CHEMICAL IMPACT ASSESSMENT OF EFFLUENTS FROM PEUGEOT AUTOMOBILE NIGERIA INDUSTRY KADUNA TO THE BIODIVERSITY

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TITLE PAGE

CHEMICAL IMPACT ASSESSMENT OF EFFLUENTS FROM PEUGEOT AUTOMOBILE NIGERIA LIMITED KADUNA

THIS THESIS IS SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF POST GRADUATE DIPLOMA IN ENVIRONMENTAL MANAGEMENT

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MARCH 2001

DECLARATION

In hereby declare that this thesis has been conducted solely by me under the uidance and supervision of Dr Mohammed T. Usman of Geography Department ederal University of Technology, Minna and I have neither copied some one's ork nor has some one else done it for me. Credit has been given to writers whose ork has been referred to in this project.

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STUDENT'S SIGN.

DATE

APPROVAL PAGE

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BY:

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This work is sumitted in partial fulfillment of the requirement for the ward f Post Graduate Diploma in Environmental Management of Federal University of echnology Minna.

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MARCH 2001

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Finally, I am eternally grateful to Almighty Allah for providing me with od health, and guiding me through so far.

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DEDICATION

THIS RESEARCH PROJECT IS SAPECIFICALLY DEDICATED TO:

Beloved father Alh. Usman Gnedako, ever late Mummy Mallama Aisha sman, darling wife Madam Halimatu Sadiya Aliyu, lovely children forever, others and sisters, other relatives and friends at present, past and future, and stly to the Almighty God and His messanger the Holy Prophet Mohammed (P. B. . H.)

ABSTRACT

This thesis investigated and assessed the level of metallic and nonmetallic chemical pollutants of pollutant load of effluents of Peugeot Automobile Nigeria (PAN) situated at Kaduna South.

Parameters such as PH, suspended solids, dissolved solids, conductivity, total solid, Temperature were determine using physical methods Nitrate, phosphate phenol, and Ammonia were determined colourimetrically using spectronic 20 chloride, dissolved oxygen carbon-dioxide, chemical Oxygen Demand (COD) Biological Oxygen Demand (BOD) and carbon dioxide were determined by titrimetric method of analysis while sulphate, cyanide were determined by gravimetric method of analysis.

Metals were determined spectrophotometrically using spectrophotometers.

The result obtained were compared with recommended standards and it was observed that the effluents is more polluted with chloride and least with sulphate.

CHAPTER ONE

1.0 INTRODUCTION

The essence of this project is to assess the effect of the pollutant (contaminate) load of the effluents from Peugeot Automobile Nigeria Limited Kaduna.

Peugeot Automobile Nigeria Limited located at Kaduna South as at now has a high concentration of industrial establishments which including manufacturing of spare parts, vehicle assembly plant etc. And as such evidents in most processing plant, process waste of diverse characteristics and discharged into environment. The outcome therefore is an environment with either potential or substantial quantity of chemical hazard. The human, animals plant crops and aquatic lives would be adversely affected.

The scope of this project therefore is to conduct investigation or analysing by physical and chemical analysis of the effluents from Peugeot Automobile Nigeria Limited at close or proximate to the point where the effluents from the forementioned limited is mixed and from the outcome of the analysis, ascertain he presence or absence of these environmental polluting chemicals expected to ave been discharged by Peugeot Automobile Nigeria Limited Kaduna covered within the scope of this assessment.

In this regard, the assessment of the pollutant load will be restricted to the pollutant whose source of origin is the Peugeot Nigeria Limited whose effluents are discharge into the environment.

The reason of this project assessment is provide analytical evidence to support or negate the notion that Peugeot Automobile Nigeria Limited is susceptible to chemical pollution to a certain degree with a view of recommending ways and method of eliminating or reducing them to environmentally permissible level.

In conclusion, the presentation of the report of this assessment will adopt the following format.

1.1.1 An appraisal of the effect of environmental pollution from the Peugeot Automobile Nigeria Limited source and the effect of these pollution chemicals on human, animals, plant crops and aquatic lives.

1.1.2 Quantitative analytical assessment of the presence of these chemical pollution discharged into the Kaduna environment particularly the environment is polluted.

1.1.3 To drawn conclusion and recommendation.

1.2.0 Aim and objectives.

The basic objective in assessing or analysing the chemical impact of the pollutant load of the effluents from Peugeot Automobile Nigeria Limited Kaduna located at Kaduna is to determine the loading or quality of contaminating thus non metal and heavy metal discharged.

This analytical study has been carried out:

1.2.1 To determine the effect of toxic chemicals to organism in the environment receiving them.

1.2.2 To determine the strength of the pollutant offensiveness of sewage to the sense of sight, total suspended and settable solids.

