PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019
54

THE ATTITUDES OF EMPLOYEES TOWARD HEALTH, SECURITY, SAFETY AND ENVIRONMENT DURING INSTALLATIONS OF TANKS AND PIPELINES IN A FUEL DEPOT IN LUBUMBASHI AIRPORT, DRC

Solomon C. Kelwon
University of Nairobi, Kenya
Institute of Human Resource Management, Nairobi, Kenya
E-mail: scckelwon@yahoo.com,

Peris K. Sogoti
University of Nairobi, Kenya
Catholic University of Eastern Africa & Kenya Institute of Management, Kenya
E-mail: periskap@yahoo.co.uk

Abstract

Lubumbashi was chosen for this study because it is the second largest city in Katanga Province in Democratic Republic of the Congo (DRC). The province is well known for the mining of many precious minerals like gold, diamond, and copper among others. The mining companies use an immense quantity of fuel, bulk diesel in their operations and aviation for their aircrafts. In the study, the target was the whole population of employees in four companies in Lubumbashi Airport. There were two fuel depot construction companies, a fuel transporter and a fuel depot. The study picked all the companies that were contracted to work in an operational fuel depot under construction. One of the researchers during the study was an Operations Manager in the fuel depot. A balance had to be done between seamless operations which were at the same time risk free. This was despite the dangers brought about by the ongoing construction which was a safety risky. It made it necessary therefore for every respondent to be targeted in the study. Data was collected using questionnaires and observation of operations. This was to ensure that every employee under target in the study is covered. The respondents were given the freedom to fill the questionnaires. The data collected were then fed into a computer and processed using the software SPSS version 20 for data analysis. Data were analyzed using descriptive statistics and inference. The findings were presented by the use of tables, figures, and bar charts which are detailed and shown in the study. This was to ensure that there was a proper understanding of the research. The details of the findings are well recorded. The three subcontracted companies were allowed to operate in a fuel depot with a lean staff for safety reasons. Of those interviewed, it was only 61 of them who agreed to return the questionnaires out of a target population of 115. This was a 53% response rate which was quite good considering the busy operations that were on going. The majority of the respondents, 98.4% were men while the rest 1.6% were female. As per the compliance to health, safety and environment, many respondents had not undergone training. This is because it was only 10.9% who had done emergency drills while 3.2% did not see the need of knowing contents in fuel tanks. Alternatively, a good number of the respondents valued the importance of safety gear, 91.2%. There is need for regular training of employees to avert serious cases of fire and accidents; since the facility falls under sensitive project in EIA/EA (Environmental Impact Assessment/Environmental Audit). The researchers recommend regular Environmental Audits from certified environmental Lead Experts.

Keywords: *safety and health, fuel depot, work environment, attitude, employees & pipeline.*

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

Introduction

Background of the Study

The importance of the study is that with poor training on safety, employees can expose a fuel facility or depot, employees, stakeholders, neighbors and country to serious dangers and calamities as far as safety is concern. The study findings were presented in a global pipeline safety conference in Abu Dhabi in United Arab Emirates where the first author had been invited to be a guest speaker.

In 2012, the Associated press reported of "a huge explosion rocked Venezuela's biggest oil refinery and unleashed a ferocious fire on Saturday, killing at least 39 people and injuring more than 80 others in one of the deadliest disasters ever to hit the country's key oil industry." They add that the refinery is close to Cardon refinery where both handle 900,000 barrels of crude and 200,000 barrels of gasoline on a daily basis for members of Organization of Petroleum Exporting Countries (OPEC). It reported that the main cause of the fire was a gas leak which was ignited leading to an explosion.

Through diverse global research studies, scholars have come to the conclusion that it is a human element that significantly contributes to the many mistakes man makes leading to disastrous accidents in our places of work (Smith & Wadsworth, 2009). In these studies, it is human carelessness, and attitudes which lead to accidents. DRC and Katanga Province is well known for the mining of diverse minerals like copper and gold in big mines. The Ebola scare has also been witnessed in this country as a result of lifestyles. All these expose employees to a lot of safety concerns.

Statement of the Problem

Governments have strict regulations to petroleum companies, require or stipulate premises and follow them up to ensure that the participants of petroleum activities do maintain high standards of a healthy safe environment and alert on emergency preparedness (Ministry of Petroleum and Energy 2005 (PSA). It is added that the sector engages many employees, for example, in Norway, 80,000 in 2005 were in employment and safety is important. Many deadly injuries and incidents reported are witnessed in construction sites as argued by Abbas, Zalat, and Ghareeb (2013). They argue further that despite such high rates of incidents, little research has been done especially in under-developed nations of the world which DRC is one of them. This necessitated the study because construction workers are involved in a lot of activities from manual work, clerical up to complex technical duties. Such kind of work exposes employees to a lot of dangers. These necessitate high level of safety consciousness (Abbas, Zalat, & Ghareeb, 2013). A lot of employees are engaged in such kind of business which is a source of income to the populace. It also enhances the per capita income of a country's workforce or population.

The above studies are in agreement with a research done recently by Silva, Araujo, Costa and Melia, (2013) in Portugal. The researchers did a study in some five Portuguese construction companies and made the following conclusions. In their reports, they found out that 26.1% of the accidents were considered serious. These were out of the 47% which had been reported in 2010. In their research findings, 26.6% and 20.6% of the accidents happened in industries and construction works respectively (Silva, Araujo, Costa, & Melia, 2013).

Abbas, Zalat, and Ghareeb (2013) argue that employees who are involved in building work especially laborers are normally involved in serious accidents up to the tune of up to 70%. This shows the severity of the problem. They add further that the majority of those who die through fatal accidents are also in this sector. Workers accounted for 13% of deaths and 18%

ISSN 2029-6932 (Print) ISSN 2538-712X (Online) https://doi.org/10.33225/pmc/19.14.54

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

were injured in Egypt. These research statistics, findings and invitation of one author to a global safety conference propelled the need for this study in DRC.

According to Hassan, Elnagar, Tayeb and Bolbol, (2013), 70.7% of employees between the ages 20 to 40 years are normally exposed to diseases caused by paints. They argue further that employees who used paints in their work were affected both neurologically and psychologically as reported. In addition, paints affected the employees' sleep, memory and also developed weak and unsteady arms or legs. They add that the uneducated were the majority who were affected and smokers. Due to their low educational background, employees' perception or attitude towards safety is compromised (Hassan, Elnagar, Tayeb, & Bolbol, 2013).

Madueme (2010) argues that fuel pipelines are normally prone to accidents caused by fires, bursts and even theft. As a result of pipelines' burst, it costs companies in terms of cash through maintenance, repairs and replacements. Such incidents occur because of lack of servicing of pipeline networks (Madueme, 2010). The methods which are used to mediate include involving communities in the protection of pipelines. On the other hand, Usman (2011) argues that when pipelines had already been installed, companies must put into consideration their life span.

Maduene (2010) did a study on fuel pipeline losses in Nigeria. She argues that major problems with spills are the environment and costs thereof. She further adds that oil spills cause serious health problems as per a research which had been done in Niger Delta. As reported, these include health problems in respiratory system, skin and deformities. It was discovered that it was frequent for pipes to burst as compared to vandalism (Madueme, 2010). In the same study, it showed that fires were a yearly occurrence between the years 2000 to 2008. This shows the importance of fire safety and serious precautions to be put in place. This calls for frequent close assessment of pipelines to be done to avoid unexpected bursts which results from lack of frequent service (Usman & Ngene, 2011). When services are done, they should be recorded. This is because insurance will require such records. Pipes do take ages but all the same their life spans are deteriorated by environmental factors like corrosion (Usman & Ngene, 2011). They are also affected by high temperatures and heat from the sun.

