Original Research Article

Hazards and Risks Control Measures among Petrol Filling Stations in Obio/Akpor, Rivers State

Abstract

This research was aimed to identify the hazards and risks control measures among petrol filling stations. It identified the hazards and risks; employees that participated in identifying hazards and controls measures with management commitment towards safety. This study adopted a descriptive research method and a closed ended questionnaire was used via purposeful sampling methods and analyzed with Microsoft Excel as a statistical tool. A total of 116 questionnaires were distributed to respondents from 35 filling stations within Obio/ Akpor local government area in Rivers State in 2022.Result showed 11% of the population strongly agreed to identify hazards in the petrol stations, 50% agreed, 32% disagreed while 14% strongly disagreed. This resulted from spill of petrol products, use of mobile phone at dispensing pumps, poor housekeeping and ruptured hose and nozzles. Thirty two percent (32%) of the respondents strongly agreed to employee's participation in hazard identification, 42% agreed, 21% disagreed while 12% strongly disagreed. This indicated little participation of employees in hazard identification based on the absence of safety training in most petrol stations. Thirty three percent (33%) strongly agreed to hazards and risks control measures in place, 21% agreed, 40% disagreed while 13% strongly disagreed. This showed that hazards and risks control measures were not effective to prevent accident. Twenty four percent (24%) strongly agreed to management commitment to safety, 29% agreed, 42% disagreed while 12% strongly disagreed. This indicated that management did not consider safety as important as productivity. These findings showed lack of safety consciousness in petrol stations and the absence of Health, Safety and Environmental Officers. Therefore, there is need for improvement by management and hence, the effectiveness of hazards and risks control measures to ensure the elimination of hazards/risks within the petrol filling stations.

Keywords: environmental safety; hazard and risk control measures; petrol filling stations; Obio/ Akpor Local Government Area.

1. INTRODUCTION

Petrol filling stations (PFS) are an important segment of the downstream sector of the petroleum industry where refined products like premium motor spirit (PMS), gasoline, kerosene, diesel and propane low pressure gas (cooking gas) are stored in wells and tanks for retail. This process is a safety critical activity, which requires full hazard and risk control in place from its design and construction phase as well as its installation and maintenance process. There is risk of an accident occurring at the PFS facility, which is caused by unsafe acts or unsafe circumstances in the facility. This can be generated from few factors recorded throughout the operation and maintenance of petrol filling station: housekeeping, transportation hazards, trips, slips, and fall, negligence, fire, electrical fault and miscellaneous cases (Mohd et al., 2015). Concerns about the health risks of workers being exposed to fuel vapor have grown (Lynge et al., 1997), therefore, there is a need to assess hazard and risk control measures at PFS in other to prevent potential accident form occurring.

Firstly, the key variables to consider while sitting a petrol station, are convenience of access, traffic effect, and environmental safety. Many land uses along Nigeria's arterial roadways, on the other hand, defy physical planning and development control techniques (Akinsulire & Fadare, 2020). As a result, Ayodele (2011) found that the aforementioned factors play a substantial role in fire and explosions, as well as traffic congestion. Based on an analysis of the environmental implications of petrol filling stations in residential neighborhoods' in Maiduguri and Jere, it was discovered that fuel stations in the area do not adhere to the 100m guideline away from residential environments.

As a result, they discovered that the presence of petrol filling stations in residential districts had a number of severe health and environmental consequences (Msheila et al., 2015). According to Akinsulire & Fadare (2020), fuel filling stations have severe environmental implications. Mohd et al. (2017) conducted additional investigations on the environmental implications of fuel filling stations). In terms of adherence to development control requirements, Ayodele (2011) found that numerous petrol filling stations in Kaduna were not in compliance with planning standards, particularly setback and minimum distance regulations. Tah (2017) found similar results in a study of filling stations in Kaduna city, albeit the study found that filling station ownership (public or private) was a significant factor of conformity/adherence to development control. Ojiako et al. (2016) revealed in his research that a large number of filling stations in Port Harcourt do not have enough setbacks (that is, 15m from the abutting roads). The fact that they are located under electricity high tension lines and the right of way was much more concerning.

