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Effects Of Automobile Repair Workshop On Water Quality Of Selected Area In Ado – Ekiti, Nigeria

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***Abstract*—The effect of organic compound from motor servicing centers and repair shops popularly known as mechanic workshop on the surface and underground water has been very glaring in terms of its negative effect in many urban areas. Leachates from this organic compound always find its way into surface and underground water through percolation and surface runoff whenever there is precipitation. This study was carried out in Ado- Ekiti metropolis in Nigeria to examine the effect of organic compound from automobile mechanic workshop on surface and underground water qualities. Water samples were taken from streams and well water around the automobile mechanic workshop site and necessary laboratory tests were conducted on them. The tests results portrayed the evidence of high water contamination. This shows that both the surface and well water around the study areas are not good for consumption and unusable for civil engineering works due to high concentration of some elements and compounds.**

Keywords—Effects, Organic Compound, Automobile, Mechanical workshop, Water Quality, Ado - Ekiti.

I. INTRODUCTION

Large quantities of pollutants have continuously been introduced into the environments as consequences of urbanization and industrial processes. [3], [10].The release of these pollutants affects the quality of the main sources of water supply i.e. ground water and surface water. Unfortunately, this leads to the presence of impurities in water which varies from dissolved gases and chemical compounds to suspended matter. Generally, these impurities are acquired through contact with the environment but exist in solution, colloid and suspension and can be characterized as biological, physical and chemical depending on the method of detection. [3], [4].

However, pollution associated with petroleum products (complete mixture of hydrocarbon) has been recognized as a serious environmental problem especially as it is being spilled on large scale [2]. They spread horizontally on the ground surface and then percolate into the ground water, soil pores, space, air and on the surface of soil particles. Liquid waste from auto-mechanic workshop which include solvents, paints, hydraulic fluid, lubricants and stripped oil sludge increases the amount of trace metal found in the ground water. The effect of organic compounds from auto mechanic workshop have reached a disturbing level as environmental contamination are widely distributed on the surface and ground water thereby having significant effects on the trophic chain, plants, animals and man [5].

Some studies conducted in Nigeria regarding soil and ground water pollution problems associated with motor vehicles wastes have been reported in [6], [7].Also [1] reported that about 20 million gallons of waste engine oil are generated in Nigeria annually from mechanic workshops which are discharged carelessly into the environment; whereas a litre of used engine oil is enough to contaminate one million gallons of freshwater.

Therefore, the nucleus of this study is the assessment and analysis of the effects of organic compound from automobile mechanic workshop on surface and underground water in Ado - Ekiti metropolis, south-western Nigeria. The results of this study will be used to provide reliable information on the water quality available in Ado – Ekiti metropolis, located in the south-western part of Nigeria.

II. MATERIALS AND METHODS

Study Area

The study area is Bawa area located in Ado – Ekiti metropolis. Ado – Ekiti, a growing urban area is the capital of Ekiti State, southwestern Nigeria and it is located between latitude 7°15'N and 8°51'N, and longitude 4°51'E and 5°45'E. The mean annual temperature of the town is about 27℃ and a range of 3.7℃ and the mean annual rainfall averages 1334mm.

Sample Collection and Analysis

Water samples were collected randomly during the day before sunset using sterilized white plastic containers of two litres capacity and the temperatures were determined immediately with the use of thermometer.

The sampling containers were labeled with different identification tags and then transported to water/public health laboratory of civil engineering department, The Federal Polytechnic, Ado-Ekiti where standard laboratory analysis were conducted. Physical and chemical tests were carried out on the samples in accordance with [8], [9] standard methods. The physical tests carried out are on appearance, colour, hardness, odour, temperature, turbidity and dissolved solution. The chemical tests conducted are on calcium, chloride, bi-carbonate, dissolved oxygen, copper, alkalinity, iron and manganese. The results obtained were then compared with the World Health Organization water quantity standard values. [8], [9].

III. RESULTS AND DISCUSSION

PHYSICAL TEST

Physical tests were performed on water samples obtained from streams and a well close to the auto-mechanic workshop. The results are summarized in Table 1.It was observed that the temperature of water values varied between 26.2°c and 27.4°c. These temperature values are not within the permissible limits when compared with W.H.O standard values. In appearance, the water samples from upstream well are within the permissible limits while that of downstream is cloudy. The colour of the water samples indicated that the colour values are within the permissible limit values (<15.0 TCU).

The turbidity values are not within the W.H.O Standard Values. The water samples at the upstream is milky while the downstream sample is cloudy and water sample for well is slightly cloudy. The turbidity values reduce as the stream water flows.