According to Jasper (2012), it is important to have pipelines installed with integrity. This is a safety measure to be sure that they are firm and risk free. Frequent service work and inspections are needed. Usman and Ngene (2011) and Japer (2012) agree that pipeline inspections should be done frequently at fixed frequencies. Usman and Ngene (2011) argue further that, pipeline systems increase their reliability, availability and should effectively be managed to minimize maintenance and repair. When this is done, it safeguards against any dangers which arise from pipeline failures. Such properties shall have been kept safely which will lead to high productivity, longer pipelines life, its reliability/dependence, costs minimized, and standards kept. When new pipelines are installed, we shall consider their integrity and incorporate in all plans, designing, types of pipelines and methods of installation.

Aim

Examine the attitudes of employees toward health, security, safety and environment during the installation of tanks and pipelines at a fuel depot in Lubumbashi Airport in Democratic Republic of the Congo.

Specific Objectives

1. Examine the attitudes of employees toward health, security, safety and environment during installations of tanks and pipelines in a fuel depot.
2. Assess the level of compliance of health, security, safety and environment during installations of tanks and pipelines in a fuel depot.

https://doi.org/10.33225/pmc/19.14.54 ISSN 2029-6932 (Print) ISSN 2538-712X (Online)

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

The study came up with the following hypothesis:

H_{A1} There is a significant relationship between employees' attitudes and their safety at work.

H_{A2} There is a significant relationship between compliance on standards and the safety of employees.

Theory

In this study, Maslow's theory of needs (basic and safety) shall be applicable here (Armstrong & Taylor, 2014). Here the basic need shall be employee health and safety as a higher need. They add that Alderfers ERG theory will also be relevant, that is growth, relatedness and existence. In existence, we have needs on safety and basic shall be health as that of Maslow.

Definition of words

Attitude: A person develops an attitude when somebody has some values to it (Howe & Krosnick, 2017). They argue further that this is when it comes to influencing a way of life and attachment to it.

Pipeline: These are metals made of steel to be used in transporting fuel from one storage facility to another (Zhao, Liang, Shi, Zhang, & Yang, 2015).

Safety and Health: This is a company's or persons' culture of being safe at work (Kim, Park, & Park, 2016). They add there will be a need to have some good management systems to enhance safety of employees.

Fuel Depots: These are fuel stations where fuel is stored in bulk to be used for refilling fuel trucks and also storage for emergencies (Sundar, Venkatachalam, & Rathinam, 2017).

Work Environment: It is defined as a place of work which is conducive to perform duties or tasks comfortably (Nantsupawat, Kunaviktikul, Nantsupawat, Wichaiklium, Thienthong, & Poghosyan, 2016).

Research Methodology

General Background

One of the most basic things that can be instituted to enhance health and safety is that of integrating a safety culture in the workplace. Whereas it would be expected that safety and health in an organization would be everybody's concern that is not the case in most companies (Sikpa, 2011). The study's aim is to know at the end of the research the attitudes of employees on safety at fuel depots and change such perceptions. Some of the problems which the study is trying to solve are to reduce or get rid of incidences and accidents in fuel companies.

During the course of research, one of the Safety Officers was sacked by one of the construction companies. He was accused of being too strict on safety issues which their supervisors incidentally did not see any need. They wanted to meet datelines at all costs not knowing the danger of a fire explosion burning several thousands of fuel. This can be attested by photo number 1 in the appendix I. No wonder several welding wires had been spread crisscrossing the fuel depot. A number of times, the wires got burned and the several fire extinguishers strategically placed came in handy. The existing safety carelessness of contractors put the Operations Manager's work at risk.

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

Population of the Study

A sample is a portion or subset of a larger group called a population (Fink, 2003). Sampling is a research technique used for selecting a given number of subjects from a target population as a representative of an entire population. In this study, the researchers choose the fuel depot in Lubumbashi Airport for it was convenient for research. In the study, the target was the whole population of employees in four companies. There were two fuel depot construction companies, a fuel transporter and the fuel depot. The study picked all the companies that were contracted to work in an operational fuel depot under construction.

It made it necessary therefore for every respondent to be targeted in the study. Data was collected using questionnaires and observation of operations. This was to ensure that every employee under target in the study is covered. The respondents were given the freedom to fill the questionnaires. The data collected were fed into a computer and processed using the software SPSS version 20 for data analysis. Data were analyzed using descriptive statistics and inference. The findings were presented by the use of tables, figures, and bar charts which are detailed and shown in the study.

There were eleven fuel depots in the city of Lubumbashi (Kelwon & Nzuve, 2014) during this study. It was only one fuel depot which was under study that had construction in progress and had contracted three companies. In all these four companies all their employees were selected and given questionnaires. The study used semi-structured questionnaires with closed and open-ended questions. In this study all employees who were working during the installation of new tanks and pipelines were interviewed. The target population was 115 as seen in table 1. In total the study was able to have all the 115 employees participate freely in the study.

Research Instrument and Procedures

The study employed the use of a questionnaire as the main research instrument. An instrument is a research tool which assists researchers in collecting data. Due to the sensitivity plus complex nature of the study and logistical issues, the questionnaires were considered ideal. The questionnaires were administered to the respondents on site. All questions were filled with the help of the researchers.

Demographic Statistics

This section discusses the demographics of the participants where the gender, marital status, age, experience, training and level of education of respondents are highlighted in the next tables 2, 3 and figures 1, 2, 3, 4. These shall be discussed further in the discussion section of this study.

Data Analysis

Quantitative analysis data was driven from the demographic section of the questionnaires. Other open ended and closed questions were analyzed using descriptive statistics like percentages and frequencies. The data were then computed using the Statistical Package for Social Science (SPSS), 20.

https://doi.org/10.33225/pmc/19.14.54 ISSN 2029-6932 (Print) ISSN 2538-712X (Online)

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

Research Results

Response Rate

It was only 61 or 53.04% of the respondents who agreed to participate and return the questionnaires. This was a good turnout or response rate. In all the fuel depots in Lubumbashi city, the study findings were representative of other fuel depots. This is because it was only one fuel depot being studied which was under construction in that period.

Table 1. Response rate of study.

Company	Questionnaires Returned	Percentage (%)	Total Number of Employees	Turn out Percentage (%)
Kapita Construction	6	9.8	34	17.65
BSL Construction	35	57.4	37	94.59
CP Fuel Depot	8	13.1	29	27.59
Fuel Transport Co.	12	19.7	15	80
Total	61	100	115	53.04

Some of the participants, 54 of them who were targeted declined to be interviewed (46.96%). In this study, a visit was made to all the selected companies where a voluntary participation of the participants was sought. The four companies picked performed diverse tasks like selling oil and gas (CP fuel depot), transporting fuel, construction of fuel depots (BSL), roads or other works (Kapita).

Gender of Respondents

Table 2. Gender of respondents.

Gender	Frequency	Percentage (%)
Female	1	1.6
Male	60	98.4
Total	61	100

In this field study, 98.4% of the participants were male employees drawn from four different companies operating in Lubumbashi in the Democratic Republic of Congo. Apart from one site, the rest did not have female employees, and only one female employee, 1.6% participated in this research study (table 2).

Table 3 indicates that 90.2% of the respondents were married while the rest (9.8%) were single. Figure 1 indicates that most of the respondents interviewed, 41%, were between the ages of 35 – 45 years while 37.7% were between the ages of 27 – 34 years, 11.5% were over 46 years with 9.8% being between 18 – 26 years. In figure 2, 31.1% of the respondents had attained college level, 19.7% university while only 1.6% had no education. The respondents who had worked over 5 years were 19.7% while the majority, 44.3% had one year and under of work experience.

