

(RESEARCH ARTICLE)



The application of computer science in fractional distillation of petroleum

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Abstract

The purpose of the study is to assess the application of Computer science in the fractional distillation of petroleum. The study sought to: Determine the merit of using Computer science in fractional distillation of petroleum. Evaluate the cost effectiveness to the application of Computer science in fractional distillation of petroleum to the welfare of citizens. Determine if Computer science can help in controlling the natural effects of fractional distillation of petroleum on the environment. Computer science has gained wider application in so many areas of human endeavor ranging from the homes to more scientific and industrial applications, hence its application of Computer science in fractional distillation of petroleum cannot be overemphasized. Irrespective of the benefits of the application of Computer science in fractional distillation of petroleum as a whole, it has become pertinent to ask how effective and efficient its application of Computer science in fractional distillation of petroleum has been. This research work tries to investigate how effective the application of Computer science in fractional distillation of petroleum. The project exertion covered statement of the problem, purpose of the study, research questions/hypotheses were formulated to enable the researcher find out facts about the study, highlighted in division one. Subdivision two was based on the literature review of this study. The study covers the research methodology which guided the study, the next stage was based on the presentation of data and its' analysis as well as the discussion of findings. The final stage of the research was concerned with the conclusion as well as recommendations and suggestions for further studies

Keywords: Computer science; Fractional distillation; Scientific industries; Petroleum

1. Introduction

The reformation of the world in every of its sector, right from domestic consumption to national and information affairs, has been so amazing. This is so with the help of information and communication technology via the Computer science. Whereby, every aspect of human is overtaken with the impact of technology. Computer science as the name implies is a computing device, which was actually the dream and aspiration of the inventors of the Computer science [1]. More so, it was invented by mathematicians to solving arithmetical equations, formulae etc. Although, this was not just the terminal point of the invention, a lot of reformations were embarked upon with development and advancement in technology and research which led to the concept of stored program introduced by a French mathematician John von Newman which in turn led to the manufacture of a Computer science that has knowledge base processing capacity [2]. This was complemented by achievement in microchip production, which in other hand helps in the production of a very s Computer mall Computer science system with a very high potentiality in data processing and fit in almost all human activities including specialization.

The Computer science in its achievement also spread its application in so many fields of study such as research, manufacturing, production etc. In the chemistry of hydrocarbon (industrial/organic chemistry), Computer science has been as well used for efficiency, reliability, accuracy etc, for production. In fractional distillation of petroleum, Computer

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science application has shown that the manual operation as it used to be had so many dangers, which do not readily create enough avenues for maximum productivity. However, with the introduction of Computer science in fractional distillation of petroleum, the impediment encountered in the cause of manual distillation has been overcome. [3]. It is also worthy of note that the introduction of Computer science in fractional distillation of petroleum though could encourage productivity, but have left so many homes in sorrows, since Computer science overtakes most of the work done by man in the factory, those men would then be left redundant and later retrenched leaving their homes in problems since they have been enjoying well paid salary for nothing. The researcher is of the interest to investigate the extent to which Computer science application in fractional distillation is of benefit, a case study of (SHELL) company in Port Harcourt, River state.

1.1 Statement of the Problem

Since the application of Computer science in the fractional distillation of petroleum, the petroleum refineries have been producing many good products of crude oil. Crude oil is processed and refined into more useful petroleum products; A numerous products of crude oil are been processed every day there by increasing productivity. But the petroleum personnel's and the surrounding environment have been facing problems like, substantial air pollution, risk of industrial accidents such as fire and explosion, health risks, unemployment (due to the application of Computer science in our refineries, the areas where manual operations could be operating, Computer science has overtaken), much income is needed to provide these systems that are used for the production of crude oil.

2. Literature review

Fractional Distillation: According to Shvoog (2008), fractional distillation of petroleum is the separation of a mixture into its components, or fractions, such as in separating chemical compounds by their boiling points by heating them to a temperature at which several fraction of the compound will evaporate. Fractional distillation is use for separating a mixture of substances with narrow differences in boiling points and it is the most important step in the refining process [4].

The distillation process is carried out in huge fractionating columns or towers, each standing some 40 to 50 meters high and 7 meters wide.

