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ANALYSIS OF SOME PHYSICO-CHEMICAL CHARACTERISTICS OF EFFLUENT WATER IN SANJIVANI CHEMICAL DIVISION, SAHAJANANDNAGAR IN KOPARGAON TEHSIL, DIST- AHMEDNAGAR (M.S.), INDIA.

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ABSTRACT

In the recent past several studies have reported the water bodies becoming increasingly contaminated due to domestic and industrial wastes. The Sanjivani Sahakari Sakhar Karkhana Limited, Sahajanandnagar, Tal – Kopargaon Maharashtra State (India) having important factor in rural economy of Ahmednagar district & is situated at Sahajanandnagar of Kopargaon Taluka. It is useful in development of many other industries such as Distillery, Biogas plant, Acetaldehyde plant, Acetic acid plant and Spirit production. The area of Kopargaon has been developed by this sugar mill because of the income gained by the farmers and the rural people of the surrounding area. But its liquid effluent containing heavy as well as toxic metals and having bad odour which have posed the threat to the ecological balance of rural area around. To minimize this problem industry have started plants such as biogas plant, distillery plant etc. to make use of the polluted liquid effluent for production of biogas and alcohol beverages. This treated liquid effluent can be used as a fertilizer. The present study deals with the physico-chemical parameters and metals such as Ca, Mg, etc. determined by different analysis methods & compare the limits with standards available for us.

KEYWORDS: Physico-chemical parameters, heavy as well as toxic metals, contaminated due to domestic and industrial wastes Biogas Plant, Distillery plant.

INTRODUCTION

The Study area Sanjivani Chemical distillation effluent water from Sanjivani Sahakari Sakhar Karkhana Limited, Maharashtra State (India) is situated at Sahajanandnagar of Kopargaon Taluka which we have selected for our analysis purpose is situated to east at 1.5 km away from our educational institute.

SAMPLING SITES AND COLLECTION

The sampling site which we have selected is Biogas plant. At the site we have collected inlet spent wash which is disposal of distillery plant after production of alcohol. Other sample collected is disposal of biogas plant which is treated spent wash with DAP for production of biogas.

Random selection method is used for collection of samples. We have collected samples at three different sessions in morning, noon and evening. From these a representative composite sample of two litre volume is made for analysis purpose. Polythene bottles are used for sample collection which were thoroughly washed with distilled water. At the time of collection, the bottles were rinsed with sample 3-4 times and then sample was collected. The distance between the inlet spent wash and outlet effluent is near about meters.

ANALYSIS OF EFFLUENT WATER

For the analysis of inlet and outlet waste water the methods used for estimation of particular parameters are as follows.

Physio-Chemical characteristics of effluent water analysis

Sr.No.	Parameters	Method
1.	Temperature	By Thermometer
2.	pH	pH meter
3.	Dissolved Oxygen (DO)	Winkler's iodometric method

4.	Chemical Oxygen Demand (COD)	Titrimetry
5.	Conductivity	Conductometry
6.	Total Solid (TS)	Gravimetry
7.	Total Dissolved Solids (TDS)	Gravimetry
8.	Total Suspended Solids (TSS)	Gravimetry
9.	Redox Potential	pH – metry
10.	Total alkalinity, carbonate Bicarbonates	Titrimetry
11.	Acidity	Titrimetry
12.	Carbon dioxide	Titrimetry
13.	Inorganic Phosphorous	Spectrophotometry
14.	Sulphate	Gravimetry
15.	Chloride	Titrimetry / Argentometry
16.	Hardness	EDTA method
17.	Calcium	EDTA method
18.	Magnesium	EDTA method
19.	Oil and Greese	Gravimetry
20.	Langelier $CaCO_3$ Saturation index	pH – metry

PARAMETERS

Temperature result table

The determination of temperature of both the samples is done by similar way. The sample was collected in beaker and soon the temperature was recorded by inserting the thermometer.

Table No. 1.

Sr. No.	Sample	Temperature (^{0}C)	pH	COD (ppm)	DO (ppm)
1	S_1	37	3.25	89,000	1.9899
2	S_2	31	7.53	26,500	3.3643

Table No. 2.

Sr. No.	Sample	Conductivity (mhos)	Total Solids (ppm)	TDS (ppm)	TSS (ppm)
1	S_1	0.123500	55,840	41,000	15,000
2	S_2	0.001530	29,860	27,000	1,310

Table No. 3.

Sr. No.	Sample	Redox potential (mV)	Total Alkalinity (ppm)	Activity (ppm)	Carbon dioxide (ppm)
1	S_1	-131	13712.5	7260	6732
2	S_2	-350	23275.0	1500	0

Table No. 4.

Sr. No.	Sample	Inorganic Phosphorous (ppm)	Sulphate (ppm)	Chloride (ppm)	Hardness (ppm)
1	S_1	0.620238	79.21375	4400	8300
2	S_2	0.301391	87.5672	6700	6700

Table No. 5.

