin concentration, and fewer progenitor myeloid cells in workers exposed to levels ≤ 1 ppm (parts per million), which is the exposure level of gas station workers. Although it was not the object of the present study, it is stated that the occupational accident contacts with fuel exposes workers in our study to the benzene's myelotoxic potential.

Another study by Wiwanitkit, Suwansaksri, & Nasuan (2001) also showed that gas station workers are at high risk of chemical risk factor exposure as a function of the work environment, tasks performed, and products handled daily. These circumstances made it difficult to avoid occupational exposure to chemicals. However, other studies by Colman, & Coleman (2006) have suggested protective measures that might reduce the risk exposure and occupational accidents using personal and collective protection equipment, changing clothes for each shift and applying hygiene measures, such as hand washing.

Additionally, a study by Hambach et al. (2001) on the perception of chemical risks showed that although workers do perceive the existence of risk, they are not continually concerned with this aspect of their jobs. This scenario might be explained by the fact that living with a continual awareness of risks would be unbearable. The authors also hypothesized that several risks inherent to work become acceptable over time, and/or that occasionally, workers have no option but to accept the risk. This applies even when the chemical risk perception is based on sensations felt by workers or their colleagues. A study by Wu et al. (2008) found that workers reported feeling unsafe due to their daily exposure to climactic changes. For gas station workers, physical risks represent the discomforts caused by the work environment itself.

These findings agree with those of another study Adami, et al. 2006) in which gas station workers' main health complaint was the need to stay in a standing position all day. Regarding biological risk perception, a study by Jovic-Vranes, et al. (2006) identified the workers' perception of imminent infectious disease risk.

The results showed that risk perception varied as a function of the frequency of the workers' exposure to contaminated fluids, knowledge of customers' diseases and history of previous accidents.

Also, another study performed with gas station workers by Kaufman, Anderson, & Issaragrisil (2009), it was found that most workers with longer duration on the job identified a lack of physical safety as a risk associated with robberies, explosions and being run over by vehicles. This finding was related to a lack of information about the types of risk that can cause long-term damage, such as chemical intoxication or risk perception that causes immediate damage. The relationship between duration of exposure and occupational accidents might be explained by the following observation by Verma, & Rana (2001) that the more time a worker spends near gas pumps or fuel, the greater the exposure.

In terms of strategic management, various studies have indicated that workers' participation in decision making is of paramount importance to their safety and health (Hambach et al. 2011; Bradshaw, et al. 2007; Ocek, et al. 2008). In these studies, it was found that Workers want to be consulted about their own needs and do not object to data collection for assessing high-risk procedures when they are duly warned about the potential risks of the materials they work with. Also, Verma, Johnson &Maclean (2000) undertook research on the benzene and total hydrogen exposures in the upstream petroleum oil and gas industry and formed several safety concerns. The study was based on the Canadian oil and gas industry and total of 1547 air samples taken by oil companies in various sectors were evaluated.

The outcome of the research can be generalized for the whole oil and gas industry around the world. For instance, it was discovered that the percentage of samples are over the occupational exposure limit (OEL) of 3.2 mg/mz or one part per million for benzene for personal long-term samples range from 0 to 0.7% in the different sector, and area long-term samples range from 0 to 13%. The findings assist to establish a precaution to the global oil and gas industry that certain operations such as glycol dehydrators should be carefully monitored and there should also be-based monitoring programme along with the traditional long-and short-term personal exposure sampling.

Chapter Summary

This chapter has contributed to the foundation for the development of this study. The purpose of this chapter has been to review the relevant literature on risk perception and occupational accidents. The first section has focused on the theories under pinning the study which are the principal-agent model and rational theory. This was followed by the discussions on the concepts of risk and occupational accidents in the oil and gas industry. The second section focused on the various occupational risk factors as well as the various occupational risk management strategies employed by management in the industry to address occupational hazards. Finally, the last section has dealt with the empirical studies on risk perception and occupational health accidents.

CHAPTER THREE

RESEARCH METHODS

Introduction

This chapter describes how the study was conducted. It defines the choice of study approach and design that was used in undertaking the study. The chapter also defines the population and sample size of the study. Also discussed are the research instrument, validity and reliability of the instrument, data collection procedure, and data analysis including the statistical techniques used to analyse the data.

Research Approach

Research approach refers to the procedural framework within which a study or research is conducted (Anabila, 2010). In order to draw a meaningful conclusion from any piece of research or study, the procedural framework of the data collection must be appropriate and relevant (Malhotra and Birks, 2007). The study adopted the quantitative approach to help the researcher identify and assess statistically, the perceived risks and occupational accidents among employees in the oil and gas industry at the Jubilee Field, Takoradi. The motivation for choosing the quantitative research approach was that the approach would ensure consistency and reliability of data collection and analysis in an attempt to cast the researcher's net widely in order to obtain as much data as possible with the intention of arriving at findings that could be broadly generalized within the institutions in the study. It is often formalized and well-structured and data is usually obtained from large samples – anything from 50 and upwards (Tull and Hawkings, 1990). It also involves the use of structured questionnaires usually incorporating mainly closed ended questions with set response (Bums, 2000).

Study Design

A study design provides a framework for the collection and analysis of data. The study adopted descriptive research and cross-sectional research designs. According to Fowler (1993), a descriptive study design is used to describe “what is”. It involves describing, recording, analysing and interpreting conditions that exist. It involves compromise or contrast and attempts to discover relationships between existing variables. Bryman and Bell (2003) also indicate that descriptive research is concerned with the condition or relationship that exists, such as determining the nature of prevailing conditions, practices and attitudes, opinions that are held, processes that are going on, or trends that are developed.

The survey method can be used for descriptive, exploratory, or explanatory research. Survey research has several inherent strengths compared to other research methods Saunders et al. (2007). Surveys can be used for measuring a broad range of observable data, such as people’s preferences, traits, attitudes, beliefs, behaviours, information Saunders et al. (2007). Survey research is also ideally suited for remotely collecting data about a population that is too large to observe directly. Due to its unobtrusive nature and the ability to respond at one’s convenience, questionnaire surveys are preferred by some respondents. Large sample surveys may allow detection of small effects even while analysing multiple variables, and depending on the survey design, may also allow comparative analysis of population subgroups (i.e., within-group and between-group analysis). Survey research is economical regarding researcher time, effort and cost than most other methods.

On the other hand, survey research also has some unique disadvantages. It is subject to many biases such as non-response bias, sampling bias, social desirability bias, and recall bias (Cohen, Manion and Morrison, 2007). There are limits to the survey method such as the possible limitation to the number of questions and the inability by the researcher to follow up in case the respondent did not come out clearly and the possibility that the survey may not secure the information needed.