The crude oil is heated to about 400°C in an electric furnace where about 75% of the crude oil is vaporized. The mixture of hot vapor and liquid flow through pipes to the fractionating columns. The fractionating column is dividing into several compartments by perforated plates called trays, each of which is maintained within a specific range of temperature. Each tray is a little bigger than the one below, so that toward the bottom of the column, the temperature is around 400°C. While the temperature at the top part of the column is only 40°C, as the vapour containing mixture of substances ascends the volatility of the substance in the mixture increased. This means that, substances with higher boiling points separate out in the trays on the lower part of the column, while those with lower boiling points separate out in the trays in the upper part of the column [5].

Fractional Distillation of petroleum: Hydrocarbons are important molecules in crude oil. They contain carbon and hydrogen atoms only. [6]. The lengths of hydrocarbon chains are short. This means that the hydrocarbons in a short chain are runny (easy to ignite and have low boiling points). There are also more useful than longer chains and can be used for fuels, on the other hand, the molecules that have longer hydrocarbon chain are more viscous, harder to ignite and have higher boiling point. However, before hydrocarbon can be useful, they must first be separated into groups with similar carbon atoms called fractions. Petroleum; Petroleum is the mixture part of hydrocarbon of molecules [7].The molecules have different sizes, weight and number of carbon atoms. The smaller molecules have few carbon atoms and low boiling point, while the large molecules have many carbon atoms and higher boiling point. In this form, petroleum is difficult to ignite and therefore is of little use. It must be refined to make useful fuels and chemicals. Each fraction consists of hydrocarbon molecules that boil over a range of temperature, for example, a kerosene fraction is a mixture that boils between 170 °C to 250 °C.

2.1 The Distillation of Petroleum

According to [8] crude oil nearly always, is associated with water and sand, hence the crude petroleum discharge from the top of the well contain water and sand in suspension. The mixture is passed under pressure into cylindrical tanks, and the gas, oil and sand are drawn of separately except for the low boiling hydrocarbon on attempt to separate the individual hydrocarbon fractionated by continuous distillation into main fraction petrol (gasoline), kerosene (kerosene, paraffin oil) gasoil (heavy oil) and lubricating oil, petroleum gas. The residue maybe waxes and asphaltic bitumen.

2.2 Industrial Distillation

According to [9]. Distillation is the most common form of separation technology used in petroleum refineries, petrochemical and chemical plant and natural gas processing plant. In most cases, the distillation is operated at a continuous steady state in which new feed is always being added to the distillation column and products are always being removed. Unless the process is disturbed due to changes in feed, heat, ambient temperature, or condensing. The amount of feed being added and the number of products produced are normally equal. This process is known as continuous steady-state fractional distillation. [8, 9].

2.3 Effects of Fractional Distillation of Petroleum

Fractional distillation of petroleum has been a useful material to operate, as some of its effects to human life. Most of this effect include; source of energy to human, source of income, pollution, greenhouse effect, global warming and acid rain etc.

2.3.1 Source of Energy

Petroleum is neither as cumbersome as coal nor as volatile as natural gas, it can be used to heat building, power internal combustion engines, and produce electricity and it has numerous non-fuel application. By far the largest proportion of the energy we obtain from crude oil is use as automotive fuel. There are vast markets for not only petrol but also diesel, for commercial vehicles and for public and personal transport. Kerosene is the basis of the aviation fuel in jet aircraft. Oil is used extensively for domestic and industrial heating, and in power stations to generate electricity, petroleum gases such as butane and methane occupy a niche market that they can be supplied as bottled gases for cooking and heating where there is no natural gas supply. Liquefied petroleum gas (L P G), a mixture of butane and methane is distributed as petrol stations for automotive use and can be supplied in bulk for heating application. L P G provides an environmentally friendly fueling option because it has low emissions. However, by no means all oil-based products are used as fuels. Petroleum also provides us with lubricants and the raw materials from which plastics and other polymers are manufactured. [10].

2.3.2 Source of Income

Petroleum as a source of energy to man has generate much revenues for producing countries, energy traders and even to all citizens of the particular country that produces the crude oil. Therefore, the benefits of petroleum have brought enumerable benefits to human civilization; quality of life, dynamic prosperity and a source of income to energy traders.