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

Table 3: Marital status of respondents.

Status	Frequency	Percentage (%)
Married	55	90.2
Single	6	9.8
Total	61	100

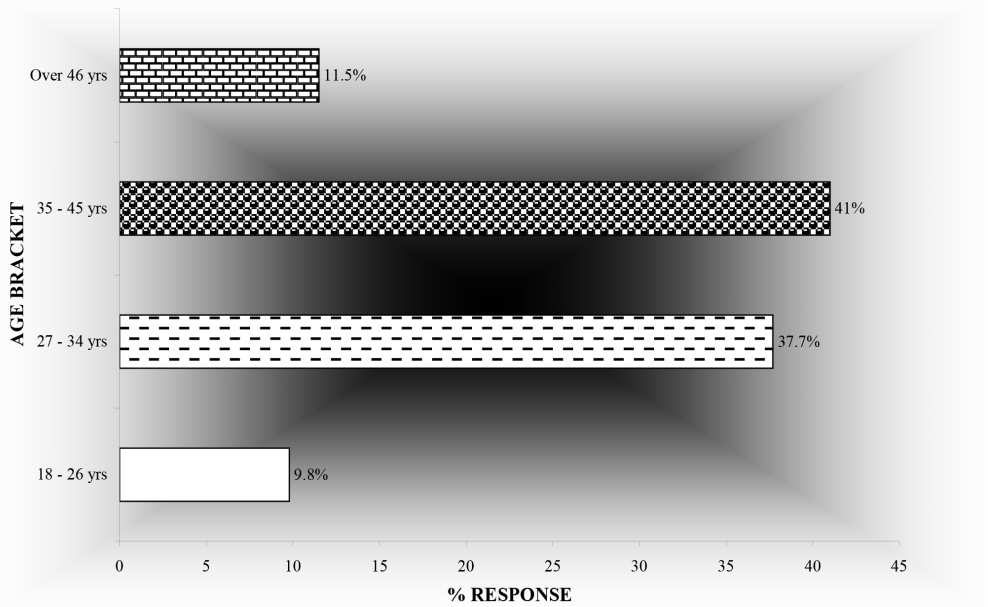

Figure 1. Age bracket of respondents.

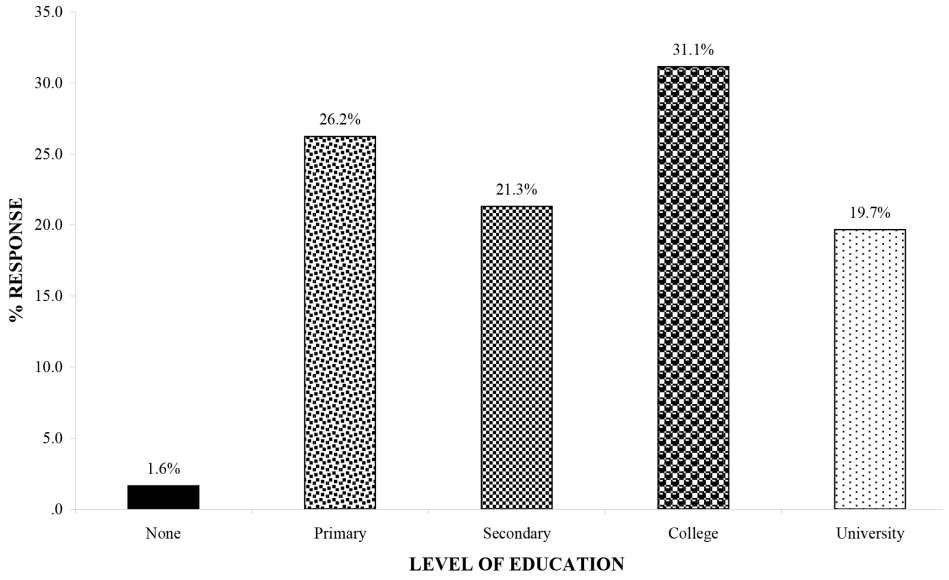

Figure 2. Level of education of respondents.

https://doi.org/10.33225/pmc/19.14.54 ISSN 2029-6932 (Print) ISSN 2538-712X (Online)

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

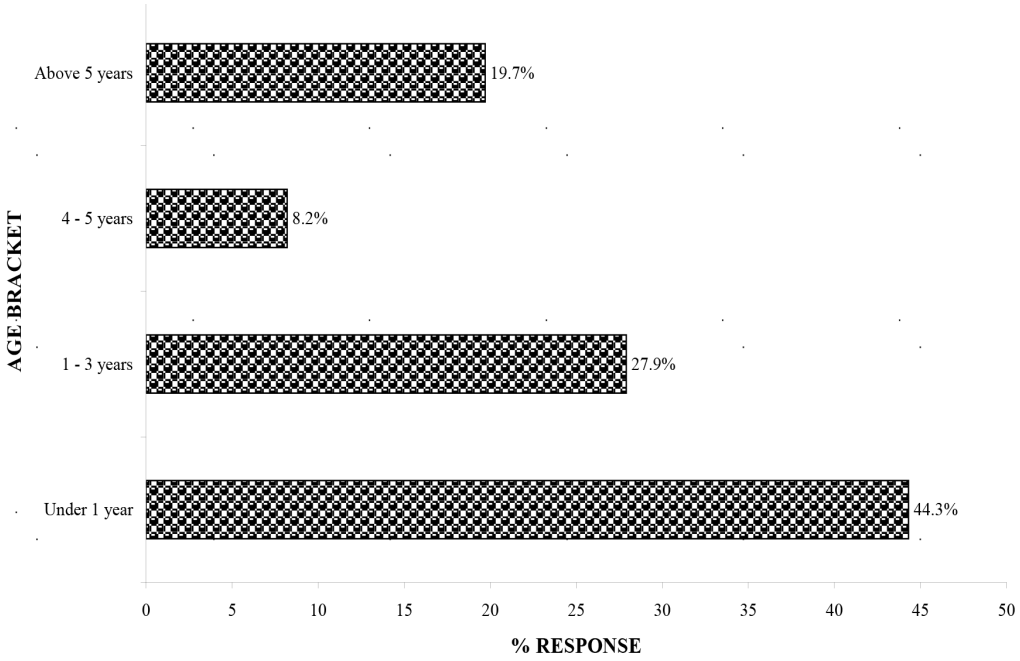

Figure 3. Duration of service in company.

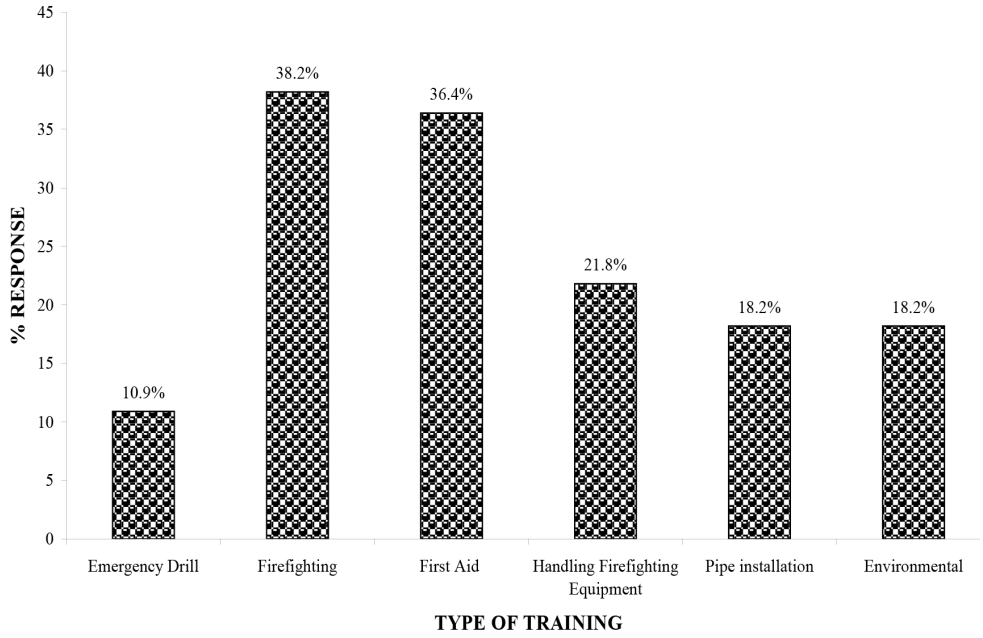

Figure 4. Types of training received.