Study Area

The study was conducted using The Jubilee oil field as the study area. The field is in the Gulf of Guinea, 60 km off the Ghanaian coast, near the Côte d'Ivoire border. It is spread out in the Deepwater Tano and West Cape Three Points blocks. The wells are at a water depth between 1,100 and 1,300 meters and at a total depth between 3,400 and 4,200 meters. The field covers 110 km², which is about the size of 155 football pitches (*Offshore-Technology.com, 2011)*. The Tweneboa field (6 km east of Jubilee) was discovered in March 2009. In July 2010 the Owo-1 drilling confirmed the reasonably big amounts of the field. A maximum depth of 4,000 meters has been drilled. There does not seem to be an underwater channel connection between the Tweneboa and the Jubilee field. Apart from these major findings, there are also several smaller wells close by. In total, the companies engaged in the discovery have discovered more than 15 wells in the western Ghanaian sea territory *(Ghanaweb.com, 2010 (I)).*

In terms of who owns the field, according to the Article 257(6) of the Ghanaian Constitution of 1992 states: "Every mineral in its natural state in, under or upon any land in Ghana, rivers, streams, water courses throughout Ghana, the exclusive economic zone and any area covered by the territorial sea or continental shelf is the property of the Republic of Ghana and shall be vested in the President on behalf of, and in trust for the people of Ghana." However, the right for exploration, development and production of different offshore blocks was sold in 2004. In the following you will find the ownership shares of each oil field (also see Image 3). Deepwater Tano Block Tullow Oil & Gas (Operator) 49.95%, Kosmos Energy 18%, Anadarko Petroleum Corporation 18%, Ghana National Petroleum Corporation 10%, Sabre Oil & Gas 4.05%.

With the West Cape Three Points, Kosmos Energy (Operator) has 30.875%, Anadarko Petroleum Corporation 30.875%, Tullow Oil & Gas 22.896%, Ghana National Petroleum Corporation 10%, EO Group 3.5%, Sabre Oil & Gas 1.854%. Jubilee Field (located in both blocks) Tullow Oil & Gas (Operator) 34.705%, Kosmos Energy (technical operator for development) 23.491 %, Anadarko Petroleum Corp. 23.491 %, Ghana National Petroleum Corporation 13.75 (10% carried interest, potential 3.75% working interest, if they decide to apply for their back-in right within 60 days after production started), Sabre Oil & Gas 2.813 %, EO Group 1.75%. [*Offshore-Technology.com, 2011*]

Population

The research problem had a bearing on the population. According to Sekaran (2003), the population is the study object and consists of individual groups, institutions, human products and events or the conditions to which they are exposed. Thus, the study population is the subset of the population with the condition or characteristics of interest defined by the eligibility criteria. Although it is usually not practically and economically feasible to involve all members of the population in a research project due to mainly cost, time constraints and population size, it was felt that it would be important to involve all eligible junior employees of the institution who met the criteria of having done one performance appraisal and who had voluntarily consented to participation in the study. In essence, the group of participants actually studied is selected from the study population (Friedman, 2002).

In this study the population covered the whole junior staffs of the Jubilee Field at Takoradi who were roughly 800. The frame of the available population was identified through personnel records of the individual provided by the Division of Human Resource of the institution.

Sample Size and Sampling Procedure

Sampling is a crucial step in achieving the desired results in this study. The question of sampling arises directly out of the issue of defining the population on which the research will focus. Factors such as expense, time, and accessibility frequently prevent researchers from gaining information from the whole population (Cohen, Manion & Marrison, 2004). Therefore, researchers often need to obtain data from a smaller group or subset of the total population in such a way that knowledge gained is representative of the total population under study. Probability sampling technique was used to identify a suitable sampling frame based on the study population.

According to Krejcie and Morgan (1970), the probability sampling method is the best method used in quantitative study. This necessitated the choice of probability methods in this study. The study used simple random sampling of probability sampling in selecting units from the population. The simple random sampling was chosen because it gives every unit of the population an equal opportunity to be selected. Krejcie and Morgan (1970) provides sample size for a population of 800. According to the sample size determination table, a population of 800 will have a sample size of 260. Therefore, this study will use a sample size of 260. The sample size determination table is attached as appendix B.

Research Instrument

The selection criteria for selecting participants in the study was determined by the requirement of the potential participant to have voluntarily consented to participation in the study and must have done one performance appraisal at the institution. The number needed was randomly selected. The instrument used for data collection was a self-administered questionnaire. Questionnaire is a set of questions with a definite purpose designed for a target group of people to be administered by themselves within a particular time frame.

According to Plano & Creswell (2008), questionnaire guarantees high efficiency in data collection and high generalisability of results over the more intensive research designs. However, Creswell & Plano (2011) emphasise that questionnaire lacks flexibility in that once a questionnaire has been designed and distributed out it becomes difficult to change the categories of data collected. Questionnaire was selected for this kind of study, because it is a self-reported measure which guarantees confidentiality and therefore it is more likely to elicit truthful response regarding the information required from the respondents.

The questionnaire was composed in a brief and appropriate language to avoid ambiguity and to attract respondent's interest. (It is attached as an Appendix B). The questionnaire consisted of different types of questions. Information about the demographic data of the participants is gathered from the multiple-choice questions (closed), which just required that the right answers be ticked by the respondents. There were also open-ended questions that required the respondents to reply in their own words and give freedom of opinions. Open ended questions also allowed the researcher to explore ideas that would not otherwise be heard (Creswell & Plano, 2011)

Pre-Test Study

Validity and reliability indicate how best the instrument used in the study best measures the parameters it is meant to measure, and it is the measure of accuracy in terms of results attained in the study (Cook & Campbell, 1979). In this study, a pre-test of the research questionnaire was done at the regional headquarters in Takoradi on the senior staff since they all face almost similar conditions. This process was aimed at testing the accuracy and strength of the questionnaire in eliciting data needed for the study. In other words, this was to help in assessing the clarity of our questions to the respondents and to elicit their understanding regarding answering questions. The questionnaires were administered and after receiving them back, it was realized that the questionnaires did not need any significant changes.

Validity

Validity in research simply means the extent to which instruments (questionnaires or structured interview schedules) measure what they intend to measure. In other words, validity means to what extent that the selected tool measures the intended research objectives (Bowling, 2009). In the context of this study, several strategies were undertaken to validate and refine the content of the questionnaire. To address the face validity, the experts painstakingly read the questionnaires and the appropriate corrections were made before it was given out. Peer review was also of immense importance. Content validity was further enhanced by asking experienced experts in the field to go through the questionnaire before it was administered to the respondents.

