ANALYSIS OF TOTAL DISSOLVED SOLID OF CHANDRAPUR REGION

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Abstract: - Chandrapur city is developing rapidly due to industrialization since last two decades. It is considered as fourth most polluted city in India. The present study was carried out with a view to have an understanding about the pollution status of Chandrapur district, particularly water quality in vicinity of Industrial area and mining projects. Environmental studies were carried out on ground and surface water to find out the physico-chemical parameter like TDS and turbidity. It is necessary to collected sample from different sites, in order to evaluate the drinking water quality in and around Chandrapur district. The analysis of various parameters using standard methods (APHA/NEERI) and their comparison with WHO (World health organization) standards values, suggest that most of the parameter within permissible limit given by Central pollution control board of India (CPCB). Concentration of parameters beyond the limits in some stations could be reduced and could be an invaluable source for domestic purposes in the region. The present paper accounts water quality of various sites situated in Chandrapur and their efficiencies respectively.
Generally Water is a good solvent and pick up impurities easily. Pure water is tasteless, colorless, and odorless. "Dissolved solids" refer to any minerals, salts, metals, cations or anions dissolved in water. Total dissolved comprises inorganic salts (principally calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulphates) and some small amount of organic matter that are dissolved in water. We generally discuss TDS for freshwater system only, as salinity consists of some of the ions contributing in the definition of TDS. The Study of water quality for streams, rivers and lakes is the most important application of TDS, although TDS is not primary pollutant, but TDS used as an indicator of aesthetics characteristics of drinking water and as indicator of the presence of broad array of chemical contaminant.

***KYEWORDS*-TDS (Total Dissolve Solids), Turbidity, Dissolved solids, Suspended solids, Hydroponic, Gravimetry, conductivity Keyword, Surface water, Ground water,, Physico-Chemical Parameters, APHA.**

I. INTRODUCTION

Drinking water pollution is the global concern of present era. The growth of industrial area is so rapid and very fast thus related to anthropogenic activities have been increased like waste discharge from industries, transportation and domestic activities. The domestic waste generated is directly enters into the different sites of water bodies without any treatment and also the continuous flow from agricultural waste water contaminates the water source of surrounding area. This entire problem affects the water resources and ultimately human health. Water is one of the three major components of our environment; therefore, there exists a close linkage between the quality of water and the environment which bears an almost importance for eco-system. Natural bodies of water are not absolutely pure as various organic compound and inorganic elements presents in dissolved form. Many kinds of macroscopic flora and fauna grow in different types of aquatic habitats. The physico-chemical quality of water vary according to the basin shapes and sizes, depth, light penetrations, precipitation, locations, temperatures, chemical nature of surrounding soil and dissolved minerals , pH, etc, and the biological component of the habitat depends upon them If all the physical, chemical and biological parameter are in optimum conditions. Most of the people depend on fresh water supplies from groundwater. It provides water for domestics use for sources of water for irrigation and various small scale industries. The availability of groundwater depend on the rate at which it is recycle by hydrological cycle.

