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PHYSICO-CHEMICAL AND BACTERIOLOGICAL ANALYSIS OF AUTOMOBILE SERVICE STATION RESIDUE WATERS

T. Selvamohan and G. Karthick
Department of Zoology , Rani Anna Government College for women,
Tirunelveli, TamilNadu, India
*E-mail: tsmohan71@gmail.com

ABSTRACT
The paper reports the analysis of service station residue water. In the service station used waters are mixed with fuel and other hydrocarbons related with. The collected service station water samples are analyzed for parameters, like Appearance and color, Turbidity , Total dissolved solids, Total hardness , Iron , Manganese, Fluoride, sulphate, phosphate ,TDS, pH, Electrical conductivity, Nitrate, calcium, Chloride, Magnesium, sodium and potassium also analyzed and the bacteriological count is also tested.
Keywords: pH, water Quality, oil pollution, Aquatic biology.

INTRODUCTION

Water is very precious for every living organism on this earth. The available fresh water to man is hardly 0.3 to 0.5% of the total water available on the earth and therefore its judicious use is imperative. In today's scenario, unplanned urbanization, rapid indiscriminate use of artificial chemicals cause of heavy and varied pollution in aquatic environments leading to deterioration of water quality and depletion of aquatic fauna including fish. Discharge of urban, industrial and agricultural wastes have increased the quantum of various chemicals that enter the receiving water, which considerably alter their physicochemical characteristics[1-2]. Nutrients like phosphorus and nitrogen from the domestic wastes and fertilizers accelerate the process of eutrophication[3-4]. The aquatic environment with its water quality is considered the main factor controlling the state of health and disease in both cultured and wild fishes [5]. Service stations, as sources of water, are of fundamental importance to man. However, service station may have been natural water sources exploited by man at different time to meet different needs or may have been created for a multitude of different purpose.[6] The increased demand of water as a consequence of population growth, agriculture and industrial development building construction has forced environmentalists to determine the chemical, physical and biological characteristics of natural water resources[7]. Pollution is caused when a change in the physical, chemical orbiological condition in the environment harmfully affect quality of human life including other animals' life and plant [7-10]. Industrial, sewage, municipal wastes are been continuously added to water bodies hence affect the physiochemical quality of water making them unfit for use of livestock and other organisms[8].

Water samples

Samples for physico-chemical and bacteriological examinations were collected. Before collecting the sample, the bottles were rinsed well with the same water sample. Then they can were stopper tightly.

Appearance and color

Appearance and color is calculated by following the reported method [11].

Turbidity

Turbidity is calculated by following the reported method[11].

Total dissolved solids
Total dissolved solids are calculated by following the reported method[11].

Electrical conductivity
Like water the conductivity of the sediment suspension is also measured by a conductivity meter [12].

pH
The pH of most natural water falls in the range of 4 to 9 and much more often in the range of 7 to 8. The method was followed for measuring hydrogen-ion-concentration by using pH meter[12].

Alkalinity
Alkalinity is determined by titrating the water sample with a standard solution of strong acid. The equivalency or end points of the titration are selected as the inflection points in the titration of sodium carbonate with H_2SO_4. This end point may be determined empirically by titration and is the pH where the derivative of pH/ml titrates is greatest. However, they are usually taken as pH 8.3 for the carbonate end point and pH 4.5 for the bicarbonate end point. The method was used for the estimation of water carbonate and bicarbonate[12].

Total alkalinity
Although the alkalinity of natural waters is generally the result of bicarbonates, it is usually expressed in terms of calcium carbonate. Three kinds of alkalinity are indicated: hydroxide (OH^-), normal carbonate (CO_3^-), boicarboante (HCO_3^-); the three are summed as total alkalinity.

Total hardness
Total hardness is calculated by following the reported method[11].

Calcium
The reported method[12] was followed for the estimation of water calcium.

Magnesium
The magnesium content of the water was measured by the reported method[12].

Sodium and Potassium
The sodium and potassium contents were measured by using flame emission spectrophotometer[12].

Iron and Manganese
Iron and Manganese is calculated by following the reported method[11].

Free ammonia
Ammonia reacts with phenol and hypochloride at the high pH with sodium nitropruside as a catalyst and result in the formation of Indophenol, a blue colored compound. The intensity of the color was proportional to the ammonia concentration. The absorption of which was read at 640 nm spectrophotometrically.

Nitrite
The nitrite content of water sample was estimated by sulphanilamide (Spectrophotometric) method.[11] 50 ml of sample was taken in a clean conical flask. To this, 1 ml of sulphanilamide solution was added. After 3 minutes, 1 ml of N-1 naphthyl ethylene diamine hydrochloride solution was added. The optical density of this mixture measured at 543 nm in a Spectrophotometer. From this value, the amount of nitrite present in the water was calculated as follows.

Calculation
Nitrite (mg/l) = Con. of Standard x OD of unknown sample / OD of known sample (standard)

Nitrate
The water nitrate content was analyzed following the reported method.[12]

Chloride
The reported method[12] was followed for the estimation of water chloride.

Fluoride, sulphate, phosphate and Tidys test (4h)
Fluoride, sulphate, phosphate and Tidys test are calculated by following the reported method[11].

RESULTS AND DISCUSSION

The Physico- chemical analysis of five water samples (service stations) was given in the following tables. The samples were analyzed in the Tamil nadu Water Analysis Department (TWAD), Madurai.

Table-1: Physicochemical and bacteriological parameters recorded in service station residue waters.