Experts 'responses were dichotomous (clear/unclear), or according to relevancy (not relevant, somewhat relevant, quite relevant, and highly relevant). All efforts were taken to consider all of the contributions of the panel and their suggestions whether addition or dropping certain items from the questionnaire. Many items of domains and sub-domains were manipulated and reconstructed with minor language adjustments to enhance clarity, and to be assured that the instrument is entirely applicable.

Reliability

Reliability refers to the extent to which the application of a scale produces consistent results if repeated measures are taken. It can be achieved when keeping results at a consistent level despite changing of time and place (Bowling, 2009). The value of Cronbach's alpha often ranged from 0 to 1. It is worthy to note that, the closer the value of α to 1, the better its reliability. Nunnally (1967) suggested an alpha threshold of 0.5 for basic research and later adjusted the value to 0.7 (Nunnaly, 1978) and recommended by Hair et al. (2006).

Results of the Cronbach's Alpha in this Study

The Cronbach's coefficient alpha (α) was used in this study to determine the reliability of items in the questionnaire. Table 1 shows Cronbach's alpha of all indicators.

Table 1: Reliability of Scales and Cronbach's Alpha of Study Variables

Variable	Items Retained	Cronbach's Alpha
Risk	5	0.731
Physical hazard	6	0.742
Psychosocial	6	0.807
Biological	4	0.723
Ergonomical	7	0.868
Chemical	5	0.887

Source: Field survey, Otoo (2018)

The Table 1 above demonstrates the values of Cronbach's alpha for all the variables. The values of the table for Cronbach's alpha range between 0.723 and 0.887. This implies that the reliabilities of the variables are not in doubt as these values are all well above the minimum value of 0.70. Thus, it can be inferred that the measures have an acceptable level of consistency.

Data Collection Procedure

A copy of introductory letter was obtained from the Head of Institute of Oil and Gas (It is attached as Appendix A) which was sent together with the questionnaires. The questionnaires were distributed to the junior staff. On the average, the questionnaires were distributed and collected within three weeks. Out of 260 questionnaires administered, 200 questionnaires were collected, giving a response rate of 77%. The data was collected from all the junior staff drawn from the Jubilee Field, Takoradi. The population size was about 800 employees and the sample size selected was 260 and this was based on the Krejcie & Morgan (1970).

This means that a total number of 260 were issued from which 200 were filled and returned which represented a response rate of (77%) whilst 60 representing 23% was not returned. The response rate is represented in table 2 below.

Table 2: Response Rate

Questionnaire	Count	Percentage (%)
Returned	200	77
Non-Returned	60	23
Total	**260**	**100**

Source: Field survey, (2018)

This response rate could be judged to be acceptable because from the point of view of Mugenda and Mugenda (2003) a response rate of 50% is satisfactory enough for analysis. The success for this high rate of returns could be ascribed to candidate's determination of ensuring that all the administered questionnaires were answered by submitting them personally to the various respondents. Furthermore, while the respondents were given enough time, there were also informed on the real date that the candidate was to go for the filled questionnaires.

Data Analysis Procedure

The data were analysed quantitatively, and this was done using Statistical Product for Service Solution (SPSS) version 21. The responses received from the respondents were analysed according to four scales (options) contained in the questionnaire. These scales were Strongly Agree (SA), Agree (A), Strongly Disagree (SD), Disagree (D). From this a descriptive analysis was made with statistical techniques used for getting percentages and averages. As per scoring given above, the entire data of 200 questionnaires were tabulated in an Excel Spread Sheet and later fed into SPSS for calculation of results. Data related to employees' socio-demographic features were assessed using frequency and percentage. Descriptive statistics comprised of means, standard deviations, frequency distributions and percentages of the responses from the questionnaires.

Ethical Consideration

An introductory letter was obtained from the Institute, University of Cape Coast to introduce the researcher to the institution. To gather data from the sampled staff, permission was sought from the management of the institution. Those staffs that were selected to participate in the study were contacted with the help of the management. The consents of the staff were sought through the management of the University. A research is expected to be free from any biases and it must be scientifically sound and reported honestly, thoroughly and completely (Malhotra & Birks, 2007). Participants were informed about the purpose of the research and what objective it sought to achieve. They were encouraged to feel free and air their views as objectively as possible and that they have the liberty to choose whether to participate or not. They also had the option to withdraw their consent at any time and without any form of adverse outcomes.

Anonymity and confidentially were guaranteed and the researcher did not cause harm or mental stress to those who choose to participate. This research and its associated methodology adhere to all of these ethical considerations. An organisational entry protocol was observed before the data were collected. Individual participant was informed of the reason for the whole exercise and the benefit that will be obtained by the institution if the research was carried out successfully.

Chapter Summary

The purpose of this chapter was to describe the methods used in achieving the aim of this study. So far it has been noted that for data collection and analysis, a quantitative method which involves structured questionnaire has been used. There has also been significant background information regarding the study context of the Jubilee Field including the way the data were collected and analysed. Ethical consideration of the study has also been revealed. This included written permission letter which was presented to all the Heads of Departments involved for approval before the commencement of the data collection and assurance of anonymity and confidentiality to those who took part in the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

In this study, the main research objective has been, "*to assess the perceived risks and occupational accidents among employees in the oil and gas industry at the Jubilee Field, Takoradi*, Ghana. Based on this main research objective, specific objectives were used to achieve the study goal. In line with these original research objectives and the method used, this chapter provides the findings and discussions which reflect on the core study specific objectives as outlined in Chapter one. The first section discusses the demographic features of the respondents while the second section addresses the main specific research questions relating to the study namely:

1. What is the level of awareness of the employees on risks in the oil and gas industry?
2. What are the perceived occupational risk factors to which employees are exposed in their work environment in the oil and gas industry?
3. What are the most frequent perceived types of occupational accidents in the oil and gas industry?
4. What are the strategies employed by the management to address the risks and the occupational accidents in the oil and gas industry at the Jubilee Field, Takoradi?

Demographic Characteristics of the Respondents

In order to understand the demographic background of the respondents, the study considered it suitable to find out the demographic data of the respondents.

This was important because it was to provide a clear focus of the study by providing relevant data concerning Jubilee Field employees.