Similarly, Okoye et al. (2020) found that just 44.1 percent of gas filling stations in Anambra State conformed to development control norms in a recent survey. Similarly, Arokoyu et al. (2016) examined how well fuel filling stations adhered to growth control restrictions such as a 15-meter setback and a 400-meter separation between two filling stations. They discovered that the fuel stations are out of compliance with physical and development control rules. According to Afolabi (2011), majority of fuel filling stations in Kaduna were unsuitably positioned on marginal lands that were prone to dangers. Putting gas stations in inconvenient locations can result in a slew of health and environmental issues.

Apart from the risks associated with the location of PSFs, the most serious risks associated with a petrol filling station are highly toxic releases, fire, and explosion. Fire is the most prevalent cause of accident (Cruz & Okada, 2008), nonetheless, explosions are more serious because of the potential for devastation, which commonly results in deaths and property loss (Khan and Abbasi, 1998).

According to vibe Ghana (2008) and Aria (2008) various incidents have happened in the PFS facilities over time, including the following: In the year 2000, there was a fire and explosion in Ontario, Canada, as a result of a tank cleaning process, which lead to loss s lives. In Accra Ghana, in 2015, there was a discharge of fuel from a ground tank during a flood, which resulted in a fire. In Gua Mesang Malaysia, in 2016 a fire started as a result of a child playing with a lighter, resulting in severe burns.

In Nigeria, accidents involving PFSs have resulted in fires, explosions, property loss, and even death. Fire occurrences have recently been reported in the Port Harcourt metropolis, and Obio /Akpor is not immune, as some PSF in the region have experienced fire and explosion. This study therefore aims to assess hazards and risks control measures among petrol filling stations in Obio/Akpor, Rivers State.

2. MATERIALS AND METHODS

2.1 Research Design

This study was conducted in 2022 and adopted a descriptive research method.

2.2 Study Area

The research was carried out at various petrol stations in Obio/Akpor. Obio/Akpor is a local government area in the Port Harcourt metropolitan area, which is one of the most populous in Nigeria. Nigeria's major economic center and is located in Rivers State. The local government area is 260km^2 in size, with a population of 283,294 people according to the 2006 census (NPC, 2006). Obio-Akpor has grown in popularity over time, increasing the commercial activities within the L.G.A. Rumuodumaya is the headquarters of Obio-Akpor. The Port Harcourt Local Government region borders it on the south, Eleme on the east, Ikwerre and Etche on the north, and Emuoha on the west. It's located between 4 45'N and 4 60'E latitudes and 6 50'E and 8 00'E longitudes. The study Areas has a larger number of Petrol Filling Stations in it and this makes it suitable for this study.

2.3 Population of the Study

One hundred and fifty three (153) filling stations registered with the Department of Petroleum Resources (DPR) made up the study's population, which is considered as the target population (Arokoyu et al., 2016).

2.4 Sample Size

Since the study population was 153 registered petrol filling stations, the sample size was calculated to be 35 petrol filling stations using Taro Yamane's formula in Equation (1).

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

where, n = sample size, N = population size, 85% confidence level and e = 0.15 margin of error.

2.5 Sampling Technique

Samples were obtained from selected petrol filling stations within Obio/ Akpor local government area in Rivers State. The sample population was stratified based on different communities with the presence of petrol filling stations (sample frame) then simple random sampling was used to administer questionnaire and gather data. This was to obtain precise information from each strata indicating different petrol filling station and then make generalization based on the response gathered from the populace.

For this study, a purposeful sampling approach was adopted. This helped in administering three (3) research questionnaires to two (2) PFS attendants and manager per Petrol Filling Station.

A well- structured work facility assessment questionnaire was used as the instrument for the study which was subjected to constant validity test by my supervisor. The reliability of the instrument was achieved by conducting a pilot- test of the questionnaire, questionnaire was distributed out among 5 workers in a petrol filling station and subjected to a Cronbach's Alpha test, to determine the reliability level, and hence confirm the consistency and precision of the questionnaire. The Cronbach alpha test returned a value of 7.7 confirming the consistency and precision of the questionnaire.