1.2.3 Aimed at collecting information about the possible pollution caused by Peugeot Automobile Nigeria Limited Kaduna.

In Nigeria a tropical country, there is an increasing awareness that pollution and contamination of the environment is most unwanted and therefore measures to stop pollution should not only based by the improvement of human condition but rather should be judged from ecological standpoint.

CHAPTER TWO

2.0 LITERATURE REVIEW

The term effluents refers to the liquid discharge which comes out of the industries as waste. The effluents contains a number of substances as impurities and thus as a source of pollution.

Pollution is defined as the existence of contaminants in the environment for a long period in time.

2.1.0 COMPOSITION OF EFFLUENTS

The composition of industrial effluents depends on the nature of the ndustrial activity and type of raw material used. The effluent is composed mainly f water but also contain a number of other substances in various concentrations. hese substance are either dissolved or suspended in the liquid and these include urfactant organic matter, sulphate phenol phosphate etc.

.2.0 CHARACTERISTIC OF EFFLUENT

These characteristic can be classified into three main group viz: - physical, emical and biological characteristic, however, only the physical characteristic ould be treated.

2.1 PHYSICAL CHARATERISTIC

The most important physical characteristic of the effluent is its total solid content which is composed of floating matter, matter in suspension, colloidal matter and matter in solution, other physical characteristic include odour temperature, turbidity colour, and electrical conductivity.

2.2.2 TOTAL SOLIDS

Analytically, the total solid contents of wastewater is defined as all the matter that remain upon the evaporation at $103C^O$ – $150C^O$. Matter that has a significant vapour pressure at this temperature is lost during evaporation and is not defined as a solid. The total solid could be a either suspended or filterable solid. The suspended fraction includes the settleable solid that will settle to the bottom of cone shape container in an hour period. While the filterable fraction consist of olloidal and dissolved solid. The colloidal fraction consist of the particulate atter with an approximate diametre range from 1mu – 1u. The dissolved solids onsist of both organic and dissolved solid consist of both organic and inorganic atter that are present in the true solution in water.

2.3 ODOUR

Effluent's odours are usually caused by gases produced through the ecomposition of organic matter. The most characteristic odour of effluent is that Hydrogen Sulphate ($H_2 S$) which is produced by anaerobic micro-organism that reduces sulphate to sulphide. The industrial effluent may contain either odourous compound or compound that produce during the process have been rated first in concern of the public relative to the implementation of wastewater treatment facilities. The elimination of odours has become a major consideration in the design and operation of wastewater collection, treatment and the disposal facilities especially with respect to the public acceptance of these facilities.

The importance of odour in human terms is related primary to the psychological stress they produce rather than to the harm they do to the body. Offensive odours can poor appetite for food, lowering of water consumption, impaired respiration, nausea and vomiting and mental perturbation. In an extreme situation, offensive odours can lead to deterioration of personal and community pride, interfere with human relations, discourage capital investment, lower socia-economic status and retard ground. These problems can result in a decline in market, rental property values, tax revenue payrolls and sales.

.2.4 TEMPERATURE

Effluent's temperature is commonly higher than that of water supply ecause of industrial activities.

The temperature of effluent is very important parameter because of its fects on the aquatic life, chemical reaction and reaction rate and the suitability of e water for beneficial uses. For example, increase in temperature can cause a change in the species exist in the receiving water body. Oxygen in addition is less soluble in warm than cold water. The increase in the rate of Biochemical reaction that accompanies an increase temperature combined in surface water can often cause serious depletion in dissolve oxygen concentration in the summer month.

Abnormally high temperature can foster the growth of undesirable water and effluent fungus. (G. TECHOBANGLONS 1979).

2.2.5 PH VALUE

It serves as the measure of acidity or alkalinity of a substance and it is the usual measure or means of expressing the hydrogen Ions concentration of a substance. Wastewater with an adverse concentration of hydrogen Ions is difficult to treat biologically and if the concentration is not altered prior to its disposal, it may alter the concentration of the receiving water and as such can affect the aquatic life.

PH is generally defined as the logarithm of the reciprocal of hydrogen Ion concentration in a solution.

$$PH = \log \left(\frac{1}{H+} \right)$$

$$= \log (H+)$$ (G. KAKABDSE, 1978)

2.2.6 CONDUCTIVITY

Conductivity is the numerical expression of the ability of an aqueous solution to conduct an electric current in the system.. This ability depends on the presence of Ions, their total concentration and as well as on the temperature of measurement. Solution of most inorganic acids, bases and salts are relatively good conductors, while molecules of organic compounds that do not dissociate in aqueous solution conduct current very poorly. (APHA et al. 1985). The electrical conductivity determination serves as a very useful purpose in chemical analysis and also in the estimation of total dissolved solids.