Table 3: Background Information of the Respondents

Variable	Frequency	Percentage (%)
Gender		
Male	151	75.5
Female	49	24.5
Age		
21-30 years	56	28
31-40 years	84	42
41-50 years	34	17
51years and above	26	13
Academic Qualification		
Below Diploma	12	6
Diploma	26	13
First Degree	60	30
Postgraduate Degree	84	42
Professional Certificate	18	9
Nature of Jobs		
Machine Operator	54	27
Administrators	56	28
Electrical Engineer	31	15.5
Biochemist	27	13.5

Industrial Hygienist	32	16
Tenure		
1-5years	32	16
6-10 years	102	51
11-15years	37	18.5
16 and above years	29	14.5
Total	**200**	**100**

Source: Field work, (2018)

The background information of the study's respondents in table 3 above indicates that a total number of 200 respondents comprising 151 males (75.5%) and 49 females (24.5%) participated in this study. This indicates that those who took part in this study were male dominant. This could not have been coincidence since in Ghana males are always dominating in the working environment. In terms of age, majority of the respondents were in their middle ages and young ones. For example, the largest group was those within the range of 31-40 with a total number of 84 (42%), followed by those between the age of 21-30 with a total number of 56 (28 %). The implication here is that the Company has relatively young ones who have long and productive years of service ahead of them. These young ones will be available to take on the positions even if the 30% of the workers are on retirement in the next 10 years. In contrast, those who are more experienced were the minority. For example, those at the age range of 41-50 were 34 (17%) whilst those above 51 years, were only 26 (13%). In all, it can be said that the industry has either employed and or invested more in the youth than the older workers, which indicates that the industry has a brighter future.

In support of this argument of the bright future of the Company, when it comes to education it can be said that the industry is endowed with those who are really educated and therefore skilful. For example, out of the total number of 200 who took part in the study, only 12 (6%) were with education that was below diploma, whereas 26 (13%) were with diploma. In terms of higher degree, 60 (30%) of the respondents were found to have had first degree. However, a total of 84 (42%) of the respondents have had postgraduate studies. This implies that at least, more than 70% of those working has had at least first degree, whilst 18 (9%) have had professional certificate.

With respect to nature of jobs performed by the respondents who were junior staff, it was found that 54 (27%) were machine operators, whilst majority of 56 (28%) were administrators. Other significant characteristics of the nature of job of the respondents were that 31 (15.5%) were electrical engineers, 27 (13.5%) were biochemists and 32 (16%) of the respondents were industrial hygienist. When it comes to experience, the study found that out of 200 respondents, majority of the respondents which is 102 (51%) have worked for 6-10 years, whereas 32 (16%) were among those who have worked between 1 and 5 years. This is followed by those who have worked the between 11-16 years with a number 37 (18.5%). This contrasts with only 29 (14.5%) who have worked for 16 years and above. The idea here is that those who have acquired experience through long service in the company far less than those who have not got experience. The good thing is that succession plan for the company will not be difficult since most of these experienced workers can easily pass on their skills to the young ones.

The Findings of the Main Study Objectives

This section presents results and analysis based on the three key questions of this study. Both descriptive and inferential statistics are used in analysing the data. As it has been indicated in the methods, the design of this research is descriptive and adopts a quantitative method. The results and analysis are presented chronologically based on the stated objectives of this study.

Objective One: The Level of Awareness of the Employees on Risks in the Oil and Gas Industry.

In line with the study, objective one was to determine the level of awareness the employees have on the various risks, the employees were first asked if they had any idea about the risks involved in the industry they are working, the response was not surprising. This is because 91% said yes, they had an idea and only 9% claimed they had no idea about the risks. However, when they were asked which aspects of risks, they were aware of and the response was very surprising as it can be seen from table 4 below.

Table 4: Statistical Analysis of the Aspects of Risks the Employees Were Aware

	Frequency	Percent
Natural environmental	56	28.0
Engineering	18	9.0
Management	6	3.0
Economic	36	18.0
Political	15	7.5
Protection	69	34.5
Total	**200**	**100**

Source: Field work, Otoo (2018)

From table 4, it could be seen that most of the employees were aware of protection risk (34.5%) as well as natural environmental risks (28%). This implies that the employees knew the oil and gas industrial activities have the risk of either polluting the environment and or producing deforestation thereby destroying the habitat of species. However, only few people were aware of the management risk (3%), political (7.5%) and engineering (9%) risk. With respect to economic risk, 18% were aware of it. In effect, although the employees were aware of the risks existing in the industry, they are only more aware of two major risks.

This contrasts with a study by Bloemen et al. (2004) in Brazil, who found that the perception of political and economic risks were the ones perceived by the respondents to be more frequently. According to Hambach et al. (2011), employees at the lower levels are mostly not aware of management risks because they assume that it is the responsibility of those at the higher level of management to handle it.

Besides risks like economic and political do not normally affect their everyday lives in the workplace if they get their pay. Thus, they do little to learn about the kind of risks associated with such components (Hambach et al. 2011).

Objective Two: Perceived Occupational Risk Factors to Which Employees Are Exposed to In Their Work Environment

In the case of the objective two, the employees were asked to indicate the occupational risk factors to which employees perceived to be most exposed to in their work environment. In response to this question a lot of different perceptions were obtained from the study respondents as table 5 shows.

Table 5: Occupational Risk Factors Employees Perceived to Be Exposed

	Frequency	**Percent**
Physical	39	19.5
Chemical	58	29.0
Ergonomic	34	17.0
Biological	24	12.-
Psychosocial	45	22.5
Total	**200**	**100**

Source: Field work (2018)

From the table 5, it can be noted that majority of the employees (29%) perceived chemical health hazard as the most risk factor that they are exposed to. The second most important risk factor that the employees perceived to be exposed to was psychosocial health hazard (22.5%). This was followed by physical health hazard (19.5%) whereas ergonomic health hazard was the fourth risk factor (17 %)

and the last factor perceived by the employees was biological health hazard (12%). The outcome of this study is interesting as it is in line with the existing literature. For example, the differences in perceptions among the employees is in line with a study by Jovic-Vranes, et al. (2006) who identified similar results. According to the study it was shown that risk perception varied as a function of the frequency of the workers' exposure to contaminated fluids, knowledge of customers' diseases and history of previous accidents.

Besides the general occupational risk factors, this study also went further to know the employees' perceptions on the individual risk factor's elements. Firstly, in terms of the chemical risk factor, the employees had different perceptions about it as table 6 indicate.