2.3.3 Pollution

Pollution is the process of making air, water, soil, etc dirty (Oxford Advanced Learners Dictionary). Occasionally, Petroleum Company during either extraction, transportation or separation of crude oil pollutes our surrounding environment. An oil tanker spilling its load at sea or polluted coastlines can destroy the local ecosystems and people's livelihoods. These effects can sometimes last for many decades, therefore petroleum companies that spills oil on land releases millions of barrels of thick poisonous crude oil into the oceans leading to death of many species in the oceans food chains and webs. Tanker spills fires involving crude oil release thick black toxic smoke into the environment causing widespread pollution and damage over a large area. Our use of fossil fuels has released huge amounts of carbon in the form of carbon dioxide and carbon found field up under rock in crude oil, natural gas and coal. Currently 3 billion and above tons of carbon are added into the atmosphere each year. Slowly these carbon dioxide molecules that are released into the atmosphere and beneath the earth would cause our planet to warn out, risking some countries life's, thereby causing earthquake. [7]

2.3.4 Green House Effect

According to science interactive LTD word bank (2005) solar radiation radiated out to space absorbed in atmosphere by greenhouse gases, carbon dioxides traps heat energy from the sun. The amount of carbon dioxide in the atmosphere is increasing by billion tons a year. The greenhouse effect, the world's energy demand and the use of crude oil is increasing. There are over 500 million cars, all pumping out carbon dioxide from the combustion of octane or petrol, thereby causing rising levels of greenhouse effect to our environment.

2.3.5 Global Warning

The rate of carbon dioxide that is been released into the atmosphere every year has led to the rising global temperatures (World Bank 2005). Flooding the destruction of the ozone from aerosols will also add to global warning by reflecting less infrared heat given out by the sun.

2.3.6 Acid Rain Effect

Acid rain and fossil fuels, carbon dioxide is not the only pollutant that is released into the environment during the combustion of fossil fuels, Sulphur and nitrogen combines with oxygen to form Sulphur dioxide and nitrogen oxide. These gases form weak acids when they react with water present in the atmosphere resulting in acid rain. Acid rain can damage forest, plant and animal lives and can acidify lakes and ponds disrupting nature's balance. Acid rain and the atmosphere in addition to releasing carbon dioxide, small amounts of Sulphur and nitrogen, present as impurities in crude oil because other polluting gases to be released into the atmosphere. Acids lakes Rivers, ponds and lakes can become acidic in areas with high rainfall levels. Low PH of the water can lead to the disruption of the ecosystem, therefore, killing many species. Acid rain damages waterways, acid rain also destroys marble when a tree loses its leaves due to acid rain, it can no longer produce on its own during photosynthesis.

2.4 Control of the Effect

Renewable energy sources, according to (Science interactive LTD 2005), Renewable energy source or alternative to using crude oil for generating electricity are now being developed. These reduce carbon dioxide emission, many sources of energy that we currently use today are now renewable. This means that unlike coal, natural gas and crude oil that are not used up can be used as renewable energy source in electricity using moving water, hydroelectric lamps are able to generate clean electricity, converting animal waste like manure from farms and farming to methane (CH₄) using bacteria is one of the ways replacing fossil fuels like gas. Solar cells using solar energy could power traffic lights and street lamps. Wind farms could supply up to 15% of the energy we use every year. Wind farms are usually found in windy population areas. The energy is totally renewable and does not increase the levels of pollution to add to either global warming or acid rain.

2.5 Need For Computer Science in Fractional Distillation of Petroleum

According to [10], a Computer science is a device, which works under the control of a stored program, automatically accepting and processing data to produce information, which is the result of the processing. This section explores the need for applying Computer science in fractional distillation of petroleum.