2.2.7 COLOUR

Industrial waste water produces colour depending on the purpose the water erves and chemical used in the factory. The organic compounds are broken down y bacteria similarly the dissolved oxygen in the waste water is reduced to zero nd the colour ultimately changes to black. In this condition the water waste can e said to septic or stale. (G. TECHOBANOGLOUS, 1979).

2.3.0 CHEMICAL CHARATERISTICS OF WASTE WATER

2.3.1 ALKALINITY

This is a phenomenon which is a result of the presence of hydroxide, rbonate and/or bicarbonate of elements such as Calcium, Magnesium, Sodium, Potassium and Ammonia. But Calcium and Magnesium are most common. Alkalinity gives the water ability to neutralize acids. (H.M. PARKER, 1975) Alkalinity which may be due to the excess of alkaline earth metal concentrations ions is significant in determining the suitability of water for irrigation. Alkalinity measurements are also used in the interpretation of water and waste water treatment process (APHA at, al. 1985).

2.3.2 CHLORIDES

This is present practically in all forms of water and it is one of the major inorganic anions in water and waste water. Along the seacoast, chloride may be present in high concentrations because of leakage of salt water into the sewage system. It may also be increased by industrial process. (G. TECHOBANOGLOUS, 1979).

Chloride imparts salty taste, interferes with Agricultural and industrial process.

2.3.3 CYANIDE

It is one of the toxic ions formed in waste water. Cyanide as sodium cyanide r hydrocyanide is widely used as an industrial material. Usually cyanide from waste water are as a result of ore extracting and mining, photographic processing, oke furnace, synthetic fibre, case hardening and industrial gas scrubbing. (C. J. ATTERSON, 1975).

Hydrogen cyanide HCN and Cyanide are highly as a dose of 0.02 ppm. As oisonous, they are rapid in their action when these compounds are inhaled in air r ingested the physiological effect involves an inactivation of the cytochrome espiratory enzymes preventing tissue utilization of the oxygen carried by blood. JOHN WELLY & SON INC. VOL.2 1968).

2.3.4 SULPHIDE

It common presence in waste water comes partly from the decomposition of rganic matter, sometimes from industrial waste but mostly from anaerobic Micro-rganism's reduction or sulphate to sulphide. Hydrogen sulphide escapes into the ir from sulphide waste water which constitute odour nuisance. It attacks metal irectly and indirectly and cause serious corrosion of concrete sewer because it is xidised biologically to H_2SO_4 on the pipe wall (APHA et. 1985).

2.3.5. PHENOLS

Its presence in effluent leads to the formation of chlorophenol that is loriferous and objectionable tasting, also toxic to aquatic life. (JOHN WEILY & N INC. VOL.2, 1968).

2.3.6 AMONIA

This is non-persistent and a nor cumulative toxic compounds which arises as ule from aerobic or anaerobic decomposition of Nitrogenous organic compound.

Ammonia and Ammonium compound, even in a relatively small amount are toxic to aquatic lives. The Toxicity concentration of dissolve oxygen. (L. KLEIN, 1959)

2.3.7 CHEMICAL OXYGEN DEMAND (COD.)

This is defined as the amount of oxygen consumed under specific condition in the oxidation of organic and oxidisable for the influence of chloride. But Biochemical Oxygen Demand (BOD) serves as the useful measure of the quality of biohydrable matter which serves for bacterial (R. B. OCAN el; al 1981). Also the sample from specific source, COD or organic carbon or even inorganic matter.

2.3.8 METALS

Trace quantity of heavy metal such as lead, Ion Copper, Zinc chromium etc. are important constituent of most waste water. Some metals are toxic to aquatic flora and fauna ever in relatively low concentrations. They can also accumulate through food to affect man who eat fish or fish. Acceptable level of discharge to natural water varies with a particular metal but in general, level an effluent will be limited to form 0.5 –2glm^3 (A. A. MOSS, 1978).

2.3.9 HARDNESS

"Hardness of waste water is not hazard to health but statistical correlation between hazard and certain type of cardiovascular disease has shown to posses the exact relationship". (Y. O. ARANSIOLA, 1977). Hardness sometimes cause deposition of scale in boilers, damage to some industrial process and causes objectionable test in palatable water.

Hard water is the one that does not form lather easily on application of soap. Though there are two types of hardness in water namely i.e. temporary and permanent hardness, both are however caused by the presence of Calcium and Magnesium Ions in the form of sulphates, chlorides and bicarbonates.

2.3.10 CARBON-DIOXIDE

It is a major respiratory product of photosynthetic plants and animals, and a decomposition product of organic matter and a certain Minerals. When dissolved in water carbon-dioxide contribute significantly to commotion of water-handling in steam condesate system. (MC GRAW HILL ENCYCLOPEDIA OF CHEMISTRY).

2.3.11 PHOSPHATE AND NITRATE

They stimulate algae and aquatic growth. They can cause methamoglobunemia in infants (blue babies) (MC GRAW HILL Sanitary Science and Water Resources Engineering).