2.6 Nature/ Source of Data

Primary data was used to generate important information gathered with a survey that was intended to produce information on hazard and risk control measure. Journals, books, and online papers were also used to gather further data that will provide important context, while helping draw better insights from direct data through interpretation, lessons and literature reviews.

2.7 Methods of Data Collection

Questionnaire was given to petrol filling station attendants and managers based on communities with PFS. A total number of one hundred and sixteen questionnaires (116), this including 10 percent to compensate for non response and invalid responses were distributed to Petrol Filling Stations. The respondents were given one day to complete the questionnaire after which one hundred and seven (107) was returned filled for analysis; respondents for this study were only attendants and managers of petrol filling stations.

2.8 Method of Data Analysis

Data was collected, grouped, processed and analyzed using Excel and then presented in tables and charts utilizing frequencies, parentages and mean scores which was used to generate results of the demographics of the respondents and also to analyze the response retrieved based on the research questions. For privacy purposes, the petrol filling stations were grouped into Government owned petrol filling station, Private owned petrol filling stations and co-operate owned petrol filling station.

3. RESULTS &DISCUSSION

Table.1: Distribution of Demography information of respondents based on gender, age, marital status, and experience on job and hours worked.

Variables	Categories	Frequency	Percentage
Gender	Male	41	38%
	Female	66	62%
	Total	107	100%
Age	less than 18	0	0%
	19-25	52	45.5%
	26-35	47	43.9%
	36 & above	8	7.4%
	Total	107	96.8%
Marital Status	Single	80	74.7%
	Married	27	25.2%
	Divorced	0	0%
	Widowed	0	0%
	Total	107	99.9%
Experience on job	0-3	63	58.8%
	4-6	44	41.1%
	7-10	0	0%
	11-13	0	0%
	Total	107	99.9%
Hours worked	less than 5	0	0%
	5	5	4.6%
	Less than 8 hours	65	60.7%
	8 hours & above	37	35.5%
	Total	107	100.8