- Efficient and Effective Distillation: - with the help of stored program concept introduced by John von Neumann, the Computer science has been able to find its application in almost every endeavours (Titilola, Agana and Gbadem, 2003). It is the view of the researcher that if Computer science is allowed to effectively control the fractional distillation processes of crude oil, excesses and wastage, which is leading to environmental degradation, can be minimize.
- Increase Productivity: - with the help of automation, the production of petroleum can be increase, as most of the manual processes would be automated with Computer science programs, which will be much more efficient leading to increase in production.
- Enhance Economy: - with the help of Computer science in fractional distillation of petroleum wastage would be reduced leading to enhancement in the economy of the production of petroleum
- Simplify Operation: - Computer science can take over most of the difficult task and simplify the task in such a way that would be easy to accomplish with higher degree of efficiency.
- It saves human or workers from hazard associated with fractional distillation of petroleum. With the help of Computer science in fractional distillation of petroleum, it will help to save the lives of workers from hazard involve when reseeding a fractionating tower which is known as continuous distillation or steady feed process, where Computer science programs can automatically control this processes, thereby saving the life's of workers.

2.6 Application of Computer Science in Fractional Distillation of Petroleum

Since there is need for applying Computer science in fractional distillation of petroleum, how will Computer science be applied in fractional distillation of petroleum? Becomes the bases of this study sub-heading; Computer science can be used in regulating a steady flow of heat based on the various boiling points of the respective tray of the crude oil with the help of a Computer science program. The element which is used in heating the furnace could be control such that the quantity of crude oil deposited at a time will be noted, the heat of integration, the amount of heat required at a steady flow within an acceptable range needed to separate the Crude oil into their respective trays, etc. Based on the above, the program will then regulate the thermostat to ensure that there is adequate separation of the mixture into their various trays. This will ensure max and quality production within a short time., also, Computer science can go beyond the above by testing the quality of products produced and recommend further fractionating or the addition of a catalyst which will guarantee quality productions and timely. For example, a Computer science can be used to ensure adequate separation of the mixture into their various trays, unlike in the separation of fractions like kerosene, gasoil and

lubricating oil etc. When kerosene boils at its own boiling range which is 750c to 200c the thermostat which is programmed will mechanically maintain steady flow of heat within on acceptable time estimated for the kerosene to be collected as the vapors of kerosene rises to condense where it can be finally collected. This process will continue until all the different fractions of petroleum are been collected and due for consumption.

The Algorithm for the application of Computer science in fractional distillation of petroleum is as shown below;

- Feed crude oil into the furnace
- Note the quality of crude oil fed into the furnace
- Supply the amount of heat of integration needed
- Note the assume proportion of each component contain in the crude oil fed into the furnace.
- Supply a steady flow of heat within an acceptable range of time required to separate each component into the respective trays.
- Test the products and suggest for consumption or further refraction
- Below is a flowchart representing the Algorithm above?