Chandrapur district is located in the east side edge of Maharashtra in Nagpur division and form the eastern part of "Vidarbha" region. It is located between 19.3 degree to 20.45 degree latitude and 18.4 E longitudes. District occupies an area of 11444 sq km, which constitutes 3.72 percent of the total area of the state and has population as per 2011 was 3,20,400 and it will be reach about 3,47,485 in 2019. The Chandrapur town is situated at 189.90 meter above form the mean sea level. Area of the city is about 70.02 km². The climate of Chandrapur is mostly tropical Chandrapur district is well known for the Coal Mines, Super Thermal Power Station and many Cement industries, Ferro alloys and paper industries. Wardha, Wainganga and Penganga are important rivers surrounded by Chandrapur district. The Wardha River flows into the district from western boundary and then flow along the boundarie of Warora, Chandrapur, Korapna,Rajura, Ballarpur and Gondpipri Talukas. Penganga and Irai rivers meet the Wardha River. The drinking water supply projects in Chandrapur district includes about 200 pipeline schemes, 170 tube wells, 4070 wells and 4515 Bore well/ Hand pumps in the entire district. Besides, the Municipal councils in Chandrapur district is regularly supplying drinking water to local public from Irai river dam. About 84% of the state is covered by Deccan basalts whereas the rest of the state is covered by Quaternary alluvium. The total replenish able groundwater resource is of the order of 37.80 BCM/Yr. Provision for domestic, industrial & other uses for Chandrapur district are about 12.40 BCM/Yr and for irrigation purposes is about 25.47 BCM/Yr. Ground water levels declining trend (more than 20 cm per year) in before Monsoon season in vicinity of Chandrapur district. Study area.. The studies carried out for three months during the end of winter season to summer season. The main aim of the study was to investigate the physico-chemicals characteristics of water samples in Chandrapur district, because most of these samples are located in the vicinity of the city.
Industrial sewage and agricultural run-off around Chandrapur cover load groundwater with chemical wastes and nutrients and make the water-supply toxic. Effective management of water resources and control of pollution are become increasingly important for sustainable developments and humans welfare. The industrial activity discharges water containing various hazardous chemicals on open ground which pollutes the vicinity groundwater. Water is a prime natural resources and a basic

human need. The present work was carried out in vicinity of Chandrapur city in order to study the water quality of different sites. Ground Water is one of the most important and basic natural resources. Water is not only one of the most essential commodities of our day-to-day life, but the development of this natural resource also plays a crucial role in economic and social development processes.

II. OBJECTIVES OF PROJECT

The main objectives of the study are:

- To Find out the quality of the water
- To know the suitability of water for the drinking purpose.
- To protect the community from the infectious disease caused to due to water having TDS more than 300 mg/l
- To aware community for water contaminants of their area

III. LITERATURE REVIEW

[1]. SONI CHAUBEY AND MOHAN KUMAR PATIL (NOVEMBER 2015): gives the relationship between variables which shows that one variable actually causes changes in another variable. In this paper, a statistical regression analysis method of fifty two data points of drinking water in different source at four fields (i.e, Khaparkheda Water Supply, Koradi Gram Panchayat, Koradi Devi Mandir and Bokara) for Nagpur city with hot and dry climate, in Maharashtra, center of India was carried out. Samples were collected during October 2013 to May 2014.This technique was based on the study and calculating the correlation coefficients between various physicochemical parameters of drinking water. The results were further compared with drinking water quality standards issued by World Health Organization (WHO) and it was deduced that most of the water samples are not potable.

[2]. Tan C. W, Thishalini A., Goh, E. G.and Edlic S.: synthetic water was used to study the relation of turbidity with suspended solid, velocity, temperature and time. Results indicated that turbidity increases with increasing temperature, suspended solids concentration, and velocity, but reduces with time. In phase there were four set of parameter-modified and four set of respective control water samples. Parameter-modified water samples were subjected changes of temperature (25-70 ^{o}C), pH (5-10), color (red, yellow, blue, orange, green, brown, and black at 500 mg/L), and conductivity (100-1000 μS/cm). Results showed the relation of these parameters fell between most likely positive and negative. In addition, the current proposed model gives a high R-squared (> 0.969), low mean square error, and has a *p* value lesser than 0.05.

[3]. Sarvin Zaman Zad Ghavidel, Majid Montaseri:(2014/12/1): A total dissolved solid (TDS) is an important indicator for water quality assessment. Since the composition of mineral salts and discharge affects the TDS of water, it is important to understand the relationship of mineral salt composition with TDS. In the present study, four artificial intelligence approaches, namely artificial neural networks (ANNs), two different adaptive-neuro-fuzzy inference system (ANFIS) including ANFIS with grid partition (ANFIS-GP) and ANFIS with subtractive clustering (ANFIS-SC), and gene expression programming (GEP) were applied to forecast TDS in river water over a period of 18 years at seven different sites. Five different GEP, ANFIS and ANN models comprising various combinations of water quality and flow variables from Zarinehroud basin in northwest of Iran were developed to forecast TDS variations. The correlation coefficient (R), root mean square error and mean absolut.