CHAPTER THREE

EXPERIMENTAL METHODOLOGY

3.0 SAMPLING/QUALITATIVE ANALYSIS

Sampling is a process of obtaining a representative portion of the material concerned. Some general rule applicable to all sampling procedure are:

(a) The sample must represent the condition existing at the point taken.

(b) The samples must be of sufficient volume and must be taken frequently enough to permit reproducibility of testing requisite for the desired objective as conditioned by the method of analysis to be employed.

Proper sampling techniques are vital for accurate testing in evaluation studies. To be a representative of the entire flows sample were taken where waste water (effluent) have mixed.

There are various methods of sampling this include the grab method, composite and continuous sampling methods.

Composite method of sampling was used and taken on a hour basic from 8.00am to 6.00pm

3.1.0 METHOD OF SAMPLING

The polyethylene sample container were washed with conc. Hcl rinsed with deionised water several times and allowed to dry. At the point of collection of the ample the containers were washed with the sample and then filled with the sample nd corked.

The two sample collected from Peugeot Automobile Nigeria Kaduna on ifferent days, one was collected on 8th November, 1993 and the other was ollected on 12th November, 1993. Information such as sample location dated and ime of collection were given for easier identification.

Since it was not possible for all the sample to be analysed the same day, they were preserved in the refrigerator.

3.1.1 SAMPLE PRESERVATION

It is theoretically known that all waste water undergo both chemical and iological changes on standing even for a few minutes. Certain chemical charge lter the chemical structure of the constituents of water waste that are function of he physical change. They were in a refrigerator at a temperature of about $4C^{O}$. At this temperature any change that may occur was small and will be considered in onsequential in effecting this analysis.

3.1.2 LABORATORY SAMPLING

The waste waters in their container were shaken vigorously for about a inutes to ensure thorough mixing. Then a specified amount and treatment equired for each determination was carried out.

3.2.0 EQUIPMENTS

(1) PH METER

(2) CONDUCTIVITY METER

(3) BALANCE METER

(4) ATOMIC ABSORPTION SPECTROPHOTOMETER

(5) SPECTRONIC 20

(6) THERMOMETER

(7) HOT PLATE

(8) OVEN

(9) FLAME PHOTOMETER SPECTROPHOTOMETER

3.2.1 QUANTITATIVE ANALYSIS

3.2.2 PH DETERMINATION

The PH meter and the associated electrode were standardized against the two eference buffer solution of PH 4.0 and 9.0. The electrode were then rinsed with listilled water.

The PH of the sample was taken as the reading indicated on the scale by the ointer

3.2.3 CONDUCTIVITY MEASUREMENT

The conductivity cell was rinsed several times with distilled water and then ith the sample.

The sample was put in a beaker and the conductivity cell introduced. The reading was taken and recorded

3.2.4 SUSPENDED SOLIDS

An empty what man filter paper was weighed (W_1) and was used to filter 100ml of the sample, the suspended solid was dried in the oven at a temperature of 103^{O}c for 30 minutes.

It was cooled in a dessicator and finally reweigh (W_2). The suspended solid was calculated using formular.

$$W_2 - W_1 \times 100 \times 100$$

Where W_1 = Initial weigh of filter paper.

W_2 = Final weigh of filter paper.

100 and 100 are constants.

3.2.5 DISSOLVED SOLIDS

A clean dry beaker was weighted empty (W_1) and 100ml of the filtrate obtained was transferred into it.

It was carefully heated to dryness on a hot plate. The beaker containing the solid residue was cooled in a dessicator and reweighted.

The heating cooling and weighing process was repeated until a constant weight was obtained. The total dissolve solid was calculated using the same formular as far suspended solid only that in this case W_1 and W_2 are the initial and final weight of the bearer respectively.

3.2.6 TOTAL SOLID

The total solid was obtained by adding the suspended solids and the solids together. I.e. Total solids = suspended solids and Dissolved solid.

3.2.7 PHENOL DETERMINATION

100ml of the sample was measured into a beaker and the PH Adjusted to 3.0 with phosphoric acid solution (1+9). 1ml of copper sulphate was added and the mixture transferred to a distillation apparatus with a 100ml graduated culinder used as a receiver. Distillation was stopped after 95ml of the sample had distilled and 100ml of distilled water were added to the distillation flask after boiling had ceased and the distillation continued about 100ml of the distillate was cooled.

50ml of the distillate were transferred into a 100ml volumetric flask and diluted to the mark with distilled water. Also a blank was prepared consisting oe 100ml of distilled water.

5ml of Ammonium chloride (NH_4C1) was added to each of the flasks and the PH adjusted to about antipyridine solution and 2ml of 4-amino antipyridine solution and 2ml of potassium ferricyanide ($K_3Fe\{CN\}_6$) were added respectively with immediate mixing after each addition.