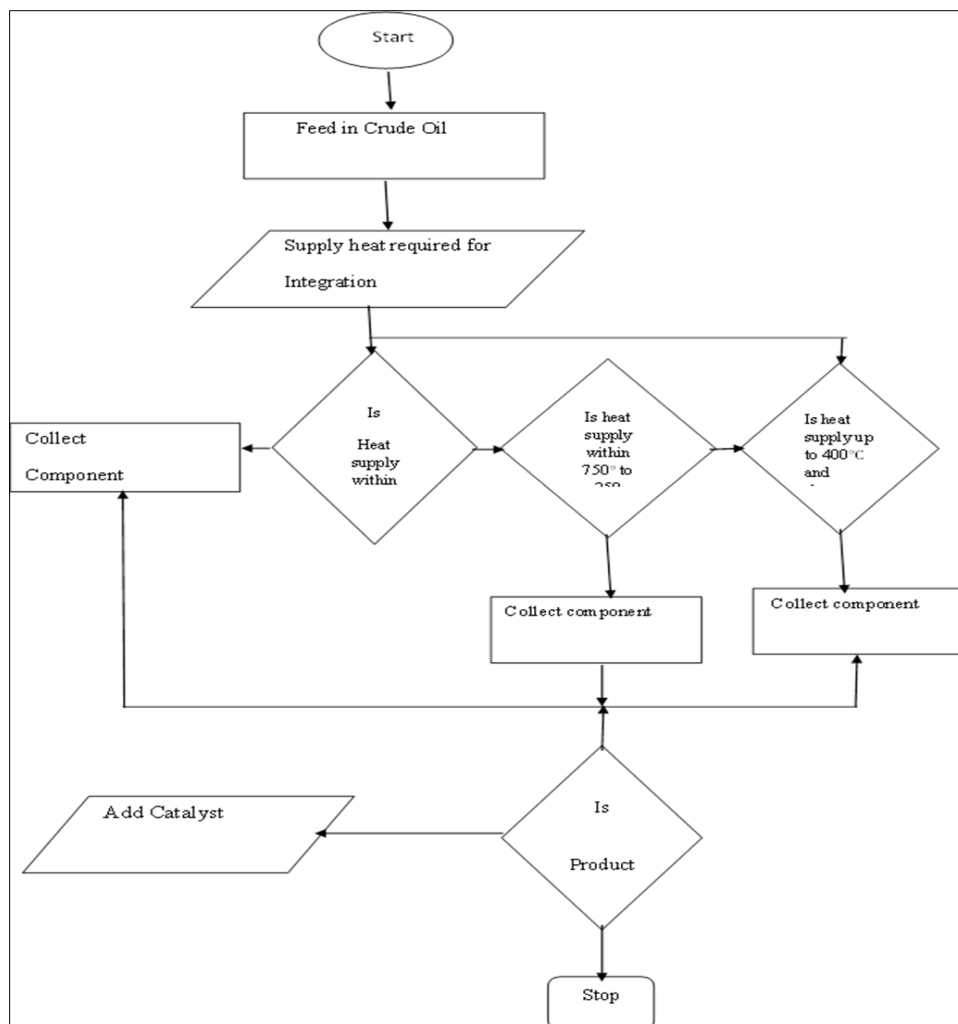


Figure 1 Algorithm for the application of Computer science in fractional distillation of petroleum

2.7 Problems associated with the application of computer science in fractional distillation of petroleum

Below are some problems associated with the application of Computer science in the fractional distillation of petroleum.

- Computer science maintenance is expensive: - Computer science as an electronic device needs to be maintain from time to time, in order to carry out its function effectively and efficiently. In order words, oil refineries that

make use of more of these systems, needs to maintain them. Since refinery will need more systems to work with, it will as well be expensive to maintain the systems.

- It needs experts: Computer science s are installed with programs that need only an expert in the field to understand the use of the programs, to know whether the programs available are relevant or not as needed in the refining of crude oil. Therefore, it is not every worker in the oil refinery that knows how and when to install this programs that are needed in the crude oil therefore becomes necessary to employ experts who would be able to mount and operate the machines well as-well as been able to service or maintain the systems. Computer science being a new discipline, the cost of employing the services of these experts are expensive.
- Wrong operation leads to bad product (Garbage in Garbage out); Computer science s work under the control of human, in order words, whatever is been garbage in is what will be garbage out. If there is any wrong operation by the system operator, the whole product of that day will also be erroneous leading to much waist.
- The use of Computer science needs advanced technology: - Computer science is a dynamic field that changes almost every day, companies like the oil refineries need an advanced technology to carry out their operations with Computer science effectively and efficiently.
- It needs steady power supply: - Computer science s are electronic devices which means it can only work effectively with the use of electricity. Therefore, petroleum companies need constant electricity to aid in the application of Computer science in the industry. A process whereby they are no constant electricity can lead to low production.

Computer science s are easily attacked by Computer science viruses and worm - virus and worms are harmful to the Computer science s, there contribute to the malfunctioning of the Computer science systems. Most often, viruses and worms cause a lot of lost to factories and industries. Apart from the physical damage caused by viruses and worms, the cost of purchasing anti-virus software is expensive which is faced out as new trends of viruses and worms are released into the system. This issue of viruses and worms has been a serious treat on users of Computer sciences.