IV. CAUSES OF TOTAL DISSOLVED SOLIDS

The TDS concentration is a secondary drinking water standard and therefore is regulated it is more of an aesthetic rather than health hazards.

Total TDS causes following effects

- The concentration of the dissolved ions may causes the water to be corrosive, salty or brackish taste, results in scale formation, and interfere and decreases efficiency of hot water heaters.
- TDS can result in water having a bitter or salty taste result in incrustations, films, or precipitates on fixtures; corrosion of fixtures, and reduced efficiency.
- The suitability of ground water for drinking purpose is determined keeping in view the effects of various chemical constituents in water on the biological system of human being. Though many ions are very essential for the growth of human, but when present in excess, have an adverse effect on human body
- TDS is a general indicator of overall water quality. It is a measure of inorganic and organic materials dissolved in water. Increased TDS may impart a bad odour or taste to drinking water, as well as cause scaling of pipes and corrosion. High TDS level indicates water hardness in respective sampling station.
- It reduces the potability for drinking purposes in the region

V. EXPERIMENTAL SECTION

TDS of water to determine the quality of water. According to the IS 10500 we had rated the quality of water and its suitability for drinking. The sampling points chose to cover the entire radius of 25 km of Chandrapur district after preliminary survey of the area, in order to get exact evaluation of water quality assessment in and around Chandrapur district. Solids may affect water or effluent quality adversely in a number of ways. Water with high dissolved solids generally is inferior quality. This may be due to human's activity and waste disposal of industries like Chandrapur thermal power station (CST), Western coal field etc. Turbidity in water is caused by suspended matters, such as clay, silt, finely divided organic and inorganic matters, soluble colored organic compounds, planktons and other microscopic constituents. The total dissolved solids concentration of good & potable drinking water should not be more than 500 mg/l according to general belief. As water moves underground or over land, it dissolves a variety of compounds including minerals, salts, and organic compounds.

The research is based on testing the quality of water. Different-different sample collected from different areas of chandrapur region. Sample of water will collect for the testing of different sources that is well water, tap water, river water, bore well water and hand pump. It is most frequently used by reference to a set of standards against relate to health of ecosystems, safety of human contact and drinking water. In this we will analyzed the TDS of water to determine the quality of water quality of water. According to the IS 10500 will relate the quality of water and its suitability for drinking. CGWB is monitoring the ground water quality of the district since the last four decades through its established monitoring wells. The objectives behind the monitoring are to develop an overall picture of the ground water quality of the district. During the year 2010, the Board has carried out the ground water quality monitoring of 22 monitong. The ground water quality data first check for completeness and then the validation of data carried out using standard checks.

VI. METHOD OF DETERMINATION OF TDS

A TDS test measures the amount, but does not identify the individual compounds or their sources. Natural sources of dissolved solids in groundwater include bedrock and salt deposits; any soluble mineral that comes into contact with the groundwater may be a source. Saltwater intrusion may contribute to the TDS concentration of groundwater in coastal areas. Additional sources of dissolved solids include on-site sewage systems; runoff and wastewater from urban, industrial, or agricultural areas; runoff from roads there is a variety of ways to measure TDS. The simplest is to filter the water sample, and then evaporate it at 180° C in a pre-weighed dish until the weight of the dish no longer changes. The increase in weight of the dish represents the TDS, and it is reported in mg/L. The TDS of a water sample can also be estimated fairly accurately from the electrical conductivity of the sample via a linear correlation equation dependent upon specific conductivity. Finally, TDS can be calculating by measuring individual ions and simply adding them together. Total dissolved solids is a non-specific, quantitative measure of the amount of dissolved inorganic chemicals but does not tell us anything about its nature. TDS is not considered a primary pollutant with any associated health effects in human drinking water standards, but it is rather used as an indication of aesthetic characteristics of drinking water and as a broad indicator of an array of chemical contaminants.