There is a need for all players within the fuel industry in Lubumbashi and globally to come up with benchmarks of frequent and regular training for all employees as per international fuel standards (figure 4). This will safeguard against the safety dangers in fuel depots.

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

Empirical Results

Attitudes of Employees on Safety

Employees Practices at Fuel Depots

As can be seen next in Figure 5, 65.1% of the respondents strongly agreed that phones, matches and lighters shouldn't be used at fuel depots, while 17.5% agreed, 11.1 strongly disagreed, 3.2% disagreed and a similar number neither disagreed nor agreed. On the other hand, 66.7%% of the respondents strongly agreed and 22.2% agreed that all employees are aware of the assembly point while 3.2% neither agreed nor disagreed and an equal percentage strongly disagreed while 4.8% disagreed. When asked whether major fuel spill should be poured a lot of water on 42.9% strongly agreed, 30.2% agreed while 22.2% strongly disagreed, 3.2% disagreed and 1.6% neither disagreed nor agreed. On a diagram on tank contents being for safety reasons 61.9% strongly agreed, 28.6% agreed while 6.3% neither agreed nor disagreed and 3.2% strongly disagreed.

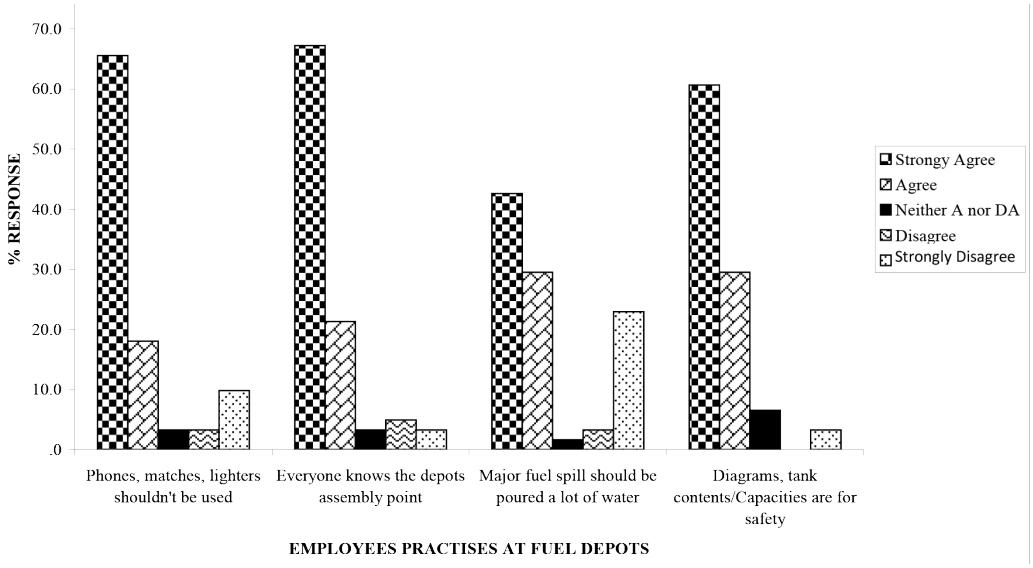

Figure 5. Employees practices at fuel depot.

Emergency Responses in Fire Outbreaks

Figure 6 gives the findings on employee's knowledge on fire emergency responses. Fifty- eight-point seven percent (58.7%) of the respondents strongly agreed that in case of fire one should shout Fire!! Fire!!! While 30.2% agreed, 4.8% disagreed 3.2% strongly disagreed while an equal number neither agreed nor disagreed. On putting on fire alarm and running to assemble point, 69.8% strongly agreed while 20.6% agreed. Fifty-five point six per cent (55.6%) of the respondents strongly agreed that in case of fire, one was expected to call the fire brigade and ambulance while 25.4% agreed, 7.9% neither agreed nor disagreed, 6.3% strongly disagreed and 4.8% disagreed. Most of the respondents were against a whole fuel truck fire that is on fire being poured water on with 34.9% strongly disagreeing, 11.1% disagreed while on the hand 22.2% strongly agreed, 19.0% agreed while 12.7% neither agreed nor disagreed.

https://doi.org/10.33225/pmc/19.14.54 ISSN 2029-6932 (Print) ISSN 2538-712X (Online)

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

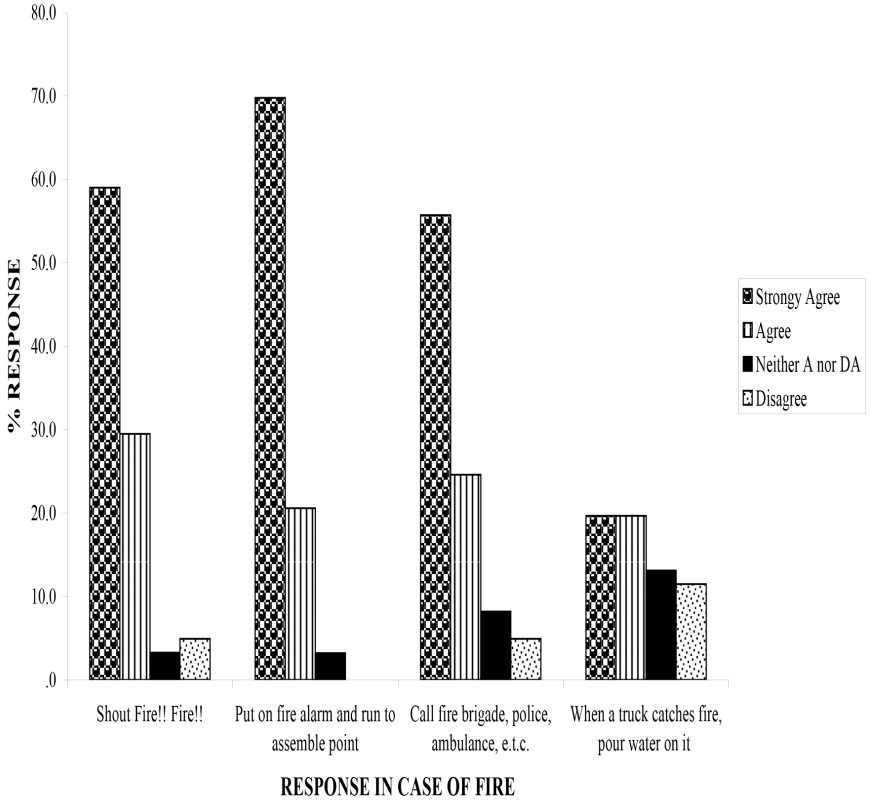

Figure 6. Emergency response in cases of fire.