3. Material and methods

3.1 Research Area

This research drudgery was carried out in SHELL petroleum industry in Port-Harcourt River State. SHELL Industry is located in the Northern part of Port Harcourt, River state. River state is bounded on the south by the Atlantic Ocean, to the north by Imo, Abia and Anambra state to the east by Akwo Ibom state and to the west by Bayelsa and Delta state. River state is predominantly Ikwerre clan and Igbo subgroup in "Population" and "land mass" and amounts of Ijaw, Ogoni etc in its coastal areas. The inland part of Rivers state consisted of tropical rainforest. Towards the coast is typical Niger Delta environment featuring many mangrove swamps. River state has one of the largest economics in Nigeria because of its crude oil. The state has two major refineries, two major seaports, airports, and various industrial estates spread across the state, particularly in the state capital of Port Harcourt. Both indigenes and non-indigenes in Rivers state are mainly civil servant, business men and women, fishermen and farmers.

3.2 Population of the Study

The population of the study was made up of all the staff in SHELL petroleum industry Port Harcourt, River state. SHELL is located at one sport in Port Harcourt called Eleme; Eleme is a town in Port Harcourt city. The industry has two thousand staff (2000) of both Junior and senior staff. The population size was two thousand (2000).

3.3 Sample of the Study

A total of 50 senior and junior staff in SHELL petroleum industry Port Harcourt, River state was randomly sample out from the stated population which made up the sample size of 50 respondents.

3.4 Sampling Technique

Random sampling was the sampling method adopted in order to minimize cost and time used in the study. Fifty staffs were selected randomly from the entire population. The research on a faithful morning visits the industry and served the first 20 senior staff and 30 junior staff she made with a questionnaire each without biased and interest of who to or not to serve.

3.5 Instrumentation

The instrument for data collection in this research work was a structured questionnaire. The questionnaire was designed to elicit information from the staff sampled. The questionnaire was structured on four-point Likert scale of

Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The questionnaire contains question drawn from the research questions and fifty (50) items (i.e. questionnaires) were produced. The researcher administered the questionnaire personally to the respondents. However, all the questionnaires distributed was retrieved the same day.

3.6 Data Collection Procedure

The questionnaires were administered to the respondents by the researcher by hand during working hours. Patience was exercised on the respondents to complete filling the questionnaires which were all returned the same day.

3.7 Data Analysis

This interval examines the analysis of data collected with questionnaire for this study. The data collected are presented and analyzed to test the validity of the research questions. The mean method was used. The chapter also deals with the summary of findings and the discussion of findings.

4. Results/ Presentation and analysis of data

4.1 Research question one (1)

It is Computer science application relevance in the fractional distillation of petroleum? The table below was used to analyze the research question.

Table 1 Application of Computer science in fractional distillation of petroleum

S/N	Items	SA	A	D	SD	Total	\bar{x}	Remark
1	Computer science is an essential tool for distillation of petroleum	10 40	20 60	15 30	5 5	50 135	2.7	Agreed
2	Computer science is very important in the petroleum industry	25 100	20 60	4 8	1 1	50 169	3.4	Agreed
3	The increase in the production of petroleum is because of the application of Computer science to it processes.	20 80	20 60	8 16	2 2	50 154	3.2	Agreed
4	The application of Computer science in fraction	10 40	20 60	10 20	10 10	50 130	2.6	Agreed

$$\text{Grand mean } (\bar{x}) = (2.7 + 3.4 + 3.2 + 2.6)/4$$

$$\frac{11.84}{4} = 2.96 \text{ or } 3.0$$

4.2 Analysis

In response to item one in table 1, 10 respondents with 40 scores strongly agreed, 20 respondents with 60 scores agreed, 15 respondents with 30 scores disagreed and 5 respondents with 5 scores strongly disagreed, with the mean scores of 2.7 indicating the acceptance that Computer science is an essential tool for distilling petroleum. In the same vein, item two in table 1, 25 respondents with 100 scores strongly agreed, 20 respondents with 60 scores agreed, 4 respondents with 8 scores disagreed, and 1 respondent with 1 score strongly disagreed with the mean score of 3.4 indicating the acceptance that Computer science is very important in the petroleum industry. More so, in response to item three in table 1, 20 respondents with 80 scores strongly agreed, 20 respondents with 60 scores agreed, 8 respondents with 16 scores disagreed and 2 respondents with 2 scores strongly disagreed with a mean score of 3.2 indicating that the increase in the production of petroleum is as a result of the application of Computer science in the industry. Finally, response to item four in table 1, reveals that 10 respondents with 40 scores strongly agreed, 20 respondents with 60 scores agreed, 10 respondents with 20 scores disagreed and 10 respondents with 10 scores strongly disagreed with a mean score of 2.6 indicating the acceptance that the application of Computer science in fractional distillation of petroleum has reduce the cost price of crude oil. The grand mean score of 3.0 indicates acceptance to research question one, that Computer science application is relevance in the fractional distillation of petroleum.

