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Physico-chemical Parameters of Textile Mill Effluent, Hinganghat, Dist. Wardha (M.S.)

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ABSTRACT

Sample of textile industry effluent was collected from Hinganghat, District Wardha (M.S.) India and analyzed for their physicochemical characteristics. The results of this analysis were compared with the water quality standards of BIS (Bureau of Indian Standard). In this analysis the various physicochemical parameters such as colour, odour, temperature, density, surface tension, viscosity, alkalinity, acidity, chloride, hardness, total dissolved solids(TDS), total suspended solid, pH, conductance, sulphate, COD, BOD, were determined using standard procedures. Elements like Sodium and potassium were determined flame photometrically. The quality of water samples were discussed with respect to these parameters and thus an attempt were made to ascertain the quality of water used for drinking and domestic purposes in the studied area.

Key words: Physico-chemical parameters**,** textile industry effluents, Water quality BIS.

INTRODUCTION

Water sources available for drinking and other domestic purposes must possess high degree of purity, free from chemical contamination and microorganisms. Rivers are lifeline of living beings and constitute an integral part of both rural and urban community as a source of drinking water and fish culture. There are 14 major rivers in India that share 83% of the total drainage basin and contribute 85% of the total surface flow. Water used by the consumers must be free from disease causing bacteria; toxic substance and excessive amount of minerals and organic matter (Yadav et al 2003) Also, the effluent from the textile industry are characteristics of waste water released from various sections of dye industries like bleaching, dye house and printing of composite cotton textile mills. The rapid growth of urban areas has further affected the groundwater quality due to over exploitation of resources and improper waste disposal practices (Hariprasad and Deccaraman, 2008).Fresh water becomes polluted due to three major reasons, excess nutrients from sewage and from industries, mining and agriculture. According to recent reports, ground water contamination is increasing due to anthropogenic activities like disposal of waste, sewage, industrial waste. (APHA, 1985) Due to rapid industrialization, urbanization, overexploitation of ground water and improper waste water techniques, contamination of ground water in urban areas results (Yadav and Singh, 2009). Therefore, pollution of water resources needs a serious and immediate attention through periodical check up of water quality.

About 71% of the earth surface is occupied by water (Rani and Arul, 2009) Out of this; about 97% is saline in nature while 2.94% water is trapped in the giant glaciers and polar ice caps. The water running off the land picks more soluble species in areas where weathering is still in its earlier stages

(Harikumar, 2008); Potability study of water samples in rural areas is necessity to facilitate their better livelihood. This indicates that merely 1% quantity of water is available for drinking, agriculture, domestic and industrial consumption.

EXPERIMENTAL

In this study water samples have been collected in polythene bottles with necessary precaution at points at which effluents discharge into drains for laboratory analysis. Determination of parameters like colour, odour, temperature, density, surface tension, viscosit**y,** alkalinity, acidity, chloride, hardness, total dissolved solids (TDS), total suspended solids (TSS),dissolved oxygen (DO), nitrogen, sodium, potassium and pathogens were carried out in the laboratory. Electrical conductance was carried out using pH-meter and conductivity meter respectively. Sodium, (Na) and Potassium (K) were determined by using flame photometer, Sulphate ion concentration (SO_4^{2-}) was determined by using Systronic-108and166 spectrophotometer. Chemical oxygen demand (COD) was determined by the dichromate digestion method while biochemical oxygen demand (BOD) was determined by the dilution method. The chemicals used were of AR grade. Double distilled water is used for the preparation of solutions and reagents. All equipment like pH, conductivity meter and spectrophotometer were checked and calibrated according to the manufacturer's specifications.

RESULTS AND DISCUSSION

Temperature

All physiological activities and life processes of aquatic organisms are generally influenced by water temperature. In the present study, temperature range was from 28-30^{o}C.

Taste and Odor

Disagreeable odor and taste in water may be because of presence of decaying vegetation, Inorganic constituents / organic substances, discharge of wastewater in water bodies. (BIS limit: unobjectionable / agreeable due to aesthetic consideration).

Studied water sample was found to be odorless and tasteless

Turbidity

Turbidity is caused by suspended matter finely divided organic and inorganic matter, soluble colored organic compounds Plankton and other microscopic organisms. Turbidity was found to be O NTU. (BIS limit: 5 – 10 NTU; aesthetic consideration and harmful bacteria may be associated with particles).

pH

The pH of natural water is important index of hydrogen ion activity and is the resulting value of the acid base interaction of a number of mineral and organic components in water. It determines the equilibrium between free CO_2, HCO_3^- and CO_3^{-2}.pH of the water effluent was found to be 6.2. (BIS limit: 6.5 to 8.5; health related problem, may affect mucous membrane and problem in water supply system)

Density, Surface Tension and Viscosity

Density was 0.9962 gm/cm^3. While surface tension was 71.2156 dyne/cm. Viscosity was calculated as 9.0712g/cm/sec which was in the comparable range.