Total dissolved solid values varied between 14,000mg/L and 2000mg/L which indicated that there is reduction in value with the length of river course with the well water having the lowest total dissolved solid and the upstream having the highest. The values of hardness obtained from the analysis of the water ranges from 1,000mg/L to 1,120mg/L. this indicated a higher value from the upstream water sample and the downstream with the lowest value. Though this value of water sample from downstream is within the W.H.O permissible value, the water samples from both upstream and well do not comply with the standards. The results indicated that the downstream water is the safest of all the waters. The upstream water has deep odour. This is as a result of effluents and runoff of oil spill on the surface area. This odour is faint for the well. This implies that the soil between the stream wells cannot filter all the polluted substance completely out of the stream water before percolation to the well location. This results indicate that none of the water samples is pleasant and not within the permissible W.H.O standards.

Table 1: Summary of physical test results on the water sample. (Location: Bawa Area, Ado-Ekiti)

S/N	TESTS	SOURCE			WATER QUALITY STANDARD VALUES(Source: WHO 2011) PERMISSIBLE/TOLERABLE LIMIT
		UPSTREAM	DOWNSTREAM	WELL	
1	Appearance	Clear	Cloudy	Clear	unobjectionable
2	Temperature	26°C	27.4°C	27°C	Cool temperature values
3	Colour (TCU)	5	5	5	< 15.0
4	Turbidity (NTU)	Milky	Cloudy	Slightly Cloudy	Clear
5	Total Dissolved Solid(mg/l)	14000	4200	2000	< 600
6	Total Hardness (mg/l)	1,120	1000	1048	50-1000
7	Odour	Deep	Unpleasant	Faint	Odourless and pleasant

CHEMICAL TEST

Chemical tests were also performed on water samples obtained from streams and a well close to the auto-mechanic workshop. The results are summarized in Table 2. The observed PH values for upstream water, downstream and well are 6.7, 7.0 and 7.2 respectively. The results indicated that the upstream water is acidic in nature while downstream is natural and the well is alkaline in nature.

The calcium and chloride contents ranges from 376mg/L to 652mg/L and 515.57mg/L to 15,877mg/L which are higher than the acceptable limits of W.H.O standard for drinking water. This indicates high calcium contents in all the locations which make the water to be hard. An indication of high chloride content causes taste and corrosion.

The Bi-carbonate and dissolved oxygen values ranges from 14.4mg/L to 75.6mg/L and 6.5mg/L to 7.0mg/L respectively. The values for Bi-carbonate are within the W.H.O limit standard whereas dissolved oxygen, the upstream and downstream values fall within the W.H.O standard but for the well, the value is higher than the W.H.O standard limits. This implies that the well water is not fit for consumption.

The value for copper, alkalinity, manganese and lead ranges from 0.01ppm to 0.011ppm, 14.4 to 7.5mg/l, and 0.04ppm to 0.07ppm and 0.001 mg/l to 0.004 mg/l respectively which are within the W.H.O limit standards.

Table 2: Summary of Chemical test results on the water sample. (Location: Bawa Area, Ado-Ekiti)

S/N	TESTS	SOURCE			WATER QUALITY STANDARD VALUES (Source: WHO 2011) PERMISSIBLE/TOLERABLE LIMIT
		UPSTREAM	DOWNSTREAM	WELL	
1	pH	6.7	7.0	7.2	6.5 - 8.5
2	Calcium (mg/l)	376	600	652	100 - 300
3	Chloride (mg/l)	517.57	3722.25	15877	200 - 300
4	Bi-carbonate (mg/l)	14.4	44.4	75.6	200 - 600
5	Dissolved Oxygen (mg/l)	6.7	6.6	7.0	(Very High level not accepted)
6	Copper (mg/l)	0.01	0.03	0.011	2.0
7	Alkalinity (mg/l)	14.4	44.4	75.6	600
8	Iron (mg/l)	0.21	0.34	0.20	0.30
9	Manganese (mg/l)	0.05	0.07	0.04	0.1
10	Lead (mg/l)	0.001	0.006	0.004	0.01

IV. CONCLUSION AND RECOMMENDATION

This study reveals that the presence of organic compound in both surface and underground water proved that organic compound from auto mechanic workshop has negative effects and is a serious geo-environmental issue that adversely hampered the qualities of water in Ado - Ekiti metropolis. The presence of some chemical element/compound in the water samples (against the W.H.O standard) indicate that the water is not fit for consumption.

It is advisable that the water should undergo various stages of water treatment before consumption. Therefore the improper disposal of these wastes now demands attention. In order to protect the surface and ground water from pollution, it is recommended from the findings that automobile mechanic workshop should be sited far away from residential areas to avoid the transfer of these metals into the water bodies.

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