Table 6: Descriptive Statistical Data on Chemical Health Hazards

	N	Min	Max	Mean	Std. D
Working with chemical substances is full of substances that are solvent, mist, fume and gases	200	1	4	3.13	0.887
The chemical/gases are flammable, poisonous and could cause cardiovascular, respiratory and renal diseases	200	1	4	3.12	0.894
The chemicals are sometimes inhaled, ingested, injected and spill over my skin	200	1	4	2.73	1.073

Chemical hazards are likely to affect ones' health when they are exposed to them for long time	200	1	4	2.53	1.173
The health impact of chemical hazards could lead to loss of life	200	1	4	2.52	1.138

Source: Field work (2018)

From the table 6, it can be noted that the employees generally have a common perception that perceived that working with chemical substances is full of substances that are solvent, mist, fume and gases (Mean=3,13, SD= 0.887). At the same time, they also commonly agreed that the chemical/gases are flammable, poisonous and could cause cardiovascular, respiratory and renal diseases (Mean=3.12, SD= 0.894). However, there is moderate agreement on the perceptions that chemicals are sometimes inhaled, ingested, injected and spill over the skin (Mean=2.73, SD= 1.073); chemical hazards are likely to affect ones‟ health when they are exposed to them for long time (Mean=2.53, SD= 1.173), and finally that the health impact of chemical hazards could lead to loss of life (Mean=2.52, SD= 1.138). In general, it can be said that while the employees perceived chemical hazard as the most dominant risk factor they are exposed to, there are differences in terms of what chemical components risks factors that are likely to cause the risk to them.

Similarly, with the psychosocial health hazards, the results were not different as table 7 indicates.

Table 7: Descriptive Statistical Data on Psychosocial Health Hazards

	N	Min	Max	Mean	SD
My workload is very challenging	200	1	4	3,00	,821
I work in isolation	200	1	4	3,20	,789
I am constantly talked down by my Superior	200	1	4	2,50	1,098
I am faced with aggression and harassment	200	1	4	2,71	1,205
Psychosocial hazard could cause hypertension, anxiety, and boredom	200	1	4	2,76	,898
I work long hours	200	1	4	2,51	1,165

Source: Field work (2018)

From table 7, the employees generally agreed that they often work in isolation and their workload is challenging, (Mean=3.20, SD=0.789; Mean=3.00, SD=0.821) respectively. However, what they differ moderately in their perceptions is on the fact that they face aggression and harassment (Mean=2.71, SD=1.205) and that psychosocial hazard could cause hypertension, anxiety, and boredom (Mean=2.76, SD=0.898). In contrast the employees least agreed on the fact that individual work long hours (Mean=2.51, SD=1.165) and individuals are constantly talked down by his or her superior (Mean=2.50, SD=1.098).

When it comes to physical health hazards it was noted that the employees commonly agreed on three issues as table 8 shows. In the first place, they perceived that the noise level in their workplace is relatively high, (Mean=3.25, SD=0.831). Secondly, they agreed on the perception that loss of hearing could result from exposure to loud noise (Mean=3.10, SD=0.908). Thirdly it was generally perceived that in their work like welding, radioactive substances could be emitted and that could cause cancer and premature skin aging (Mean= 3.00, SD=0.927).

Table 8: Descriptive Statistical Data on Physical Health Hazards

	N	Min	Max	Mean	Std. Dev
The noise level in my workplace is relatively high	200	1	4	3.25	.831
Loss of hearing could result from exposure to loud noise	200	1	4	3.10	.908
Extreme heat could cause body cramp	200	1	4	2.20	1.019
Vibration could disorder the spine and causes fatigue	200	1	4	2.95	.958
In my work like welding, radioactive substances could be emitted and that could cause cancer and premature skin aging	200	1	4	3.00	.927
Inadequate illumination could affect the eyes	200	1	4	2.61	.575

Source: Field work, Otoo (2018)

In contrast, the employees had relatively modest agreement on their perceptions on the following: Vibration could disorder the spine and causes fatigue (Mean= 2.95, SD=0.958); Inadequate illumination could affect the eyes (Mean= 2.61, SD=0.575); Finally, there was less agreement on the perception of the employees on the fact that extreme heat could cause body cramp (Mean= 2.20, SD=1.019).

On the issue of ergonomical health hazards, the employees had common perceptions of all the elements apart from some few elements as table 9 illustrates.

Table 9: Descriptive Statistical Data on Mechanical/Ergonomic Health Hazards

	N	Min	Max	Mean	S.D
When performing my job functions, I stand and or sit for a long time	200	1	4	2.98	.829
Some of the work materials at my duty post are obsolete	200	1	4	3.03	.856
I lift heavy objects manually	200	1	4	3.07	.789
The chair and materials arrangements in my workplace are very uncomfortable	200	1	4	3.02	.811
My work is repetitive and monotonous	200	1	4	3.37	.705
Ergonomic hazards could cause deformity of one's body	200	1	4	2.97	.801

Mechanical/Ergonomic hazards could cause back, neck and body pain	200	1	4	2.91	.852

Source: Field work, Otoo (2018)

The table on Mechanical/Ergonomic health hazards indicate that all the employees have common perceptions on them. From the table, it can be seen that there is a common perception that the work they do is repetitive and monotonous (Mean= 3.37, SD=0.705). Also, heavy objects are manually lifted ((Mean= 3.07, SD=0.789); some of the work materials at their duty post are obsolete (Mean= 3.03, SD=0.856); the chair and materials arrangements in the workplace are very uncomfortable (Mean= 3.02, SD=0.811). However, the employees' perceptions are relatively moderate when it comes to the following: When performing my job functions, I stand and or sit for a long time (Mean= 2.98, SD=0.829); Ergonomic hazards could cause deformity of one's body (Mean= 2.97, SD=0.801); and lastly, Mechanical/Ergonomic hazards could cause back, neck and body pain (Mean= 2.91, SD=0.852).

The final hazards considered were biological. In the case of this it was found out that although the employees perceived it to be risk factor, they less agreed on issues relating to it as table 10 shows.

Table 10: Descriptive Statistics on Biological Health Hazards

	N	Min	Max	Mean	Std. De
Microbes could be found in some substances I work with in my workplace	200	1	4	2.69	1.078
Some of this hazardous waste could impact on the health of workers	200	1	4	2.47	1.160
Biological hazards could cause tubercolosis, pneumonitis, pneumonoconiosis	200	1	4	3.00	.716
Proper environmental hygiene is lacking in my place of work	200	1	4	2.67	1.144

Source: Field work, Otoo (2018)

From Table 10, it could be found that the employees mostly agreed that biological hazards could cause tuberculosis, pneumonitis, pneumoconiosis (Mean= 3.00, SD=0.716). Besides this fact, there were less agreement on the following: Microbes could be found in some substances I work with in my work place (Mean= 2.69, SD=1.078); Proper environmental hygiene is lacking in my place of work (Mean= 2.67, SD=1.144); and some of this hazardous waste could impact on the health of workers (Mean= 2.47, SD=1.160).