The solution were allowed to stay for 3 minutes for colour development after which the absorbance of the sample was measured against the zero absorbance of the Blank at 510nm.

Calculation

$$\text{Phenol in ppm.} = \frac{\text{Absorbance x K}}{\text{S}}$$

Where K = Calibration factor = 284.4

S = Volume of sample used.

3.2.8 CHLORIDE

50ml of the sample was poured into a conical flask and 1.0ml of potassium chromate indicator solution added and mixed properly. The solution was then titrated against 0.025N silver nitrate standard solution from a burette until the brick-red colour persisted throughout the sample.

Calculation

$$\text{Chlorine in ppm.} = \frac{V_1 - V_2 \text{ x N x } 71{,}00}{\text{S}}$$

Where V_1 = Volume of $AgNO_3$ required to titrate the sample.

V_2 = Volume of $AgNO_3$ required to titrate the amount of V_1

N = Normality of silver Nitrate

S = Volume of the sample used.

3.3.7 AMMONIA DETERMINATION

Sodium hydroxide (NaOH) was added to 100ml of the sample to adjust the PH to 10.5. Two drops of sodium potassium tartrate was added and shaken very well. 1ml of Nessler for 20 minutes for colour development, the absorbance was then taken.

Calculation

$$\text{Ammonia Nitrogen} = \frac{A \times 1000}{S}$$

Where A = absorbance

S = Volume of the sample

Ammonia = E x 1.22

Where E = Ammonia Nitrogen mg/litre.

3.2.9 DETERMINATION OF NITRATE

5ml of the sample was taken in 50ml dry beaker and 1ml of brucine sulphanilic acid solution was added.

10ml of concentrated sulphuric acid was measurement into another 50ml flask.

The contents of the two beakers were then mixed by carefully adding each of the sample when the brucine sulphanilic acid solution to the beaker containing the concentrated sulphanilic acid. By pouring from one beaker to the other for six times, proper mixing was obtained. The beaker containing the sulphanic acid was rinsed with 100ml of distilled water into the beaker containing the mixture.

The mixture was kept in the dark for ten minutes for colour development and the absorbance was measured at 410nm against a blank which was given the same treatment as the sample except that the addition of brucine sulphanilic acid solution was omitted.

3.2.10 SULPHATE DETERMINATION

The sample was filtered and 200ml was taken in a beaker, the PH adjusted to 3.0 and 10ml of Hcl added. The acidified solution was heated to boiling and 5ml of hot Barium chloride solution added slowly while stirring vigorously. The temperature was kept below boiling until the liquid was clear and the precipitate has settled completely.

The solution was filtered on a fine filter paper and the precipitate washed with hot water. The filter paper and its contact was then placed in a platinum crucible and ignited at temperature of 800^{O}c for 1 hour. The platinium crucible was cooled in dessicator and weighed.

Calculation

$$\text{Sulphate mg/l} = \frac{W \times 411/500}{S}$$

Where W = gramm of Barium sulphate

S = volume of sample

411/500 = a constant

3.2.11 CYANIDE DETERMINATION

50ml of the sample was acidified with dilute nitric acid in a beaker to prevent the precipitation of other silver salts, such as phosphate and carbonate which might form in neutral solution, and also to produce a more readily filterable precipitate.

To the cool acidified solution, 0.1m silver Nitrate solution was added slowly with constant stirring. This was continued until precipitated, this was detected by ad ding few drops of silver nitrate to the supernatant solution which did not give any precipitate. The solution was then kept in the dark for one hour before filteration.

The precipitate was collected in a weighed filtering crucible and wash three times by decantation with $10cm^3$ of dilute nitric acid. The precipitate and the crucible was tried in an oven at 140^{O}c for one hour, cooled in a dessicator and weighed to a constant weight.

The cyanide was precipitated according to the equation.

CN x Ag^{x} _____ AgCN.

Calculation

$$\text{CN-in ppm} = \frac{\text{x x B}}{W}\ \text{xs}$$

Where X = weight of the precipitate

B = weight of cyanide

W = molecular weight of silver cyanide

S = volume of sample used.

3.2.12 PHOSPHATE

50ml of the sample was taken in a flask and 25ml of ammonium molybdate vanadate solution was added. After a thorough mixing the mixture was allowed to stay for two minutes for colour development. Finally, the absorbance was measured with a spectrotic 20. Distilled water used as the reference sample.

DISSOLVED OXYGEN DETERMINATION

2ml of manganous sulphate solution and alkaline iodide-solution azide solution were added respectively to the sample in the bottle mixed by enverting the bottle several times and allowed to stand. After the floc has settled, 2ml of sulphuric acid were added.

100ml of the sample was taken in conical flask and immediately titrated against 0.025 sodium thiosulphate solution to a pale yellow colour, then 2ml of starch was added and titration continued to the disappearance of the blue colour.