Electrical Conductivity (EC)

Electrical conductivity is caused due to presence of electrolytes which dissociate into cations and anions.EC of the sample was measured to be 0.989mM.(BIS limit: relates to total dissolved solids**)**

Total dissolved solids(TDS)

It is an index of solid present in dissolved form and estimated as being 0.5 to 0.9 times the conductivity in mS/cm (BIS limit : 500-2000 mg/L; palatability decreases and may cause gastro-intestinal irritation). In the present study, TDS was calculated to be 860ppm.

Dissolved Oxygen (DO)

The DO was found to be 0.4921 mg/lit. The lower DO content may be due to intrusion of high organic load in the water which leads to oxygen depletion.

Hardness

Total hardness is sum of the calcium and magnesium concentrations, both expressed as calcium carbonate, in mg/L Water is conventionally classified as hard or soft from the following classification 50 – 100 mg/l(Soft), 100 – 250 mg/l (Moderately hard) 250 – 350 mg/l(Hard),> 350 mg/l(Excessive hard).Total hardness in the studied effluent was calculated to be 243mg/l. Thus, the studied water sample was found to be moderately strong and thus need to be treated before using it for the domestic purposes.

Alkalinity

Alkalinity of water is acid-neutralizing capacity of the water to pre-designated pH .Alkalinity is the sum of all the titratable bases .Alkalinity in water is mainly due to carbonate, bicarbonate and hydroxide content.Borates, phosphates, silicates or other bases if present also contribute for alkalinity.(BIS limit : 200 to 600 mg/L; taste become unpleasant**)** In the present study, total methyl orange alkalinity was found to be 18.096 mg/lit.

Biological Oxygen Demand (BOD)

BOD of effluent determined was 25.86 mg/lit. Urban runoff carries pet wastes from streets and sidewalks, nutrients from lawn fertilizers, leaves, grass clippings, and paper from residential areas, which increase oxygen demand. Biochemical oxygen demand is a measure of the quantity of oxygen used by microorganisms (e.g., aerobic bacteria) in the oxidation of organic matter. This high BOD of the studied water sample is an indication of the contamination.

Chemical Oxygen Demand (COD)

COD determines the oxygen required for the chemical oxidation of organic matter. COD values conveyed the amount of dissolved oxidizable organic matter including non-biodegradable matter present in it. COD value in sample effluent was found to be 45.12 mg/lit.

Chloride

The chloride content in the sample was 62.029mg/lit. Chloride is generally present at low concentration.High concentration of chloride may impart undesirable taste to drinking water. The tolerance of chloride by human being varies with climate, exertion and loss through perspiration. (BIS limit: 250 to 1000 mg/L; decreases palatability, salty taste and corrosion)

Sodium

Sodium levels in ground waters vary widely.It varies between 6 to 130 m/L depending upon geological formation. In surface water generally the sodium concentration ranges between 1 and 300 mg/L depending upon the geographical area. Excessive intake of sodium chloride causes vomiting. (Guideline values: 200 mg/L; based on taste threshold and health consideration) Sodium concentration was found to 0mg/l in the sample flame photo metrically.

Potassium

The concentration of K is quite lower than Na. It remains mostly common in solution without undergoing any precipitation. Potassium concentration was not found in the sample.

Nitrogen

Organic nitrogen includes such natural materials as proteins, peptides, nucleic acid, urea and numerous synthetic organic compounds. Knowledge of nitrogen in waste water is important when it is used as an irrigant. In the investigated sample, nitrogen was not found.

Acidity

Acidity is a measure of the effects of combination of compounds and conditions in water. It is the power of water to neutralize hydroxyl ions and is expressed in terms of calcium carbonate. Water attain acidity from industrial effluents, acid mine drainage, pickling liquors and from humic acid. No phenolphthalein acidity and methyl orange acidity was found in the studied water sample.

Pathogens

The most common danger associated with drinking water is contamination by sewage, by other waste or by human or animal excreta. This is determined by conducting test for total coli form counts fecal coli form counts. The pathogen observed was *Salmonella species* which is gram negative and short rod shape.BIS limit: 10 CFU/100 ml and absent; Causes illness and fatal for life).

CONCLUSION

The water quality parameters of the areas situated around Hinganghat nearer to the textile industries are studied. From this analysis it may be concluded that proper environment management plan may be adopted to control the release of effluent. Hence it is suggested to exercise all the necessary precaution before the water is used for drinking and irrigation. Otherwise, it may lead to much adverse health effect.

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