Sr. No.	Sample	Calcium (ppm)	Magnesium (ppm)	Langelier $CaCO_3$ Saturation index	Oil & grease (ppm)
1	S_1	2545.89	1289.6814	-1.45	31420
2	S_2	5772.63	185.5795	-0.11	1100

Chemical Oxygen Demand (COD)

Reactions

$Cr_2O_7^{-2} + 14H^+ + 6e^- \rightarrow 2Cr^{3+} + 7H2O$

$6Fe^{2+} \rightarrow 6Fe^{3+} + 6e-$

$MnSO_4 \rightarrow Mn^{2+} + SO_4^{2-}$

Alkaline KI $\rightarrow K^+ + I^- + OH^-$

$Mn^{2+} + 2OH^- \rightarrow Mn(OH)_2$ white ppt. (O_2 absent)

$Mn2+ + 2OH- + ½\ O2 \rightarrow MnO_2 + H_2O$ (O_2 present)

$MnO2 + 4H+ + 2I- \rightarrow I_2 + Mn^{2+} + 2H_2O$

$I_2 + 2Na_2S2O_3 \rightarrow Na_2S_4O_6 + NaI$

Total Alkalinity – carbonates & bicarbonates
Reactions

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H^+ + HCO^{-3}$

$HCO^{-3} + H^+ \rightarrow H_2CO_3$

$H_2CO_3 \rightarrow H_2O + CO_2 \uparrow$

Sulphate result table
Gravimetric method
Reaction

$Ba^{2+} + SO_4^{2-} \rightarrow BaSO_4$

Chloride result table
Reactions

Ag+ + Cl- → AgCl (White ppt.).

$2Ag+ + CrO_4^{2-} \rightarrow Ag2CrO4$ (Reddish brown ppt.).

M^{2+} + EBT → M-EBT complex (Wine red).

M-EBT + EDTA → M-EDTA + EBT (where M-metal

Physico-chemical characteristics of effluent water analysis

Sr. No.	Parameters	Sample first (raw spent wash) (ppm)	Sample second (Treated effluent) (ppm)
1	Dissolved Oxygen (DO)	2.0588	3.6363
2	Chemical Oxygen Demand (COD)	90,000	27,000
3	Total Solids (TS)	54,740	27,680
4	Total Dissolved Solids (TDS)	40,000	26,420
5	Total Suspended Solids (TSS)	14,740	1,260
6	Total alkalinity, carbonates & bicarbonates	12,712.5	22,275
7	Acidity	6,250	1,500
8	Carbon dioxide	6,732	0
9	Inorganic phosphorous	0.520238	0.201391
10	Sulphate	79.21375	87.5672
11	Chloride	4,331	6,674
12	Hardness	8,200	6,600
13	Calcium	2444.88	5771.52
14	Magnesium	1289.14	185.57
15	Oil and grease	30,240	1,000

Physico-chemical characteristics of effluent water analysis

Sr. No.	Parameters	Sample first (raw spent wash)	Sample second (Treated effluent)
1	Temperature	38°C	32°C
2	pH	3.05	7.43
3	Conductivity	0.01285 mhos	0.001428 mhos
4	Redox potential	-131 mV	-348 mV
5	Langelier$CaCO_3$ saturation index	-1.35	-0.10

RESULTS AND DISCUSSIONS

Physico - chemical parameters

- The results related to the physico-chemical characteristic of the sugar mill distillery effluent collected at biogas plant. The inlet & outlet composite effluent samples have been listed in the given result table.
- The results reveal that the pH value have increased after treatment. The acidic pH (3.05) of inlet spent wash changes, to alkaline pH (7.43) after treatment. The pH values are not in standard range (4.3- 5.3) recommended by ISI & WHO.
- The concentration of dissolved oxygen in water depends on temperature, pressure and concentration of various ions. The DO level was recorded in the range of 2 to 4 ppm.
- The TDS values ranges between 26000 to 4000 ppm which are in the recommended standard range. The term total hardness indicates the concentration of Ca & Mg only. It is express in terms of calcium carbonates. Total hardness varies from 6500 to 8500 ppm.
- Carbon dioxide, inorganic phosphorous, oil and grease these parameters have been decreased from untreated to treated effluent.

- The electrical conductivity is very low & is 0.01285 mhos for untreated effluent which decrease to 0.01168 mhos for treated effluent after biogas formation.

CONCLUSION

- The pH values of effluents are higher than standard limits probably due to the presence of chemicals formed by degradation of sugar itself.
- High DO concentration is undesirable as it accelerates the corrosion at high temperature and pressure.
- The lower range of conductivity value indicates that effluent water has less content of inorganic acids, bases and salts which are good conductor.
- Sudden rise in conductivity in water indicates addition of some Pollutants.
- Water having conductivity more than 20 mmhos have not been suitable for irrigation as the samples which we have analysed have the conductivity between 11-13 mmhos is therefore suitable for irrigation purpose.
- Lower values of redox potential indicate more & more reduction processes while rise in it will denote more oxidation processes. Redox potential related to pH –when there is decrease in 1 unit of pH, there is decrease in 0.058 V of redox potential.
- Langelier calcium carbonate saturation index results include that both the effluents cause significant corrosion.

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