Calculation

$$\text{Dissolved oxygen in ppm} = \frac{T \times 0.2 \times 1000}{S}$$

Where T = Volume of 0.25 sodium thiosulphate solution used.

S = Volume of the sample used.

3.2.13 CARBON-DIOXIDE DETERMINATION

ALKALI BLANK DETERMINATION

To 80ml of carbon dioxide free water, sufficient standard sodium hydroxide was added to yield PH 8.5. After which it was titrated to PH 5.0 with standard hydrochloric acid.

20ml of standard sodium hydroxide was added and then titrated to PH 5.0 with standard hydrochloride acid.

The volume of standard hydrochloride acid corresponding to carbon-dioxide in 1ml oif standard sodium hydroxide is given by.

$$\frac{B - A}{20} = X$$

where B = Volume of Hcl required to titrate to PH 5.0 of the addition of 20ml of standard sodium hydroxide i.e. in the second step of the procedure.

A = Volume of Hcl required to titrate from PH 8.5 to PH 5.0

100ml of the sample was taken in a beaker and tritrated hydroxide ($\{V_1 x\}$NaOH). Then it was titrated from PH 8.5 with standard hydrochloric acid V_2

Calculation

CO_2 in ppm. = $\underline{45{,}6000 \times N \times (V1\ V2 \times X)}$

S

When N = normality of Hcl

V_1V_2 = volume of Hcl required to titrate the unboiled and

V5boiled sample respectively from PH 8.5 to 5.0

V_1X, V_2X = Volume of NaOH required to adjust unboiled and boiled

sample respectively to PH 8.5

X = Volume of Hcl required to titrate the Co2 in 1ml of base from

PH 8.5 to 5.0

S = Volume of sample used.

3.2.14 BIOLOGICAL OXYGEN DEMAND

100ml of effluent was placed in 250ml with dilution water. The diluted solution was poured into two BOD bottle and one was incubated for 5 days at room temperature of 20^{o}c.

The remaining bottles were carefully opened and into it 2ml of manganese II sulphate, sodium azide and 50% sulphuric acid were related and then shaken. The mixture was titrated against 0.025N sodium thiosulphate solution to a yellow colour. 1ml of starch indicator solution was added and titrated to colourless.

After 5 days, the contents of the incubated bottle was treated as above. A blank was also set up using 100ml of distilled water. The Biological Oxygen Demand was the calculated from the data obtained.

Calculation

1ml 0.025N sodium thiosulphate = 0.2g dissolved O_2

$$\text{Dissolved oxygen ppm} = \frac{0.2 \times \text{Titre} \times 1000}{\text{Bottle Volume}}$$

$$\text{BOD} = (D_1 - D_2) - (D_3 - D_4) \times \frac{T}{V}$$

Where D_1 = Dissolved oxygen before incubation for blank.

D_2 = Dissolved oxygen after incubation for blank

D_3 = Dissolved oxygen before incubation for sample

D_2 = Dissolved oxygen after incubation a sample

V = Original sample of the sample used

T = Volume of dilute solution 250ml.

3.2.15 CHEMICAL OXYGEN DEMAND

1ml of the sample was placed in 50ml volumetric flask diluted to 50ml mark with distilled water. 1g of mercuric sulphate, 5ml of conc. H_2SO_4 acid, 1g silver sulphate and 25ml of potassium dichomate solution were added. The mixture was placed on the ice bath and 70ml of concentrated H_2SO_4 acid added.

The mixture was then refluxed for two hours at a room temperature of 200°c. The mixture was cooled and diluted to 300ml with distilled water. A blank containing distilled water was treated in the same was in another flask. 8 drops of phenarthroline ferrous sulphate indicator were added into the solution and titrated ferrous ammonium sulphate solution to a reddish brown colour, the chemical oxygen demand was then calculated from the data obtained.

Calculation

$$\text{COD} = \frac{\text{Titre for blank-Titre for sample x N x 8,000}}{\text{Volume of sample used}}$$

Where N = Normality of ferrous Ammonium sulphate

Solution = 0.0250N

8,000 is a constant.

3.2.16 DETERMINATION OF METALS

The samples were digested with analytical graded reagent Nitric acid before the determination of the metals. Dilution series to get working range of the standard solution were prepared. Atomic aborption spectrophotometer was used in the dtermination of metals.

METAL DETERMINATION BY ATOMIC ABSORPTION SPECTROPHOTOMETER (AAS)

PRINCIPLE OF (AAS)

The principle is based on the fact, when the element of interest in the sample passes over a flame, it become dissociated from its chemical bonds and is placed into an un-excited un-ionised "ground state".

It is then capable of absorbing radiation at discrete line of narrow band width. The desired element in the sample can be considered as being able to absorb only the reasonance lines whose wave-lengths correspond to some high level.