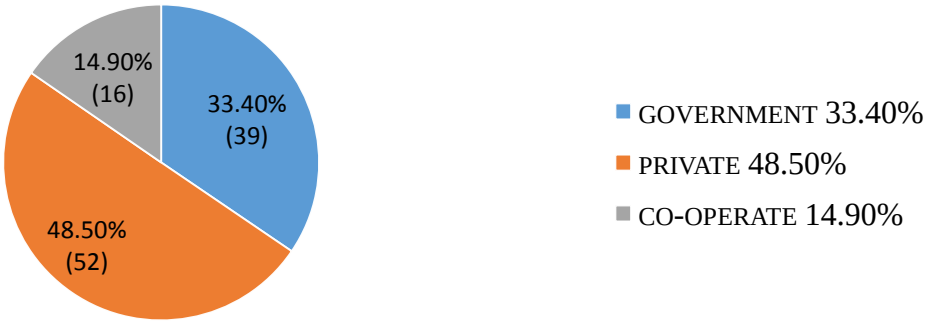

Figure 1: Ownership of petrol filling stations

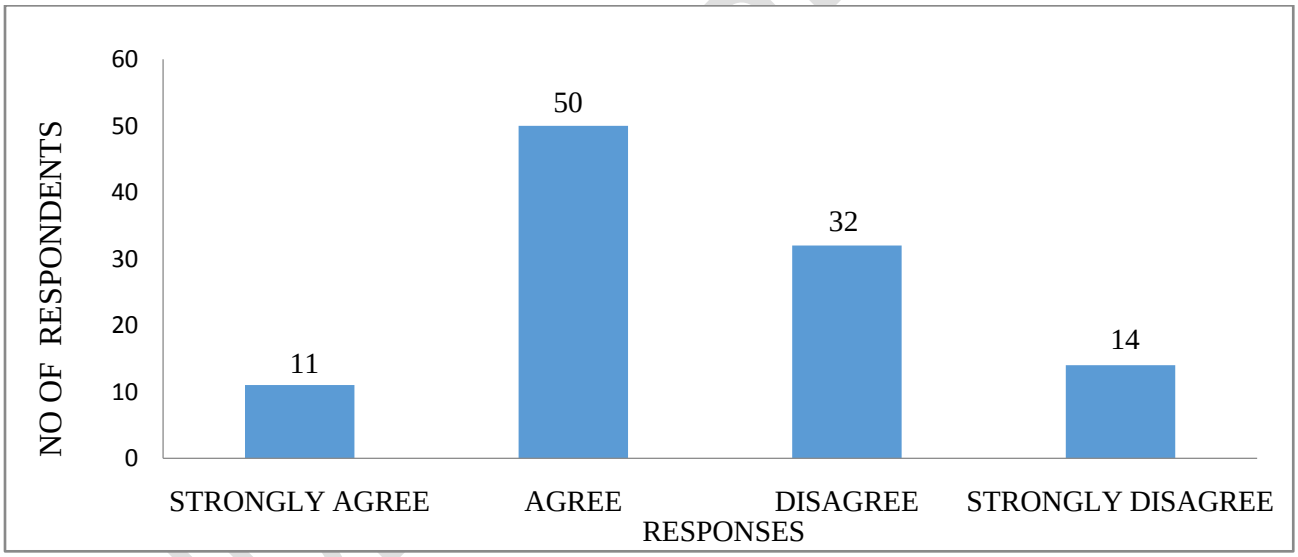

Figure 2: Response to hazards and risks within the petrol filling station.

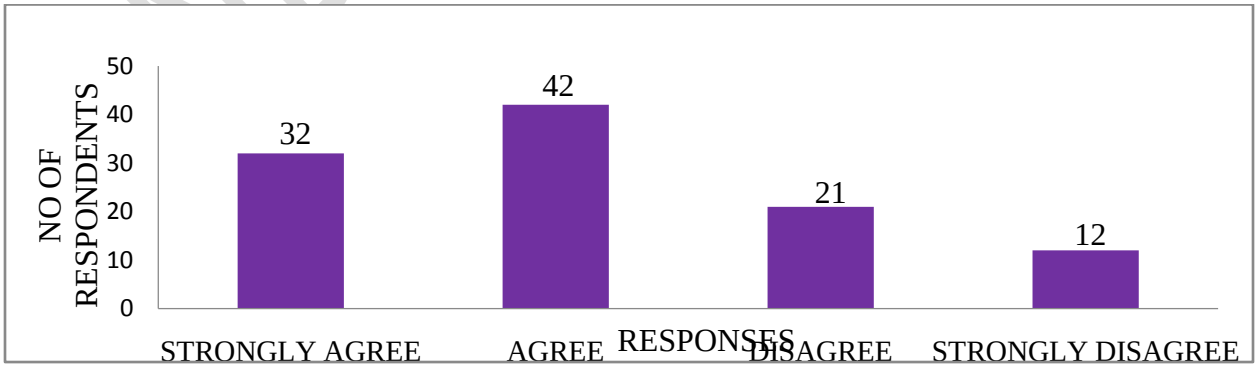

Figure 3: Bar chart showing response to Identify employees' participation in hazard identification within the Petrol Filling Station.