4.3 Research Question Two (2)

Is it more economical in the application of Computer science in the fractional distillation of petroleum to the method use before? The data in table 2 is used in analyzing this research question.

Table 2 The economy of applying Computer science in fractional distillation of petroleum

S/N	Items	SA	A	D	SD	Total	\bar{x}	Remark
5	Using Computer science in petroleum distillation is better than the manual method.	30 120	15 45	5 10	- -	50 166	3.5	Agreed
6	Due to the application of Computer science in fractional distillation of petroleum, most home are now living in abject poverty	20 80	10 30	10 20	10 10	50 140	2.8	Agreed
7	Computer science application in fractional distillation of petroleum has enhance the economy of the producing countries	25 100	15 45	5 10	5 5	50 160	3.2	Agreed
8	Computer science application in the distillation of petroleum increase productivity	25 100	15 45	7 14	3 3	50 162	3.4	Agreed

Looking at item five in table 2, 30 respondents with 120 scores strongly agreed, 15 respondents with 45 scores agreed, 5 respondents with 10 scores disagreed and no response to strongly disagreed, with a mean of 3.5 indicating the acceptance that the use of Computer science in petroleum distillation is better to manual method. Furthermore, in response to item six in table 2, 20 respondents with 80 scores strongly agreed, 10 respondents with 30 scores agreed, 10 respondents with 20 scores disagreed and 10 respondents with 10 scores strongly disagreed, with a mean score of 2.8 indicating the acceptance that due to the application of Computer science in fractional distillation of petroleum, most home are now living in abject poverty. More so, in response to item seven in table 4.2, 25 respondents with 100 scores strongly agreed, 15 respondents with 45 scores agreed, 5 respondents with 10 scores disagreed and 5 respondents with 15 scores strongly disagreed with a mean score of 3.2 indicating the acceptance that Computer science application in fractional distillation of petroleum has enhance the economy of the producing countries. Finally, in response to item eight in table 4.2, 25 respondents with 100 scores strongly agreed, 15 respondents with 45 scores agreed, 7 respondents with 14 scores disagreed and 3 respondents with 3 scores strongly disagreed with a mean score of 3.2 indicating the acceptance that Computer science application in distillation of petroleum increased productivity. The grand mean score of 3.2 indicates acceptance to research question two that it is more economical in the application of Computer science in fractional distillation of petroleum to the method used before.

4.4 Research Question Three (3)

Table 3. Controlling disaster with fractional distillation of petroleum with the Computer science

S/N	Items	SA	A	D	SD	Total	\bar{x}	Remark
9.	The application of Computer science in fractional distillation reduce hazards to staff	30 120	15 45	5 10	- -	50 175	3.5	Agreed
10.	Pollution of the environment can be minimizing with the application of Computer science in fractional distillation of petroleum.	20 80	10 30	3 6	17 17	50 133	2.66	Disagreed
11.	Computer science can aid efficient, effective control of pollutants associated with fractional distillation of petroleum.	18 72	12 36	5 10	15 15	50 133	2.7	Agreed
12.	Computer science can be used as a means of renewable energy source for the control of pollution associated with petroleum.	15 60	20 60	10 20	5 5	50 145	2.9	Agreed

Can Computer science be used in controlling the disaster with fractional distillation of petroleum? The data in the table 3 was used in analyzing the research question.