Objective Three: The Most Frequent Perceived Types of Occupational Accidents in the Oil and Gas Industry

With regards to objective three, when the employees were asked about the existence of occupational accidents, majority of them agreed that they are happening frequently (Mean = 3.40; SD = 0.850). In fact, the occupational accidents were reported by 97% of the employees who took part in the study. The most frequently reported occupational accidents could be seen from table 11 below:

Table 11: The Most Frequent Perceived Types of Occupational Accidents

	N	Min	Max	Mean	S.D
Fuel spills and leak	200	1	4	3.53	0.907
Pipeline & gasoline storage area explosions	200	1	4	3.38	0.713
Hit by metal	200	1	4	3.33	0.820
Gas blow out	200	1	4	3.37	0.724
Fuel inhalation	200	2	4	3.43	0.676
Collision between car and workers	200	1	4	3.35	0.762

Source: Field work, Otoo (2018)

From the table 11, it is found that Fuel spills & Fuel leak (Mean = 3.53; SD = 0.907) were the most frequent types of occupational accidents. The second most frequent type was Fuel inhalation, (Mean = 3.43; SD = 0.676) followed by Pipeline & gasoline storage area explosions (Mean = 3.38; SD = 0.713); Gas blow out (Mean = 3.37; SD = 0.724) and finally Struck by metal (Mean = 3.33; SD = 0.820).

Objective Four: Strategies Employed by the Management to Address the Risks and the Occupational Accidents

In this study, after the risks and the occupational accidents have been identified as the appropriate strategies for their management were also analysed. In general, it was found that majority of the respondents agreed that there had been various strategies put in place to mitigate against both the risk factors and the occupational accidents. Indeed 85% of the respondents agreed and 15% also strongly agreed that a number of strategies that have been put in place to address the issues as it can be seen from table 12:

Table 12: Descriptive Statistics on Management Strategies

	N	Min	Max	Mean	S.D
Management provides pre-employment training to create risk awareness among newly recruited employees	200	2	4	3.63	.732
There is all the time education & inspection by the department responsible in the workplace	200	1	4	3.47	.756
Management periodically calls for a health examination monitoring/surveillance	200	2	4	3.63	.718

Decisions on risks management are taken by both the management and the lower level employees	200	1	4	3.30	.851
Implementation of the on health, safety and security (HSS) programme is taken seriously by Management	200	1	4	3.28	.875
Management is completely committed to the health and well-being of their workers by communicating risk to us	200	1	4	3.39	.782
There is a very functional and active technological OHS System in place to have condition-based monitoring	200	1	4	3.21	.902
A system of reward and penalty for violation of safety regulation is put in place by the management	200	1	4	3.33	.858

Source: Field work, Otoo (2018)

Table 12 summarizes the perceived strategies for addressing the major risks and occupational accidents in the oil and gas industry at Jubilee Field at Takoradi. From the analysis, it was realized that the employees commonly agreed that management provides pre-employment training to create risk awareness among newly recruited employees (Mean = 3.63, SD=0.732) as well as periodically calling for a health examination monitoring/surveillance (Mean = 3.62, SD=0.718). Additionally, it was agreed that there was all the time education & inspection by the department responsible in the workplace (Mean = 3.47, SD=0.756). It was also perceived that management was completely committed to the health and well-being of their workers by communicating risk to them ((Mean = 3.39, SD=0.782).

Furthermore, it was found that a system of reward and penalty for violation of safety regulation was put in place by the management (Mean = 3.33, SD=0.858). The idea here was that the implementation of the on health, safety and security (HSS) programme has been taken seriously by the management (Mean = 3.28, SD=0.875) as perceived by the respondents. Also, it was found that decisions on risks management are taken by both the management and the lower level employees (Mean = 3.30, SD=0.851). Finally, it was also declared that there had been a very functional and active technological OHS System in place to have condition-based monitoring (Mean = 3.21, SD=0.902).

Discussion of Findings

This study aimed at investigating into the risk perception and occupational accidents among employees in the oil and gas industry at the Jubilee Field in Takoradi and a total of 200 respondents participated in the study. The findings from this study revealed that this is a male (75.5%) dominated occupation. This is not surprising considering the nature of work involved in oil and gas industry. This is consistent with the findings in earlier studies (Jinadu, 1980; Aliyu & Shehu, 2006; Eyayo, 2014)). Majority of the respondents had completed tertiary education; they also knew and were aware of the Occupational Health Hazards they are exposed to. The high literacy level among these workers was consistent with the report of Eyayo (2014) that 73% and 81% respectively of the workers have completed at least high school.

It was revealed that the employees were aware of the various risks facing the industry which include natural environmental, protection, engineering, management, economic and political. However, only few people were aware of the management risk (3%), political (7.5%) and engineering (9%), whilst with respect to economic risk, 18% were aware of it. In effect, although the employees were aware of the risks existing in the industry, they are only more aware of two major risks. This is not consistent with the literature. For example, in contrast to a study by Bloemen et al. (2004) in Brazil, who found that the perception of political and economic risks were the ones perceived by the respondents to be more frequently, this study found that the employees were more aware of the natural environmental and protection risks.

The study also showed that the workers were exposed to a wide variety of hazards which can be broadly classified as; physical, chemical and mechanical/ergonomics, biological and psychosocial. The employees knew that they were exposed to various risk factors, especially chemical risk factors making their workplace being particularly dangerous. The frequency of occupational accidents tends to a state that allows the perception of risk factors to be different from each other. Such evidence confirms the findings of literature on risk factors that Hambach et al. (2011) found about workers' perception on risks that they face in the workplace and in similar situations

In terms of the hazards that the employees are exposed to, a similar environmental exposure has been observed among service station attendants by the study conducted by Achalu (2000). In this study 60% of respondents were exposed to physical hazards like noise. However, no worker reported occupational noise-induced hearing loss. Occupational exposure to high noise levels has been reported to depend on a variety of factors including occupation and industry, workplace factors and use of protective devices Achalu (2000). High noise levels can cause masking of warning signs, annoyance and fatigue. Other harmful effects of noise are hypertension, hyperacidity, palpitations and disturbed relaxation and sleep.