PHYSICAL EXAMINATION	BIS limit		Samples analyzed				
	Desirable limit	*Permissible limit*	SVG A	SVG B	SVG C	SVG D	SVG E
1. Appearance	-	-	Black	Slightly turbid			Black
2. Color	-	-					
3. Odor	Un objectionable		Fuel smell			Slightly fuel	Foul smell
4. Turbidity NT units	1	5	50	35	30	45	55
5. Total Diss. Solids mg/l	500	2000	501	980	496	777	1414
6. Electrical conductivity	-	-	716	1400	708	1110	2020
II. *CHEMICAL EXAMINATION*							
7. pH	6.5-8.5	6.5-8.5	6.45	7.95	7.15	7.50	7.18
8. Alkalinity	-	-	0	0	0	0	0
9. Total Alk. as CaCo3	200	600	160	310	100	220	300
10. Total hardness as CaCo3	200	600	280	160	180	460	140
11. Calcium	75	200	70	58	45	115	35
12. Magnesium	30	100	27	32	15	38	12
13. Iron	0.3	0.3	0	0	0	0	0
14. Manganese	0.1	0.3	0	0	0	0	0
15. Free Ammonia	0.5	1.0	0.5	1.0	0.5	1.5	1.0
16. Nitrite	0.5	1.0	0.5	1.5	1.5	2.0	1.5
17. Nitrate	45	45	10	20	15	20	25
18. Chloride	250	1000	140	260	160	240	490
19. Fluoride	1.0	1.5	0.8	1.0	1.0	0.8	0.8
20 . Sulphate	200	400	25	34	40	32	46
21. Phosphate as PO4	0.5	1.0	1.5	0.5	0.5	1.5	1.0

22. Tidys test 4 hrs. as O2	-	-	0.8	0.9	0.8	0.8	0.9
III. *BACTERIOLOGICAL EXAMINATION*							
1 . Standard plate count /ml		500organism/ ml	100	130	120	140	160
2. Total Coliform / 100ml		10/100ml	50	70	50	100	120

Appearance is the common physical factor to the fresh water system. In the most of the service stations (Table-1) show the turbid appearance.. In naturally, the water has no color. But the water expresses the color of something present on it. On that, the service station shows the black color. It means, the water contain high amount dissolved solid and presence of fuel materials on it. In the SVG B service station shows the high pH value of 7.95. The lowest pH value is found out in SVG A service station at pH 6.45. It shows the pH value is presence between 6.5 – 7.5. The similar findings were also reported earlier[13]. In their finding pH level is vary between 6.1 – 7.5.

Among the five service stations, the alkalinity level is high in the SVG B service station as 310. The least value is finding out in SVG C service station as 100. The alkalinity level is increase due to the conversion of the insoluble carbonates into soluble bicarbonates[14]. Total hardness values ranged from 140 – 460 mg/L of which higher value of 460 mg/L at SVG D service station, the minimum value (140 mg/L) is observed in SVG E service station. Water becomes a conductor of electric current when substances are dissolved in it, and the conductivity is proportion to the amount of dissolved substances[15]. Conductivity merely measures the concentration of substances in selection[16]. The present study electric conductivity varied from 2020 to 708 ± 1.1 uhmOS/cm.

Calcium was found higher (115 mg/L) in SVG D service station and lower (35 mg/L) in SVG E service station. Calcium is found in greater abundance in all natural water and its main source is weathering of rocks from which it leaches out[17]. In the present study, magnesium high amount (38 mg/L) in SVG D service station, and also least amount (12 mg/L) in SVG E service station. Magnesium content lower than calcium ions in natural water[18]. But due to the addition of animal waste and other waste into the water body increase the magnesium level. The presence of sodium is high in SVG A service station as 142 mg/L compared with other five service stations. The lowest value is recorded as 5.5 mg/L in SVG E service station. Iron is nil in the five service station using waters. The free ammonia values are varied from 0.5- 1.5. The high value is found in SVG A service station and least amount is found in SVG E service station.

The amount of free ammonia level is increase due to the denitrification process[19]. In that NO_2^- and NO_3^- is reduced to NH_3. It is expressed in the service station by high algal blooming to create the greenish color appearance to the water. The amount of nitrite is very low in the all of the five service stations examined. It is in trace amount as 0.5– 2.0. The nitrate level is ranged between 10 – 25 mg/L in the five service stations. The high amount is observed in SVG E service station.

In the present study, the presence of chloride is maximum (490 mg/L) in SVG E service station and minimum (140 mg/L) level in SVG A service station. The reason of chloride is high amount of contamination with organic wastes and found the result in the range of 140 – 173 mg/L[17]. Fluoride is the toxic substances to the human. It causes the various health problem to the human and animals. The Indian Government Standardize the fluoride level as 1.6 in the aquatic system. May our results also fulfill this level. In this, the SVG C service station has the higher value of 1.0 mg/L fluoride. The lowest amount of fluoride is estimated in the other three service stations as 0.8. Sulphate in the five service stations is ranged from 25 – 46± 7 mg/L. The high (46 mg/L) is found in the SVG E service station. Phosphate level ranged between0.5 - 1.5. The highest value is found in SVG A & SVG D service station. Found out the phosphate value have 6.0 mg/L indicates the presence of the pollution[13]. The pH alkalinity in all the five service stations is nil.

The manganese is nil in the five service stations. The manganese plays a main role in hardness of water. This results were indicates the level of organic content present in the service station water.
In the bacteriological examination, the standard plate count indicates 100 – 160 organism / ml. it is the below value of the permissible limit. It is due to the fuel contamination it eradicates the high amount of living organisms on the water.

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