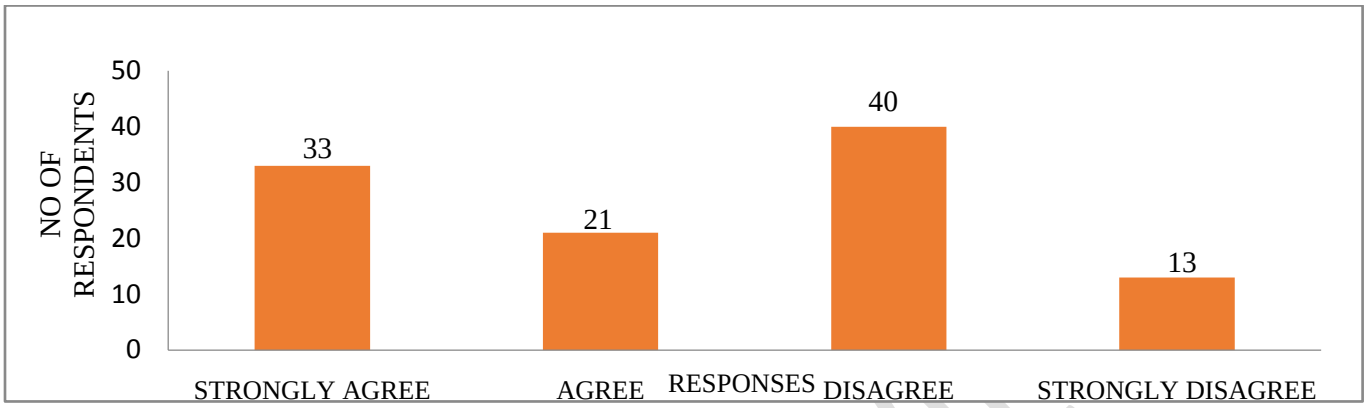

Figure 4: Response to the hazards and risk control measures put in place within the Petrol Filling Station.

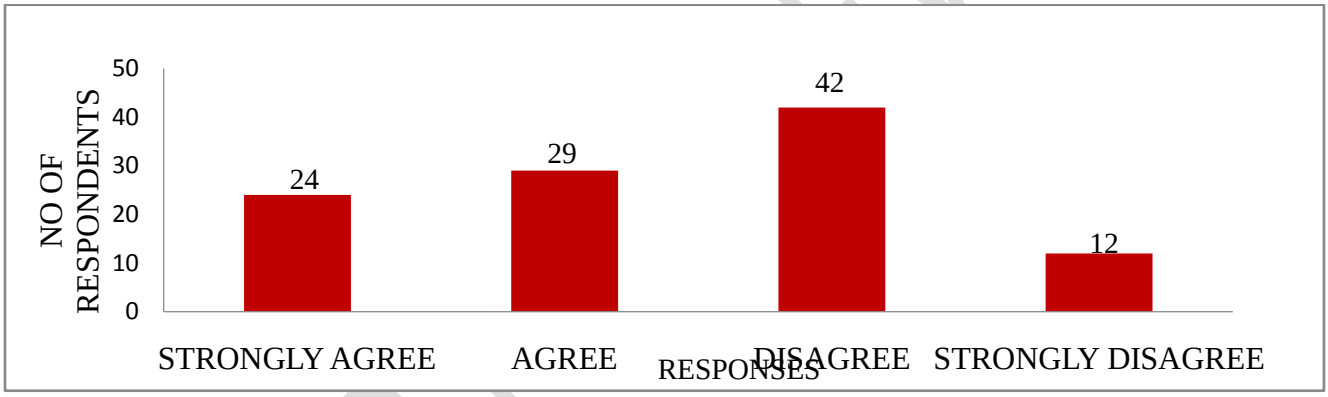

Figure 5: Response to management commitment in improving the safety measures of the Petrol Filling Station.

Table 1 shows the Distribution of Demographic information of respondents based on gender, age, marital status, and experience on job and hours worked. In total there are more female respondents sixty-six (66) and male respondents forty-one (41), with 62% female and 38% male. The age distribution of the respondent where captured in Table 1 the employee age class with highest respondents fall between the age bracket of 19-25 years while the lowest number of respondents fall within the age bracket of 36 years above. The respondents that fall within the highest response class of (19-25 years) are mostly petrol filling station attendants, while the least respondent class (36 years above) is mostly petrol filling station managers.

The marital status of the respondents is presented in Table 1, which indicates that 80(74.7%) respondents were singles while 27(25.2) respondents were married.

Table 1 also shows the experience of respondent on current job and the number of hours worked daily. Respondents with job experience ranging 0-3 year (63) with 58.8% and respondent within 4-6 years (44) with 41.1%.

The ownership of petrol stations as shown in Figure 1 indicates that a large number of petrol stations are owned by private individuals with 48.50%, Government owned petrol stations has about 33.40% while Cooperate owned petrol filling station has about 14.90% all located in different areas.