The handling of heavy machinery, uncomfortable ergonomic postures and probably working long hours makes the workers vulnerable to health diseases and illness. Back or neck pain, finger or toes turning white, stiffness, painful joint, numbness in hands, wrists, forearms, shoulders, knees and feet and swelling or inflammation are some illnesses that could result from Mechanical/Ergonomics Health Hazard. The Chemical Health Hazard which could be ingested, inhaled, injected and/or absorbed through the skin could be systemic and causes some occupational diseases and/or illnesses like renal disorder, respiratory diseases, reproduction disorder etc and carcinogens. Organic dust in the form of carbon black is a type of Biological Health Hazards.

In the case of strategies, it was noted that management has used both Health Promotion and Protection strategies. In the case of the health promotion strategy, there has been health risk assessment which is a management tool that allows the workplace comply with her occupational policy, helps the workers do their jobs without damage to their health, enables the workplace meet its legal responsibilities, enables the workplace show due diligence in the protection and promotion of the health of the workers, provides an auditable platform and involves the work force in protecting the health of the workers. There is also training, physical activities, and strict enforcement and implementation of the Organisational Occupational Health and Safety Policies. Creating and maintaining good relationship with both management and junior level employees has been taken seriously and this could help reduce approval delays in risk and accidents reduction.

This is in line with the argument made by Eyayo (2014) who said that management must often try to adapt well to the views of lower level employees and try to understand them if they want to prevent risks at work. This strategy constitutes a positive possibility of learning about risk factors and the individual and collective measures to minimize the accidents. Slovic (2000) also argued that knowing about workers' perception about a set of occupational hazards, is essential to prepare an effective plan. He further argued that the management need to maintain a good relationship with the employees and when the relationship with both junior level employees and management is good, the former become committed to health and safety procedures in the industry. Some studies have indicated that workers' participation in decision making is of paramount importance to their safety and health (Bradshaw et al 2001; Ocek, et al. 2008). Workers want to be consulted about their own needs and do not object to data collection for assessing high-risk procedures when they are duly warned about the potential risks of the materials they work with (Slovic, 2000)

Chapter Summary

This chapter has focused on achieving the main research objective which has been, "to assess the perceived risks and occupational accidents among employees in the oil and gas industry at the Jubilee Field, Takoradi, Ghana. In line with these original research objective and the method used, this chapter has provide the findings and discussions which reflect on the core study specific objectives as outlined in Chapter one which include: the level of awareness of the employees on risks; the perceived occupational risk factors to which employees are exposed to; the most frequent perceived types of occupational accidents; and the strategies employed by the management to address the risks and the occupational accidents in the oil and gas industry at the Jubilee Field, Takoradi. The first section of this chapter has discussed, first, the response rate and the demographic features of the respondents while the second section addressed the main specific research questions relating to the study.

The finding has revealed that the employees were aware of the risks they face particularly environmental and protection, but little was known about management, political and engineering/operational risks. In terms of risk factors, most of the employees had the perceptions that they were more exposed to chemical and psychosocial hazards whilst their perceptions on physical, ergonomical and biological were modest. In the case of the accidents, almost all the employees (98%) were convinced that accidents often take place with the most frequent ones being:

fuel spills and leak, pipeline & gasoline storage area explosions, hit by metal, gas blow out, fuel inhalation and collision between car and workers. On the basis of these, the management has put in place measures to mitigate these risks and accidents. Among them include training, physical activities, strict enforcement and implementation of the Organisational Occupational Health and Safety Policies as well as creating and maintaining good relationship with both management and junior level employees by allowing them to take part in the decision-making process in risks reduction.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter presents a summary of the findings that emerged from the study and data analysis. It draws conclusions and makes recommendations on how best risks and occupational accidents among employees in the oil and gas industry at the Jubilee Field can be minimized. Finally, the suggestion for future research is also highlighted.

Summary

The study set out to investigate into the perceived risks and occupational accidents among employees in the oil and gas industry at the Jubilee Field, Takoradi, Ghana. There were four main specific objectives, which the study aimed to achieve, and these included to:

1. examine the level of awareness of the employees on risks in the oil and gas industry;
2. assess the perceived occupational risk factors to which employees are exposed in their work environment in the oil and gas industry;
3. examine the most frequent perceived types of occupational accidents in the oil and gas industry;
4. assess the strategies employed by the management to address the risks and the occupational accidents in the oil and gas industry at the Jubilee Field, Takoradi.

The study was quantitative based on the views of 200 staff from the study area. A self-administered questionnaire was the main research instrument. The questionnaire contained several questions (items) and was subdivided into subscales. The maximum and minimum score for each question ranged from 4 to 1 where 4 stands for Strongly Agreed, 3 is Agreed, 2 is Disagreed and 1, Strongly Disagreed. The results from the survey were analysed with the help of the Statistical Package for the Social Sciences (SPSS 22.0 version) software.

Key Findings

The major findings as they related to the specific objectives of the study have been summarized as follows: The findings have revealed that the employees were aware of the risks they face particularly environmental and protection, but little was known about management, political and engineering/operational risks. In terms of risk factors, the study revealed that most of the employees had the perceptions that they were more exposed to chemical and psychosocial hazards whilst their perceptions on physical, ergonomical and biological were modest. In the case of the accidents, almost all the employees (98%) were convinced that accidents often take place with the most frequent ones being: fuel spills and leak, pipeline & gasoline storage area explosions, hit by metal, gas blow out, fuel inhalation and collision between car and workers. Based on these, the management has put in place measures to mitigate these risks and accidents. Among them include training, physical activities, strict enforcement and implementation of the Organisational Occupational Health and Safety Policies as well as creating and maintaining good relationship with both management and junior level employees by allowing them to take part in the decision-making process in risks reduction.

Conclusion

This study has revealed that oil and gas workers are aware of some of the risks and the risk factors they are exposed to especially chemical risk factors due to their workplace being particularly dangerous. Thus, the identification of Occupational Health Hazards, the awareness of the workers on the health hazards, the risk associated with them and the effectiveness of the Occupational Health Practices is crucial in the promotion, protection and rehabilitation of the health and well-being of people working in the industry. From this study, it could be deduced that these could be reduced with the implementation of appropriate strategies such as the implementation of a system of reward and penalty for violation of safety regulation put in place by the management.

However, it must be said that whether these strategies would be effective or not would depend on the workers and the working environment. This is because whether a rule will be violated or not depends strongly upon the type of safety culture that is in place in an organisation. Even more importantly, it could be demonstrated that the effectiveness of risk management strategies also depends upon the existing safety culture. For example, in a less advanced reactive safety culture, punishment is more effective than in a more advanced calculative/proactive safety culture. The debate on the effectiveness of punishment as a risk management strategy was enriched by further evidence indicating that increased punishment cannot be considered the “first best solution”. This is because punishment and reward need to be fairly balanced and that a "just" safety culture also needs to be created to ensure effectiveness.