Knowledge of Emergency Responses

On the knowledge of emergency responses at fuel depots as shown in figure 7, most of the respondents were aware that hazardous materials should be thrown away from the depot with 45.9% of the respondents strongly agreeing, 36.1% agree while 13.1% strongly disagreed, 6.6% disagreed and 6.6 neither disagreeing nor agreeing. When asked to comment on whether fuels or oils should not be spilled in fuel depots 62.4% strongly agreed, 16.1% agreed while 13.1% strongly disagreed, 6.6% disagreed and 1.6% neither agreed nor disagreed. On fires in fuel depots being put off using fire extinguishers, 27.9% strongly agreed, 26.2% agreed, 23% strongly disagreed, 9.8 disagreed while 13.1 neither disagreed nor agreed.

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

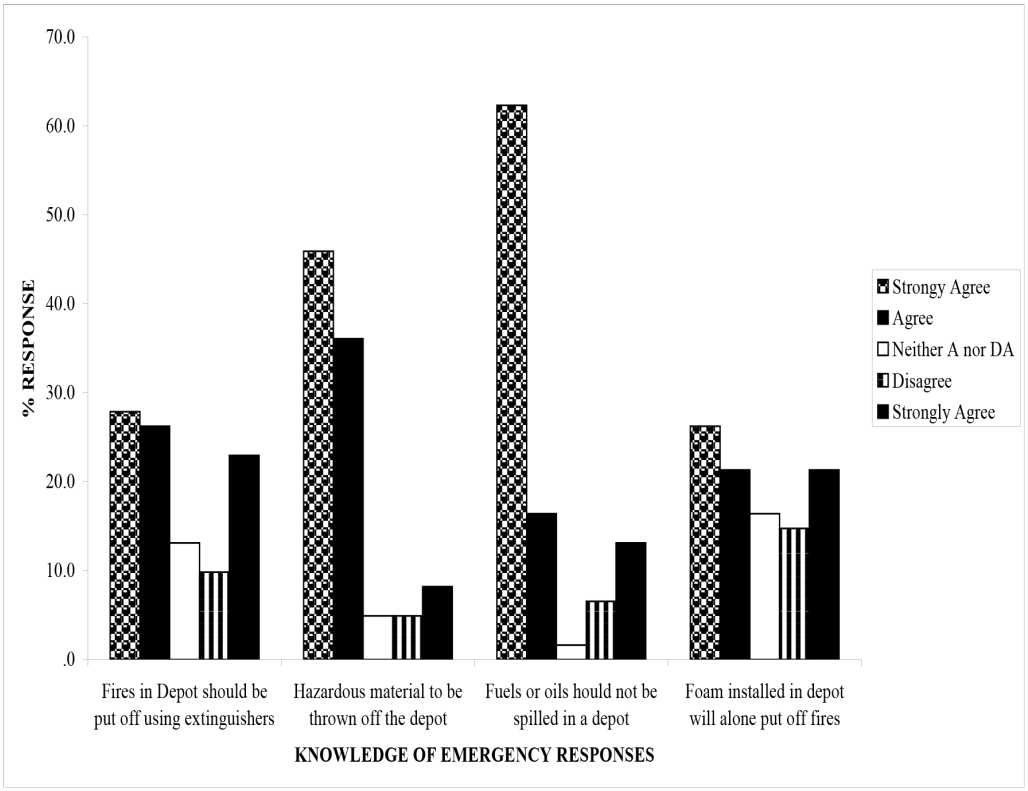

Figure 7. Knowledge of emergency responses.

Employees Compliance on Safety Standards and Practices at Work

Organizations will be able to comply with safety standards and practices depending on their policies. In this study, it is a total of 90.2% of the employees that are above the age of 27 years. It shows that the policy of such organizations value mature citizens to work for they are stable persons in society. With proper education, employees will value safety at work. In the study under investigation, 98.3% of the employees acquired education from primary to university. In a fuel depot, which is a hazard area, education is critical especially in tanks and pipeline installations.

When it comes to training, it is paramount that organizations have well trained employees in their areas of specialization. In this study, 18.2% of the employees had the expertise in installation of pipelines. This is reasonable considering that it was only BSL (57.4%) and no other organization was involved in that kind of work which needed their expertise. Other contracted companies had their own roles to play. In this nature of work, experience was also needed. In all the four companies, 55.8% of them had an experience between 1 to over 5 years. This is reasonable considering the expertise of employees where most of them were mobile as they looked for greener pastures.

Knowledge of compliance and Safety Measures

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

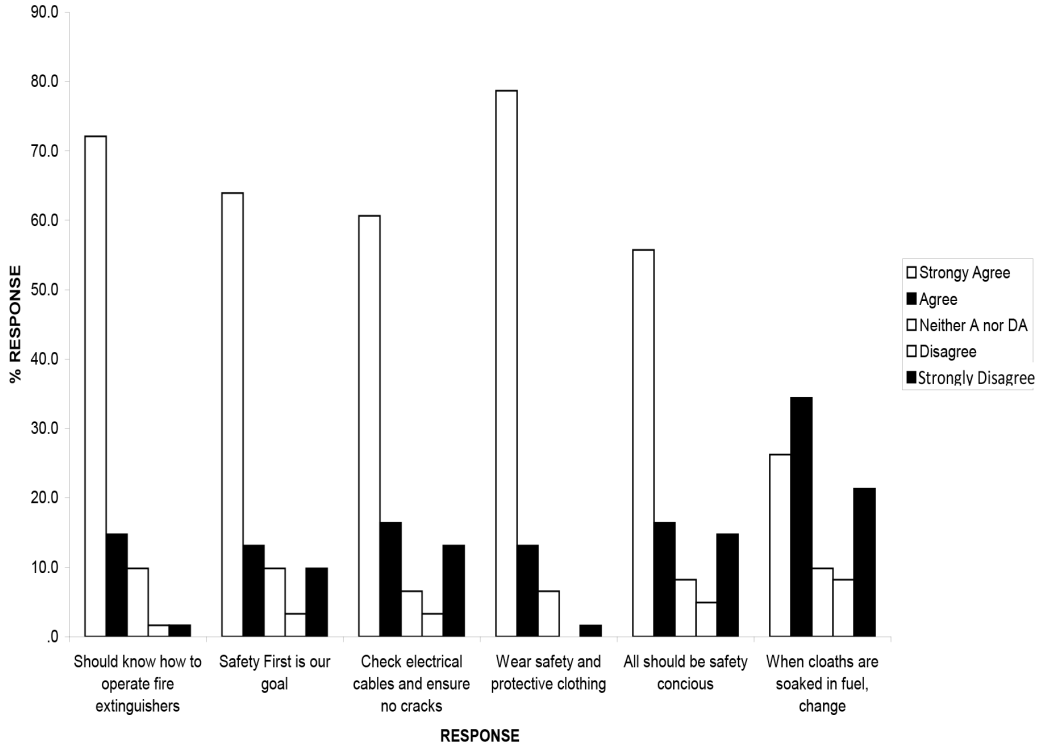

Figure 8. Knowledge of safety measures.

As can be seen from figure 8, measuring employee's knowledge on safety measures at fuel depots, had most of the respondents, 91.8% being aware that protective clothing should be worn within fuel depots. This can be derived from the figure above where 78.7% of the respondents strongly agreed to this while 13.1% agreed. The next safety measure that most of the respondents, 86.9% concurred with was that employees at fuel depots should know how to operate fire extinguishers with 72.1% strongly agreeing, 14.8% agreeing. When asked about safety being the first goal in a fuel depot, 63.9% strongly agreed, 13.1% agreed while 9.8% neither agreed nor disagreed with an equal number strongly disagreeing while 3.3% disagreed. Sixty-point seven percent (60.7%) of the respondents when asked whether it is necessary to check electrical cables and ensure there are no cracks, 60.7% strongly agreed, 16.4% agreed while 13.1% strongly disagreed, 6.6% neither disagreed nor agreed and 3.3% disagreed. On employees being safety conscious within fuel depots, 55.7% strongly agreed, 16.4% agreed while 14.8% strongly disagreed, 8.2% neither agreed nor disagreed and 4.9% disagreed. When questioned on whether clothes that are soaked in fuel should be changed, 34.4% agreed, 26.2% strongly agreed while 21.3% strongly disagreed, 9.8% neither agreed nor disagreed and 8.2% disagreed.