Identification of hazards and risk within the petrol filling station were presented in Figure 2. The following findings were made; 50 (49.7%) respondents agreed that due to the nature of the PFS facility and the presence of volatile compounds, there are many hazards laying within the facility which could be dangerous. Also, 11(10.9%) have strongly agreed to possible hazards such as spill of products while offloading from tankers, electrical faults unrepaired and dispensing hose and nozzles are ruptured and still in use making rooms for risk which is a threat to both workers and the environment, this is in agreement with Ahmed et al. (2012) as hazard contributing factors within the petrol station facility. Studies have shown that wrong packing of tankers within the petrol station facility can be a strong ground for the occurrence of fire accident. Recently in 2022, it was recorded that a fuel tanker fire explosion took place in Onitsha, Anambra State. This was as a result of wrong packing of a petrol tanker which in turn led to the destruction of goods and other valuable properties. This indicates that there is still need for improvement in petrol stations in order to maintain a hazard free environment. Only 32(31.6%) disagreed to have identified hazards, indicating that the facility is in its best working condition. While 14 (13.8%) disagreed that there are no trip and fall hazards as well as poor housekeeping in the PFS facility.

Employee's participation in hazard identification within the PFS were presented in Figure 3. From the figure, 42(41.9%) agreed to have participated in the identification of hazards as a measure of reducing the potential accidents that could occurs within the facility by reporting hazard, injuries and incident. This is achieved as employees think of safety as their responsibility and takes appropriate action. 32(31.6%) strongly agreed to employees participation in hazard identification based on a routine check carried out by attendants, participation in safety trainings and emergency drills. 21(20.8%) disagreed to conduct or participate in tool box meeting while 12(11.7%) strongly disagreed to being involved in hazard identification as it is assumed not to be their responsibilities. This shows the need for regular trainings and orientations for the petrol station attendants as a way of building safety consciousness among petrol station workers.

Identifying the hazard and risk control measure in place at the petrol filling station were presented in Figure 4. From the figure, 33(32.6%) respondents strongly agreed that there are hazards and risks control measures in place at the PFS facility for accident prevention. These include the use of job hazard analysis (JHA) before maintenance is carried out, effective water hydrant and extinguishes. 21(20.8%) respondents agreed that hazards and risks control measures are in place including the elimination of possible hazards and also provision of engineering and administrative controls. These include proper labeling of control switch and parking spaces for tankers without much interference with the forecourt. 40(39.7%) respondents disagreed to risk control measures in place for accident prevention such as caution signs while 13(12.8%) respondents strongly disagreed that there is no hazards and risks control measures in place.

Accessing Management commitment in improving the safety of petrol filling stations were presented in Figures 5. From the figure, 24(23.9%) respondents strongly agreed that management is committed in improving the safety measures by conducing regular safety training and tool box talk where safety issues are addressed. Also, new employees are trained to understand the risk involved in their job, important exit points and muster point are shown to employees in other to respond rightly to situations. 29(28.8%) agreed that management improves the petrol filling station by creating an avenue for communication between attendants and management, thereby creating a means were employees can access management on personal hazard observations within the facility, also, management considering safety important as

productivity is a method of reducing accidents while profit is maximized. Furthermore, 42(41.9%) disagreed to management commitment in improving the safety of the PFS facility while 12(11.9%) disagree to management being committed to improving the safety of the facility. This clearly indicates that there is need for continuous improvement by management. Therefore hazard and risk control measures is needed for improvement in petrol filling stations.

4. CONCLUSION

The research findings of this investigation showed there were safety issues in petrol filling stations in Obio/Akpor, River State. Based on the findings, it appeared that petrol filling station attendants agreed that management staff are not taking full responsibility on hazard/ risk control measures within their work facilities. Also, some of these PFS attendants were not aware of the possible risks associated with their jobs, neither were they prepared to guarantee that dangerous situation are recognized and controlled effectively.

In other to boost workers participation on hazard identification and to improve the safety measures within the PFS that leads to better participation and accident prevention, the research emphasis that hazard and risk control measures are seen as strategies that have a positive impact on the safety of petrol stations. This research provided basic information that renders solution to the petrol station managers on improving hazard and risk control measures necessary for accident prevention, increased productivity and profitability.

CONSENT AND ETHICAL APPROVAL

Ethical approval was obtained from the management of the different petrol filling stations in November 2021, before the commencement of the survey. All the respondents were administered consent forms.

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