Gravimetry and conductivity are the two important methods of measuring total dissolved solids. Gravimetry methods are the more accurate methods and they involve evaporating the liquid solvent and talking the mass of residues left. This is the best methods generally, but it is time consuming. If inorganic salts are there as the great majority of TDS, gravimetry methods are more appropriate. Concentration of dissolved ionized solids in the water is directly related to the electrical conductivity of water. Ions in the dissolved solids in water generate the stability for that water to conduct electrical current, which is measured by a TDS meter or conventional conductivity meter. Conductivity generally provides an approximate value for the TDS concentration, usually to within 10% accuracy. Water treatment facilities can use reverse osmosis to remove the dissolved solids in the water that are responsible for elevated TDS levels. Reverse osmosis removes virtually all dissolved substances, including many harmful minerals, such as salt and lead. It also removes healthy minerals, such as calcium and magnesium, and ideally such water should be filtered through a magnesium and calcium mineral bed to add the minerals to the water. The mineral bed also increases the pH and decreases the corrosive potential of the water.

The Environmental Protection Agency (EPA) establish standard for drinking water which is fall into two categories -- Primary Standards and Secondary Standards. Primary Standards are based on health considerations. Secondary Standards are based on taste, odor, and color, corrosive, foaming, and staining properties of water. There is no Primary drinking water standard for total dissolved solids, but the Secondary standard for TDS is 500 mg/L

According to IS 10500 TDS and Quality of water relates as follow:

Table.1

Level of TDS in mg/lit	Rating
Less than 300	Excellent
300-600	Good
600-900	Fairly good
900-1200	Poor
Greater than 1200	Unacceptable

VII. GROUND WATER RELATED ISSUES AND PROBLEMS

The major parts of the district are showing falling ground water quality trends mainly in southern, north western and north eastern parts of the district comprising almost entire Rajura, Gondpipri Chandrapur, Bhadravati, Warora and parts of Chimur, Brahmapuri and Sindewahi, hence, the water conservation needs to be taken up in these areas. Apart from these, the ground water quality is getting affected due to industrial pollution in and around Ballarpur paper mill, whereas fluoride contamination is also observed in some parts of the district. To study these problems studies have been carried out by CGWB, the details of which are discussed below.

Essentiality although many essential elements may contribute to TDS, the measurement technique does not, itself, differentiate essential from toxic elements. Metabolism since TDS represents an undifferentiated collection of just about everything dissolved in a water sample, it is impossible to speak of the "metabolism" of TDS. Total Dissolved Solids (TDS) Toxicity Interestingly, early epidemiologic studies suggested that "moderately high" TDS concentrations protected people against cancer and heart disease. The inclusion of other cardiac risk factors, such as Na, in the total TDS of earlier studies probably accounts for the conflicting results in the older literature. Saline waters may adversely impact animal health by several possible mechanisms. An extreme example of this effect is water intoxication that results in death. The presence of excessive solutes in drinking water adds to this burden and consumes resources that would otherwise be used for growth, milk production, or fighting off disease.

A detailed study of area around Ballarpur Paper Mill, Ballarpur was taken up by CGWB in 2011-12 to study the impact of paper mill effluents on ground water. The study revealed that

- Due to the effluents discharged by the paper mill of Ballarshah the color of Wardha Rriver water has changed to light brownish up to 4-5 km in downstream direction.
- The paper mill effluents Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) values were high and exceed the limit for discharge to inland surface water, thus it requires further treatment.
- A detailed study of Fluorosis endemic villages falling in 7 talukas of the district was taken up by CGWB in 2000-01 to mainly assess the intensity of the Fluoride contamination in ground water of shallow and deeper aquifers of the area and to bring out the extent of the problem and suggests effective remedial measures.
- High Fluoride concentration is noticed in Vindhyan sediments in parts of Rajura, Korpana and Warora talukas followed by highly weathered granite gneisses of Chimur taluka.Fluoride free water supply schemes should be framed exclusively for drinking water purpose by tapping surface water and collector wells, wherever feasible.
- Proper well design in construction of tubewells and sealing of fluoride rich zones based on scientific methods.
- Open wells/shallow borewells should be located in the vicinity of surface water bodies.
- De-fluoridation techniques may be adopted with community involvement