Handling Measures at Fuel Depots

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

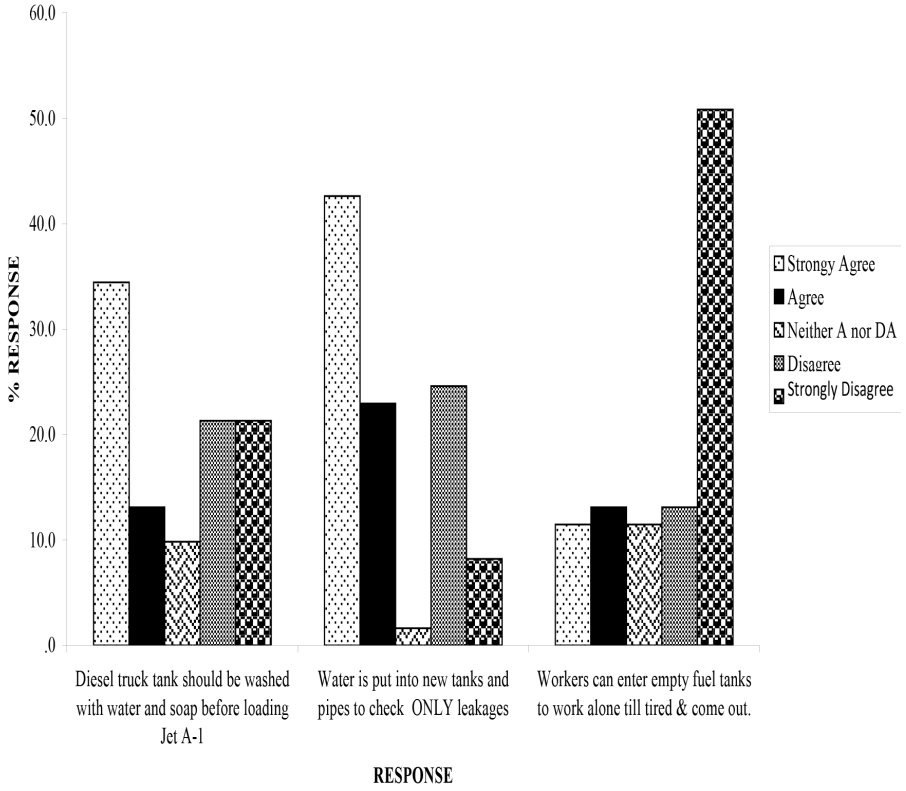

Figure 9. Handling measures at fuel depots.

Figure 9 indicates that 34.9% of the respondents strongly agreed that diesel trucks should be washed with water and soap before loading Jet A-1 fuel. Soap is the worst contaminant of Jet A-1 which the respondents did not know. On the other hand, 22.2% neither agreed nor disagreed, 19% disagreed, 12.7% agreed and 1.6% strongly disagreed. When they were asked to comment on water being put on to new tanks and pipes to check only leakages 44.4% strongly agreed, 22.2% agreed while 23.8% disagreed, 7.9% strongly disagreed and 1.6% neither agreed nor disagreed. On workers entering empty fuel tanks to work till tired and come out, most of the respondents 49.2% strongly disagreed, 12.7% disagreed, 11.1% neither agreed nor disagreed while 15.9% agreed and 11.1% strongly agreed.

Organizational Culture on Safety and Emergency Responses

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

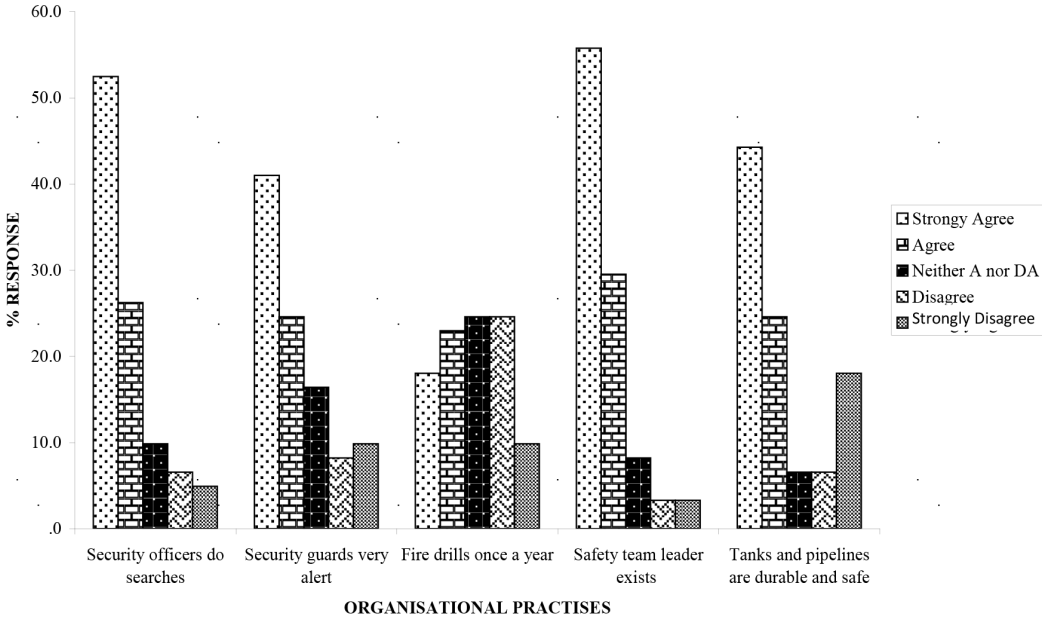

Figure 10. Organizational culture of safety and emergency responses.

The study was also able to have hindsight on the organizational culture in fuel depots through five questions in the Likert Scale. In the fuel depots safety team leaders exist. This is evident from the responses given where 55.7% strongly agreed, 29.5% agreed with 3.3 % strongly disagreeing and a similar number disagreeing while 8.2% neither agreed nor disagreed. At the same time security officers always undertook searches on people and vehicles entering fuel depots. Fifty-two-point five percent (52.5%) strongly agreed to this while 26.2% agreed, 9.8% neither agreed nor disagreed and 6.6% disagreed and 4.9% strongly disagreed. On the tanks and pipelines being durable and safe, 44.3% of the respondents strongly agreed, 24.6% agreed while 18.0% strongly disagreed, 6.6% disagreed as well as neither agreed not disagreed. When asked whether fuel depots security guards were very alert, 41% of the respondents strongly agreed, 24.6% agreed while 9.8% strongly disagreed, 8.2% disagreed and 16.4% neither agreed nor disagreed. On fire drills being carried out once a year, 24.6% of the respondents neither agreed nor disagreed while a similar percentage disagreed. Twenty three percent (23%) of the respondents agreed that fire drills were carried out once a year while 18.0% strongly agreed while 9.8% disagreed.

Discussion

Demographics

In this field study, 98.4% of the participants were male employees drawn from four different companies operating in Lubumbashi in the Democratic Republic of Congo. This is as compared to 1.6% of female employees. On the other hand, 90.2% of the respondents were married while the rest (9.8%) were single. 41%, were between the ages of 35 – 45 years while 37.7% were between the ages of 27 – 34 years. Most of the respondents, 31.1%, had made it up to the tertiary level while 26.2% had attained primary education as their highest level of education, 21.3% secondary and 19.7% were university graduates. 44.3% had been with their current organization for less than one year while 27.9% for between 1 – 3 years. It was found

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

out that cumulatively, the number of respondents who had been with their current organizations for more than four years were 27.9%. In addition, it was found out that most of the respondents (38.2%) had undergone training on firefighting, while 36.4% had first aid training.