$$\text{Grand mean } (\bar{x}) = \frac{(3.5+2.66+2.7+2.9)}{4}$$

$$\frac{11.86}{4} = 2.99$$

4.5 Analysis

In response to item nine in table 3, 30 respondents with 120 scores strongly agreed, 15 respondents with 45 scores agreed, 5 respondents with 10 scores disagreed with no response to strongly disagree with a mean score of 3.5 indicating the acceptance that the application of Computer science in fractional distillation reduces hazards to staff. In response to item ten in table 3, 20 respondents with 80 scores strongly agreed, 10 respondents with 30 scores agreed, 3 respondents with 6 scores disagreed, and 17 respondents with 17 scores strongly disagreed with a mean score of 2.66 indicating acceptance that the pollution of the environment can be minimize with the application of Computer science in fractional distillation of petroleum. In response to item eleven in table 4.3, 18 respondents with 72 scores strongly agreed, 12 respondents with 36 scores agreed, 5 respondents with 10 scores disagreed and 15 respondents with 15 scores strongly disagreed with a mean score of 2.7 indicating the acceptance that Computer science can aid efficiently and effectively in the control of pollutant associated with fractional distillation of petroleum. In response to item twelve in table 3, 15 respondents with 60 scores strongly agreed, 20 respondents with 60 scores agreed, 10 respondents with 20 scores disagreed and 5 respondents with 5 scores strongly disagreed with the mean score of 2.9 indicating the acceptance that Computer science can be used as a means of renewable energy source for the control of pollution associated with petroleum. The grand mean score of 2.97 indicating acceptance to research question three which states that; can Computer science be used in controlling the disaster associated with fractional distillation of petroleum.

5. Discussion

The following are the discussion of findings for the study; Based on research question one a grand mean 3.0 indicates that Computer science application is relevant in fractional distillation of petroleum. This research question was accepted and supported by the view of Richard and Jeffery (1986), that Computer science application is very essential in the fractional distillation of petroleum. Computer science can be used in regulating a steady flow heat based on the various boiling points of the respective tray of the crude oil. They also added that Computer science application has increase productivity, that with the help of automation, the production of petroleum can be increase, as most of the manual process would be automated with Computer science programs, which will be much more productive leading to increase in production. Mark (1990) pointed out that with the help of a Computer science program the element, which is used in heating the furnace, could be control such that productions will be high. Base on research question two, the grand mean scores of 3.2 indicates that it is more economical in the application of Computer science in fractional distillation of petroleum to method used before. This fact was accepted and supported by the view of [10] that in the fractional distillation of petroleum, manual operations as it used to be have so many dangers which do not readily create enough avenues for maximum productivity. However, with the introduction of Computer science the impairment encountered in the cause of manual distillation was been overcome. They also added that with the help of Computer science in fractional distillation of petroleum wastages was reduced and productivity increased leading to enhancement in the economy of the producing countries.

Based on research question three, the grand mean score of 2.97 indicates that Computer science can be used in controlling the disaster associated with fractional distillation of petroleum. The fact was Okayed and supported by the view of [8] that Computer science, if allowed to effectively control the fractional distillation processes of crude oil. Excesses and wastages which is resulting in environmental degradation can be minimize. In addition, if Computer science is allowed to control all the processes involving the fractional distillation of petroleum, it will save petroleum workers from hazard associated with the fractional distillation of petroleum.

6. Conclusion

The application of Computer science in the fractional distillation of petroleum according to the findings of this research work is the best answer to increase productivity, increase the economy of the producing states or countries, and reduce risks associated with the production of petroleum. The need has arisen for petroleum producing countries to employ Computer science technology in full force in the production of petroleum in order to achieve maximal productivity.

Recommendations

From the analysis of the data presented the researcher recommends that;

- Petroleum Industries Should Be Provided With More Computer As To Enhance Efficiency And Effectiveness In Their Production.
- Petroleum Industries Should Employ Specialist That Are Skilled And Experienced In The Use Of Computer Science In Fractional Distillation Of Petroleum.
- Workers Of Petroleum Industries Should Be Given Orientation, Training And Retraining On How To Use Computer Science Effectively In The Industry.

Suggestion for further studies

The following suggestions are made for those who shall be interested in taking a research in this topic or related topics;

- In view of the fact, there is a shortage of materials, the researcher is of the view that a similar study should be carried out in the application of Computer science in fractional distillation of petroleum in a wider scope.
- Problems associated with the application of Computer science in the fractional distillation of petroleum.
- The economic implication of Computer science in the fractional distillation of petroleum.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there was no conflict of interest during these studies.

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