VIII. RECOMMENDATIONS

- The dugwells are most suitable structures for ground water development in the district. The sites for borewell and tubewells wherever feasible, need to be selected only after proper scientific investigation
- Borewells down to the depth of 60 to 80 m are feasible in Deccan Trap, Vindhyan Sedimentaries and Archean Metamorphics, however their siting/location should be guided by proper scientific survey and tools.
- In shallow aquifer potability of ground water is mainly affected by localized industrialize contamination, Thus, in these areas, all the wells used for water supply should be first analyzed. Likewise, adequate sanitary protection to the wells may be provided to control the contamination. Rajura, Korpana, Warora and Chimur talukas of the district are affected by the high fluoride concentration in ground water. To cater to the drinking water requirements of fluoride affected villages, fluoride free water supply schemes should be framed by tapping surface water and collector wells. This should be coupled with educating and creating awareness in public, constructing open wells/shallow borewells should be located in the vicinity of surface water.

IX. RESULTS AND CONCLUSIONS

This study emphasizes the need for regular groundwater quality monitoring to assess pollution activity from time to time for taking appropriate management measures in time to mitigate the intensity of pollution activity. The quantity of water in around the industrial belt reached already alarming stage causing health effects as per the analysis report. The major industries nearby sampling point should supply protected drinking water to the people surrounded by industries or they have to rehabilitate people from that point since they are mainly responsible for creation of pollution.

A large number of industrial activities are taking place in urban areas, especially in congested, populated areas. The wastes generated by industrial activities in urban areas get mixed with domestic wastes and pollute the groundwater. Hard water has high TDS levels, which might be the reason for scale built up in filters, pipes, and valves, reducing performance and adding to the cost of system maintenances. In aquarium, spas, swimming pools, and reverse osmosis water treatments systems, we can see these effects. Total dissolved solids are tested frequently in all these applications, and filtration membranes are also checked just to prevent adverse effect. From the present investigation it can be said that the water qualities of Chandrapur region are not an immediate threat to human beings though the concentrations of some parameters like turbidity, alkalinity, sodium, mercury and cadmium levels in few sites are alarming. They may be permissible limit thus required treatment for safe human consumption. If proper monitoring and remedial measures are not taken up as soon as possible the danger and health risk of heavy metals could be prevalent in the study area. Further, water can be brought to a better condition for public utility by restricting the disposal of sewage, organic wastes,

bathing and washing. Otherwise, the degradation of such important water resources would continue in the near future and water crisis in the region will be worsened. Regarding the ground water seven parameters such as total dissolved solids, alkalinity, hardness, sodium, potassium, iron and cadmium showed very wide variations and crossed the maximum permissible limit lay down by WHO and ICMR. Hence, adoption of suitable remedial measures is the prime solution to protect the important water recourses for future generation.

Reliable data on possible health effects associated with the ingestion of TDS in drinking water are not available. The results of early epidemiological studies suggest that even low concentrations of TDS in drinking-water may have beneficial effects, although adverse effects have been reported in two limited investigations. Water containing TDS concentrations below 500 mg/litre is usually acceptable to consumers, although acceptability may vary according to circumstances. However, the presence of high levels of TDS in water may be objectionable to consumers owing to the resulting taste and to excessive scaling in water pipes, heaters, boilers, and household appliances. Water with extremely low concentrations of TDS may also be unacceptable to consumers because of its flat, insipid taste; it is also often corrosive to water-supply systems. In areas where the TDS content of the water supply is very high, the individual constituents should be identified and the local public health authorities consulted. No health-based guideline value is proposed for TDS. However, drinking-water guidelines are available for some of its constituents, including boron, fluoride, and nitrate be recommended to treat elevated TDS levels associated with high levels of sodium or potassium.

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