Attitudes of Employees

We shall next discuss the employees' attitudes in fuel depots. In a fuel depot, diagrams, tank contents, and capacities must be shown for safety reasons. In our study, 90.5% of the respondents agreed to this. These are important about fuel spillage during loading, offloading fuel into tanks or trucks. Disasters shall be avoided when this safety measure is taken into consideration during operations. It is important for a fire assembly point or location to be known in a fuel depot. The findings of our study showed that 88.9% agreed to this. People are supposed to assembly here during fire outbreaks in fuel depots or any other business premise.

Fires are disasters in fuel depots which should be contained at all costs. Fires are generated with the existence of oxygen, fuel and ignition. In this study, it was only 82.6% of the respondents who agreed that phones, matches and lighters should not be used at a fuel depot. Fires should only be lit at designated places like kitchens which are far from fuel. In a fuel depot, a major fuel spill should be poured a lot of water after some has been pumped into extra storage tanks. In this study, 73.1% were in agreement to this safety precaution.

In the next discussion, we shall handle emergency responses in case of fire. We are required to put on a fire alarm and fight the fire with all available equipment. When somebody is not knowledgeable, should run to a fire assembly point. In the study, 90.4% were in agreement to this. Secondly, in case of fire, we should shout fire! Fire! The percentage of the respondents who agreed to this was 88.9%. In case of a fire, people should call the fire brigade, police and ambulance. It was only 81% of the respondents who agreed with this. These stakeholders will save the situation by responding to that emergency. In a situation where a whole truck catches fire, we are not supposed to pour water on it. If we do that, fuel will float, and fire will increase the more. 46% of the respondents disagreed to the statement that we are supposed to pour water.

Finally, employees in fuel depots should be knowledgeable on emergency responses. In the study, most of the respondents, 82% were aware that hazardous materials should be thrown away from fuel depots. This is because they will be sources of combustion. When the respondents were asked to comment on whether fuels or oil should not be spilled in fuel depots, 78.5% agreed. These are also fire causing agents. On the comment that fires in fuel depots should be put off using fire extinguishers, it was only 54.1% that agreed. It showed their little knowledge on the importance of fire extinguishers.

The study came up with the following first alternative hypothesis:

H_{A1}There is a significant relationship between employees' attitudes and their safety at work.

There is a big relationship between employees' attitudes and their safety at work. In the study findings, a good percentage of the respondents, 17.5% were of the opinion that phones, matches and lighters can be used in a depot or neither agreed nor disagreed. Such an attitude can be very risky in a fuel depot because such kind of employees can burn it by mistake or through ignorance. When it came to a major fuel spill in a depot which should be poured a lot of water, 27% of the respondents either did not agree or were not sure. That is a very big percentage which can expose a fuel depot to fires.

https://doi.org/10.33225/pmc/19.14.54 ISSN 2029-6932 (Print) ISSN 2538-712X (Online)

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

Compliance on Safety Standards

Fuel depots should have compliance to all safety standards. These include training, educating employees well, and recruiting those with enough experience. In this study, the respondents were in agreement on education, 98.3%, age 90.2%, experience 55.8% and training, 18.2%. It was only a small percentage who did not see the value for training. Employees should have knowledge of safety measures in fuel depots. In this study, 91.8% of the respondents agreed that employees should have protective equipment and clothing. Another safety measure where most respondents, 86.2% concurred was that employees at fuel depots should know how to operate fire extinguishers. In a fuel depot, electrical cables should be checked and ensured that there are no cracks. About 77.1% of the respondents agreed to this. Fuel trucks and other vehicles should not be allowed to enter depots if they have defects to avoid these causing fires. A small number of respondents, 77% agreed that safety first should be the main goal of fuel depots. All should generally be safety conscious where 72.1% agreed with this principle.

Another safety measure in fuel depots which we shall tackle next is handling measures. Water is put into new tanks and pipelines are not to check only leakages but also the integrity of pipes. There were 66.6% of the respondents who agreed with this which showed their lack of knowledge. A good percentage of respondents, 61.9% were in agreement that workers enter empty fuel tanks to work alone till tired and then come out. This is not safe, and hence many employees were not knowledgeable on this. It will risk the workers to work in such an environment. The comment that diesel trucks should be washed with water and soap before loading Jet A-1 gave the result of 47.6% of the respondents agreeing. It showed their ignorance on the risks of doing that. Soap is the worst contaminant to Jet A-1. It was only the fuel depot who could have been the only ones who disagreed, 20.6%.

Finally, an organizational culture is a contributing factor in properly handling safety and other emergencies. The study was able to bring into some insight on the organizational culture of the fuel depot. Safety team leaders existed since 85.2% of the respondents agreed. Security officers always did searches on people and vehicles entering the fuel depot as agreed by 78.7% of the respondents. It was also found out in this study that, 65.6% of the respondents agreed that security guards were very alert. Finally, 41% of the respondents agreed that fire drills were carried out once per year. It showed this was a rare safety measure done in the four companies.

In the study, we had the following second alternative hypothesis:

H_{A2}There is a significant relationship between compliance on standards and the safety of employees.

Employees should comply with standards for their safety at work. To work in a fuel depot or even construction companies, it requires that employees have some basics in handling emergencies. In this study, it was only 10.9% of the respondents that had been trained on emergency drills. This was a very small percentage which meant that in case of any emergency, many employees will perish in the fuel depot. The respondents who had been trained on pipeline installation and environment were 18.2% each, respectively. It meant that those untrained employees if they were to install pipelines, they were to have questionable integrity. This was a safety concern.

Conclusions

Findings from this study reveal that most of the employees in the gas and oil industry in Lubumbashi, DRC do not have adequate training in emergency drills, firefighting, first aid and handling of firefighting equipment. At the same time training in pipeline installation was wanting. The study further revealed that the employee's knowledge and practices as pertaining to health and safety measures within fuel depots was poor. This was further supported by the

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

pictures which were taken that showed cases of human carelessness and recklessness within the fuel depots. In one of the pictures, a welder welds metals at very close proximity to fuel tankers and trucks offloading fuel. It was evident from the study that the organizational culture around safety and health measures within fuel depots was greatly hampered by employee's attitudes, more so towards safety and health issues.

The study recommends that future researchers investigate attitudes of employees on safety in other countries and economies. This will help in making conclusions of study. The study resorted to using a survey research. A sample of all fuel depots in Lubumbashi was done. All depots were not studied because it could have been tedious because other depots were not doing construction operations. All employees for the companies in operation in the fuel depot were interviewed. Through this, the study was exhaustive. Employees were given the choice to freely fill and return the questionnaires. Through this, they were required to cooperate with their supervisors so as not to become a hindrance to operations which were ongoing, and the study would not become a security and safety threat. As a result, the study met its objectives.

Following the state of training levels, employees' knowledge and practices within fuel depots, it is important that a raft of measures be adopted. First, there is need for all players within the fuel industry in Lubumbashi and globally to come up with benchmarks of frequent and regular training for all the employees as per the international standards. At the same time there is need for all the regulatory frameworks regarding health, safety of employees and that of fuel depots to be strictly adhered to. This includes abiding by governments' occupational safety and health. Security managers should be further trained in handling of all fire equipment within a depot and in emergency controls. Fire drills should not only be limited to the staff and people within fuel depots but should also be coordinated with other stakeholders such as neighbors, airport personnel and national security agents. At the same time all fire equipment and water hydrants should be regularly checked and serviced.