The narrow emission lines which are to be absorb by the sample are generally provided by hallow cathode made of the element being sought. Such a lamp emits only the spectrum of the desired element.

PROCEDURE

100ml of the sample were placed in a beaker and 5ml of conc. Hcl acid added. It was evaporated to 10ml on a hot plate and diluted to 100ml with distilled water.

The instrument was switched on and the correct wave length for the desire element was selected using selection knob. The correct lamp call for the desired element was then selected and put into plate. The air and acetylene valve were then opened. The fuel line was opened and ignited by pressing the ignition knob. The recorder base line was then set by turning the zero knob. A standard solution of the desired element was then introduced into the instruction by placing the suction tube suck in the solution which then passes over the flame, become dissociated and absorbs radiation proportional to its concentration. The recorder then draws a peak proportional to the concentration of the solution. The sample was then treated in the same manner. The peak produced by the sample was then compared to that of the standard and the concentration of the element kin the sample was calculated using this formular:

$$\text{Metal (ppm)} = \frac{\text{conc. Of standard}}{\text{Peak length of standard.}} \text{ x peak length of sample}$$

Metal elements determined and their wave lengths are listed below:

ELEMENT	**WAVE LENGTH**
IRON	248.3
ZINC	213.8
CHROMIUM	357.9
CADMIUM	228.8
NICKEL	232.0
LEAD	283.0
COPPER	324.8

CHAPTER FOUR

.0 TABLE OF ALLOWED STANDARD LIMITS FOR TREAD EFFLUENTS

PARAMETER	STANDARD LIMIT
TEMPERATURE	NOT TO EXCEED $32.5^{O}c$
PH	6.0 – 9.5
TOTAL SOLIDS	1,500 mg/litre
ELECTRICAL CONDUCTIVITY	90mv
PHENOL	1.0ppm
CYANIDE	0.2ppm
PHOSPHATE	50 ppm
SULPHATE	450 ppm
NITRATE	600 ppm
AMMONIA	1.0 ppm
DISSOLVED OXYGEN	250 ppm
CARBON DIOXIDE	400 ppm
CHEMICAL OXYGEN DEMAND	5.2 ppm
BOD AT $20^{O}c$	20 ppm
LEAD	1.0 ppm
CADMIUM	1.0 ppm

CHROMIUM	1.0 ppm
ZINC	1.0 ppm
NICKEL	1.0 ppm
COPPER	1.0 ppm

Obtained from Flentye M.E, Quality specification for finished water, water quality and treatment. Hand book of public water supply Edition 1971, and water pollution Technology John A. Black and FEPA 1991.

4.1.0 DISCUSSION OF RESULT

4.1.1 PH

The PH of the samples were found to be within the limit.

4.1.2 CONDUCTIVITY

The conductivity is within the standard limit and indicates that the concentration of the pollutants present in the effluents are not very much.

4.1.3. ODOUR

Odour is at reduced rate hence slightly pungent. It does not produce psychological stress, or cause vomitting and mental perturbation.

4.1.4 CYANIDE

The cyanide content determined was within the standard limit. High concentration of cyanide is toxi and poisonous.

4.1.5 PHENOL

The phenol content was within the standard limit. High concentration of phenol may produce chloro-phenols which are odoriferious in chlorination of water containing them. Also the presence of phenol in industrial waste water discharge into the river will frequently cause off-lovour in fish tissues and other aquatic food.

4.1.6 PHOSPHATE

The phosphate concentration of sample was fund to be within the limit of standard specification higher concentration will increase the rate of growth of algae which affects the aquatic organisms in water as they will not be able to survive in the absence of oxygen.

4.1.7 SUSPENDED SOLIDS

From result obtained, the concentration of suspended solids were within the standard limit. The presence of suspended solids cause the water to be turbid or coloured which eventually settles, creating sludge bank down stream.

4.1.8 DISSOLVED SOLIDS

Results obtained from determination of dissolved solids showed that they fall within the standard limit. High concentration of dissolved solids can bring about gastro-intestinal irritation. It also affects the quantity of water with regard to its taste.

4.1.9 CHLORIDE

Chloride contents are was within the standard specification. High oncentration increases the growth of organism in the receiving stream.

4.1.10 NITRATE

Nitrate concentration falls within the limit of standard. This shows that, the oncentration of nitrate which is a nutrient is within the specification need for the iological treatment. High concentration of Nitrate will hasten the growth of algae n the river thereby depleting oxygen in the river.

4.1.11 DISSOLVED OXYGEN

Dissolve Oxygen is required for the survival and growth of many aquatic rganisms. The concentration of dissolved oxygen may also be associated with orrosivity and photosynthetic activity. The absence of oxygen may permit naerobic decay of organic matter and the production of toxic and undesirable sthetic materials in water. From the results obtained the amount of dissolved xygen in well below the standard specification.