Thus, there is no "one-size fits all" strategy that can be considered to minimize or reduce risks in the oil and gas industry. Whatever it is it has to be understood that knowing about workers' perception about a particular set of occupational hazards they face, is essential to prepare an effective plan for risks reduction in the industry. In this sense, it can be said this study has achieved the goal it set out to achieve as it has revealed the perceptions of the employees in the Jubilee Field which can be the basis of risks minimization.

Recommendation

Based on the study findings with several recommendations for the improvement of health and safety standards in the industry are put forward. In the first place, although training is carried out when employed, more resources should be channelled towards health and safety training during the employees'' lifetime in the industry to further strengthen health and safety adherence. Training should focus on hazard identification and risk assessments, which may offer the industry long term benefits, which will potentially lead to a reduction in occupational accidents, injuries and illnesses.

Also, training programmes that focus specifically on improving the health and safety related behaviours of employees should be designed and implemented to boost psychological aspects that are critical in improving observance of OHS standards amongst employees in the steel industry. In addition, bonuses/rewards could be offered to employees in various departments/divisions that excel in observing health and safety standards.

Finally, efforts must be made to ensure that all important stakeholders such as management, employees, labour unions, customers, government, among others become a united force in promoting health and safety standards in the industry. Management must also be proactive and not reactive by acting only when accidents take place, such that health and safety matters should be a priority on their agenda.

Areas for Further Research

This study was based on quantitative analysis but in the near future, both qualitative and quantitative methods should be used, and this will help employees to better describe the situation and explain in detail the reason for the answers that have been uncovered using quantitative. Also, future research could be conducted to address one of the limitations outlined in this study. For example, this study only concentrated on limited number of 200 junior staff at the Jubilee Field. This means the views of the employees could not be generalized. As a result, the future research could extend the investigation to both junior and senior workers and to obtain a wider generalization of the study.

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APPENDICES

Appendix A: Introductory Letter

UNIVERISTY OF CAPE COAST

INSTITUTE OF OIL AND GAS

QUESTIONNAIRE ON AN EVALUATION OF PERFORMANCE APPRAISAL SYSTEM OF THE UNIVERISTY OF CAPE COAST

Dear Respondent,

I am a student of University of Cape Coast, Master of Business Administration in Oil and Gas Management programme at the Institute of Oil and Gas. This questionnaire is designed to ascertain information for my research work on the topic: "**PERCEIVED RISK AND OCCUPATIONAL ACCIDENTS AMONG EMPLOYEES IN THE OIL AND GAS INDUSTRY AT THE JUBILEE FIELD IN TAKORADI**." This research is in partial fulfilment of the requirement for the award of a Masters of Degree in Business Administration in Oil and Gas Management at the University of Cape Coast.

All the answers you provide will be treated with utmost confidentiality and for academic purpose only. Please feel free to answer the questions as candid as possible.

Thank you.

George Ayitey Otoo

To answer a question, either tick [√] or write short notes on the space provided where necessary.

SECTION A: SOCIO-DEMOGRAPHIC DATA OF RESPONDENTS.

1. **Gender:** Male [ ] Female [ ]
2. **Age Range**: 21-30 [ ] 31-40[ ] 41-50[ ] 51 and above [ ]
3. **Academic Qualification**: Below Diploma [ ] Diploma [ ], First degree [ ] Postgraduate degree [ ] Professional Certificate [ ]
4. **Nature of Jobs:** Machine operator [ ] Administrators [ ] Electrical engineer [ ] Biochemist [ ] Industrial hygienist [ ]
5. **Years of Work Experience (Tenure):**

   1-5 years [ ] 6-10 yrs [ ] 11-15 yrs [16 yrs and above [ ]

SECTION B: RISK FACTORS

Below are statements on risk factors that employees are exposed to. Indicate the extent to which you agree / disagree with each of the statement by ticking the appropriate box with 1 representing Strongly disagree, 2 Disagree, 3 Agree and 4 Strongly Agree:

Statement on Chemical Health Hazards

Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
Working with chemical substances is full of substances that are solvent, mist, fume and gases				
The chemical/gases are flammable, poisonous and could cause cardiovascular, respiratory and renal diseases				
The chemicals are sometimes inhaled, ingested, injected and spill over my skin				
Chemical hazards are likely to affect ones‟ health when they are exposed to them for long time				
The health impact of chemical hazards could lead to loss of life.				

Psychosocial Health Hazards

Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
My workload is very challenging				
I work in isolation				
I am constantly talked down by my Superior				
I am faced with some kind of aggression and harassment				
Psychosocial hazard could cause hypertension, anxiety, and boredom				
I work long hours				

Physical Health Hazards

Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
The noise level in my workplace is relatively high				
Loss of hearing could result from exposure to loud noise				
Extreme heat could cause body cramp				

Vibration could disorder the spine and causes fatigue				
In my work like welding, radioactive substances could be emitted and that could cause cancer and premature skin aging				
Inadequate illumination could affect the eyes				

Mechanical/Ergonomic Health Hazards

Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
When performing my job functions, I stand and or sit for a long time				
Some of the work materials at my duty post are obsolete				
I lift heavy objects manually				
The chair and materials arrangements in my workplace are very uncomfortable				
My work is repetitive and monotonous				

Ergonomic hazards could cause deformity of one's body				
Mechanical/Ergonomic hazards could cause back, neck and body pain				

Biological Health Hazards

Statement	**Strongly Agree**	**Agree**	**Disagree**	**Strongly Disagree**
Microbes could be found in some substances I work with in my workplace				
Some of this hazardous waste could impact on the health of workers				
Biological hazards could cause tubercolosis, pneumonitis, pneumonoconiosis				
Proper environmental hygiene is lacking in my place of work				

SECTIONC: MANAGEMENT STRATEGIES

Management Strategies

Statement	Strongly Agree	Agree	Disagree	Strongly Disagree
Management provides pre-employment training to create risk awareness among newly recruited employees				
There is all the time education & inspection by the department responsible in the workplace				
Management periodically calls for a health examination monitoring/surveillance				
Decisions on risks management are taken by both the management and the lower level employees				
Implementation of the on health, safety and security (HSS) programme is taken seriously by Management				
Management is completely committed to the health and well-				

being of their workers by communicating risk to us				
There is a very functional and active technological OHS System in place to have condition-based monitoring				
A system of reward and penalty for violation of safety regulation is put in place by the management				

Thank you

APPENDIX B

Krejcie And Morgan's Sample Size Determination Table

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384