Acknowledgements

Foremost is to acknowledge CP fuel depot head of department or supervisor for allowing this study to be carried out. The fellow employees are also worth appreciation and the respondents in this study. Our families and children, Enoch Toroitich, Abigail Jerop, & Elisha Tuitoek deserve acknowledgement. They accorded their valuable time and patience in carrying out research and even being away to deliver the findings in Abu Dhabi, UAE. The global conference organizers, Flaming Gulf are hereby also sincerely appreciated for their invitation and privilege to present this paper and findings in their global conference with other experts from diverse parts of the world. Last but not least is to thank God for security, safety, health and life when carrying out this study in a hazardous gas and oil environment. PMC publishers are also appreciated for their peer reviewing, diligently correcting our mistakes, making suggestions and finally accepting to publish this research.

References

Abbas A. R., Zalat, M. M., & Ghareeb, N.S.E (2013). *Non-fatal occupational injuries and safety climate: A cross sectional study of construction building workers in Mit - Ghamr City*, Dakahlia Governorate, Egypt. Retrieved on November 8th 2017 from http://dx.doi.org/10.4236/ojsst.2013.34009.

ACSNI (1993). *Third Report (Organizing for Safety) of the Human Factors Study Group, Advisory Committee for Safety in Nuclear Installations*. HSE Books, Suffolk.

Alexendar, M. (2004). *The notion of safety culture and employee attitudes to safety within a UK North Sea and USA Gulf of Mexico offshore environment*. Loughborough University Business School.

Armstrong, M., & Taylor, S. (2014). *A Handbook of Human Resource Management Practice*. London, Kogan Page Publishers.

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

Associated Press (2012). Refinery blast kills 39 in Venezuela, dozens hurt. *A news report*, retrieved on September 19th 2018 from https://newsinfo.inquirer.net/257966/refinery-blast-kills-26-in-venezuela-dozens-hurt#ixzz5RWFhoWb0.

Calixto, E., Moraes, C. D. C., Outi, C. A., & Santos, W. A. (2013). Risk assessment methodology to support shut down plant decision. *Open Journal of Safety Science and Technology*, *3*(4), 116-124. Retrieved on November 8th 2017 from doi:10.4236/ojsst.2013.34015

Cox, S. (1996). Safety culture in organisational change. *OIM Conference on Offshore Management of Change*, February. Robert Gordon University, Aberdeen.

Fink, A. (2003). *How to sample in surveys*. 2nd Edition. Thousand Oaks: Sage.

Hassan, A. A. E. H, Elnagar, S. A. E. M., Tayebm, I. M. E., & Bolbol, S. A. E. H (2013). *Health hazards of solvents exposure among workers in paint industry*, 3. Published online December (http://www.scrirp.org/journal/ojsst) and http://dx.doi.org/10.4236/ojsst.2013.34011.

Howe, L. C., & Krosnick, J. A. (2017). Attitude strength. *Annual Review of Psychology, 68,* 327-351. Retrieved on May 27th 2019 from http://doi:10.1146/annurev-psych-122414-033600.

Jasper A. (2012). Oil/Gas pipeline leak inspection and repair in under water poor visibility conditions: Challenges and perspectives. *Journal of Environmental Protection*, *3*(5). Article ID: 19510. Retrieved from http://doi:10.4236/jep.2012.35049.

Kelwon, S., & Nzuve, S. N. M. (2014). Attitudes of shop floor employees toward women managers in fuel depots: A case of fuel depots in Lubumbashi, Democratic Republic of the Congo. *Problems of Management in the 21st Century, 9* (3), 206-212.

Kim, Y., Park, J., & Park, M. (2016). Creating a culture of prevention in occupational safety and health practice. *Safety and Health at Work, 7*(2). Retrieved on 27th May 2019 from https://doi.org/10.1016/j.shaw.2016.02.002.

Lhao, Y., Liang, P., Zhang, Y., & Yang, T. (2015). The pitting susceptibility investigation of passive films formed on X70, X80, and X100 pipeline steels by electrochemical noise and Mott-Schottky measurements. *International Journal of Corrosion,* Article ID 298584. Retrieved on 27th May 2019 at http://dx.doi.org/10.1155/2015/298584.

Mutwil, K. (2011). Effect of creep characteristics on pipeline durability. *Journal of Achievements in Materials and Manufacturing Engineering*, *48*(1), 97-102.

Nantsupawat, A., Kunaviktikul, W., Nantsupawat, R., Wichaiklium, A., Thienthong, H., & Poghosyan, L. (2016). Effects of nurse work environment on job dissatisfaction, burnout, intention to leave. *International Nursing Review, 64*(1), 91-98. Retrieved on 27th May 2019 from https://doi.org/10.111/inr.12342.

Sikpa, F. C. (2011). *An assessment of occupational health and safety practices on job performance at the Tetteh Quarshie Memorial Hospital*, Mampong-Akuapem. Kwame Nkrumah University of Science and Technology.

Silva, S., Araujo, A., Costa, A., & Melia, J.L. (2013). Safety climates in construction industry: Understanding the role of construction sites and work groups. *Open Journal of Safety Science and Technology*, *3*. Retrieved on November 8th 2017 from http://dx.doi.org/10.4236/ojsst.2013.34010.

Stella, M. (2010). Pipeline production losses in the Nigerian oil industry from 1999 to 2008. *International Journal of Engineering Science and Technology*, *2*(8), 3451-3455.

Sukarno, P., Sidarto, K.A., Trisnobudi, A., Setyoadi, D.I., Rohani, N., & Darmadi (2007). Leak detection modeling and simulation for oil pipeline with artificial intelligence method. *ITB Journal of Engineering Science, 39*(1), 1-19.

Sundar, K., Venkatachalam, S., & Rathinam, S., 2017). *An exact algorithm for a fuel-constrained autonomous vehicle path planning problem*. Retrieved on 27th May 2019 from https://www.researchgate.net/publication/301818164_An_Exact_Algorithm_for_a_Fuel-Constrained_Autonomous_Vehicle_Path_Planning_Problem.

Usman, M. A. & Ngene, S. E. (2011). An Innovative Approach to Managing the integrity of Oil and Gas Pipelines: Pipeline Integrity Management System. *Petroleum and Coal*. 54(1).

Smith, A. P., & Wadsworth, E. M. J. K. (2009). Safety culture, advice and performance. *Report submitted to the IOSH Research Committee, Centre for Occupational and Health Psychology*, Cardiff University, 63 Park Place: Cardiff, CF10, 3AS, UK.

PROBLEMS
OF MANAGEMENT
IN THE 21st CENTURY
Vol. 14, No. 1, 2019

Appendix I

Site Photos

Photo No. 1. Datelines set to finish project where safety is a concern as fuel is offloaded & loaded. Complete construction of tanks and pipelines to alleviate fuel storage issues. Source: 1st Author.

Received: *February 16, 2019* Accepted: *June 28, 2019*

Solomon C. Kelwon	M.B.A, Human Resources Management (University of Nairobi, Kenya); Aviation, Operations & Safety Manager (Over 10 years, East & Central Africa); Aviation/ Operations Fuel & HR Consultant (Nairobi, Kenya). E-mail: scckelwon@yahoo.com, Website: https://www.linkedin.com/in/solomon-kelwon-author-mihrm-mkim-mba-317a8644
Peris K. Sogoti	M.A, Environmental Planning and Management (University of Nairobi); Lead Expert (National Environmental Management Authority, NEMA) & Lecturer, Catholic University of Eastern Africa & Kenya Institute of Management, Nairobi, Kenya. E-mail: periskap@yahoo.co.uk

https://doi.org/10.33225/pmc/19.14.54 ISSN 2029-6932 (Print) ISSN 2538-712X (Online)