4.1.12 CARBON – DIOXIDE

The carbon-dioxide concentration is low compared to the standard limit. Carbon-dioxide is the major respiration producer of plants and animals and a lecomposition product of organic matter and certain minerals.

4.1.13 METALS

Metals fall within the standard limit. The presence of any of these metal in cessive quantities will interfere with many beneficial uses of water because of eir toxicity. Some of these metal are necessary to for growth of biological life d absence of sufficient quantities of them could limit the growth of algae. herefore the metals content do not have any effect as it is within specification.

.2 SUMMARY OF RESULT

PARAMETERS	SAMPLE 1	SAMPLES 2
Appearance	Darkgrey	Darkgrey
Temperature	30^{o}c	29^{o}c
Ordour	Pungent	Pungent
Conductivity	4.1×10^{-4} ohms	4.2×10^{-4} ohms
Total Solid	473 mg/l	472mg/l
Suspended Solid	237 mg/l	238mg/l
Dissolved Solid	236mg/l	234mg/l
PH	8.9	8.7
Chloride	39ppm	38.50ppm
Cyanide	0.022ppm	0.021ppm
Sulphide	0.003ppm	0.004ppm

Phenol	0.41 ppm	0.40ppm
Ammonia	0.32ppm	0.31ppm
COD	147ppm	149ppm
BOD	10.20ppm	10.10ppm
Phosphate	5.1ppm	5.2ppm
Nitrate	6.20ppm	6.50ppm
Carbon-dioxide	7.04ppm	7.03ppm
Zinc	5.2ppm	5.10ppm
Chromium	0.20ppm	0.25ppm
Nickel	0.10ppm	0.10ppm
Cadmium	0.05ppm	0.7ppm
Lead	0.10ppm	0.10ppm
Copper	0.08ppm	0.9ppm

S_1 = First Sample

S_2 = Second Sample

CHAPTER FIVE

.0 RECOMMENDATION & SUGGESTION

Industrial effluents usually contain a high concentration of toxic or oisonous substance and thus need to be treated before being discharged into the nain stream. I will recommend that effluents be adequately treated within the ndustry before discharge. Industries should as much as possible monitor the mpact of their effluents on the receiving water bodies. This could be achieved by ollecting series of samples of the effluents from time to time and comparing the esults obtained.

The Author is recommending that immediate and much emphasis should be laid on effluents treatment and its quality control since they are discharged to hear-by river which are used for fishing, recreation, irrigation and drinking. Other reasons include the prevention of the spread of disease which are caused by pollutant from effluents, to prevent physical, chemical and biological contamination of water supplies and to prevent destruction of other valuable aquatic life.

How to treat an effluent depends upon its composition, concentration flow rate and plant specific concerns such as effluent limit, the abundance of water quality to sewer certain effluent to publicly owned treatment work.

I recommend the company within the scope of this project to employ the qualization method of treatment. The equalization method minimises the hour to our variations in effluent flow and composition, and it prevents shock loads from ub-setting the down process. The equalization basis may be designed with a ariable ore constant volume, it is usually mixed to ensure adequate equalization nd to prevent solid from selling out.

Water quality is the responsibility of all individual and jointly, so a standard hould be set up for the maximum value of toxic chemical discharged by the ompany, it should be stressed that mere setting of standard without corresponding ompliance by the companies will not lead to any improvement of the effluent.

As a result of the National Environmental Policy act of 1969 public law 19 – 90, an environmental impact assessment is required for any activity of the human nvironment and that is supported by Federal grants, subsidies loans, permits or icense. To comply with this requirement, the Federal Environmental Protection Agency has directed that all applications for federal assistance grants for waste water treatment facilities contain an assessment of the impact of the proposed project on the natural environment.

It is important that each new wastewater management project have a well conceived, completely impact report to inform the public and all responsible agencies of government from Local to Federal. The report can become the basis of public hearing on the project in an effort to seek the support of the public on which the project will have an impact.

Every conceivable effect of a project on the environment must be taken into account because the environmental impact statement becomes a legal document on the basis of which the proposed project may have to be defended in court. Many environmental consulting firms with experts in field such as environmental science/engineering, ecology, soil science, aquatic and terrestrial biology, land – use planning to mention a few have been created to serve planning agencies responsible for the preparation of these documents.

5.1 CONCLUSION

The result obtained shows that the extent of pollutants of the effluent load from Peugeot Automobile Kaduna falls below the standard limit.

The company should use pre-treatment procedures of its effluents to ensure that these pollutant remain below the standard limit, since most of the settlements around the area use the stream as direct source of drinking water.

Lastly, from investigation carried out based on the results got the concentration of the pollutant load of the effluent from Kaduna Automobile do not create harzard due to poisoning to the users of the Kaduna river.

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