DRINKING WATER QUALITY INDEX OF HANDPUMPS IN KOTA CITY

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ABSTRACT

Currently, in India the scenario of ground water accounts for nearly 80% of the rural domestic water needs and 50% of the urban water need in India. Due to misplaced municipal solid waste, waste water flouring in open drains and untreated effluent from various industries in the Kota city, there is always a probability of ground water contamination. This polluted water seeps through the soil and get mixed with ground water. Water from the tube wells is drawn by individual resident and government agencies. Government also supplements its water supply through hand pumps in the area where pipeline network is not provided. An approach has been taken in this study to asses' drinking water quality of ground water from the hand pump as a source of it. Current and future demand of fresh water could be met by enhancing water use efficiently and proper managed its demand. In this paper, we discuss about ground water treatment and new technological changes by talking Kota as a model

Keywords :Ground water Quality of Kota city, Physical and Chemical properties of water, Quality index of water.

I.INTRODUCTION

Kota is an important hub of Rajasthan located on the banks of Chambal River. Kota is one of the Industrial hubs in Northern India with chemical engineering and power plant based there. Major part of the city is located on the right bank of the river consisting of old city area and the railway station. The area on the left bank has developed around the development of the various industries in the 50's and 60's, when factories like SHRI RAM FERTILISER, J.K SYNTHETICS came up. It is now the hub of Educational Institutions and is home to Asia biggest manufacturer's of the fertilizers

It has two treatment plants to supply treated water throughout the city with a proper networking of distribution pipeline. The main problems of the city is widely spread open nalah. Due to lack of proper flow, these are

heavily clogged by municipal waste. This problem has been seeking attention causing ground water contamination.

From the view of health and aesthetic condition ground water treatment is very necessary. Hand pumps, which have been around for centuries can provide a cost effective solution to allow the rural poor to gain access to clean water for drinking and other purposes. They are widely use in places where access of water is scarce and where financial resources for investment operations and maintenance are limited

Data of the census 2011 shows that use of tap water and hand pump water has been increased in rural area as well as urban area. Tap water is supplied after treatment and is regularly monitored by water supply department; on the other hand hand pump water quality is monitored seasonally or annually. The aesthetic condition of hand pump is always sensitive because of their unprotected locations and use

I. GROUND WATER TREATMENT (HAND PUMPS)

1.1 Introduction

BIS IS 10500:2012, specifies the acceptable limits and the permissible limits of different parameter of water in the absence of alternate source.

1.2 Parameters Adopted

1.2.1 pH (Hydrogen ion concentration)

The hydrogen ion concentration or pH value of water is a measure of degree of acidity or alkalinity of water. Acidic water causes tuberculation while alkaline water causes incrustation. For potable water, the pH value should be between 6 to 9 and preferably between 7 to 8.5ppm.

1.2.2 Turbidity

Turbidity is a measure of resistance of water to the passage of light through it.

Turbidity is expressed in term of NTU (Naphelometric Turbidity Unit) or Ppm (Part Per Million). The permissible turbidity of domestic water may be between 5 to 10 ppm.

1.2.3   Total Hardness

The hardness of water is due to presence of certain salts such as carbonate, bicarbonate, chloride and sulphates of calcium and magnesium dissolved in it. Hardness is expressed in term of degree of hardness or in ppm. Thus 1degree of hardness is equal to 1ppm

1.2.4   Total Dissolved Solids (TDS)

Total dissolved solids is a measure of the combined content of all inorganic and organic substances contained in a liquid in molecules, ionized or micro granular suspended form. The amount of total solids should be preferable be less than 500ppm

1.2.5 Fluorides

Fluorine is a common element that does not occur in the elemental state in nature because of its high reactivity. If present in small concentration, fluoride is good but in excess concentration (more than 3ppm) can cause dental fluorosis or mottled enamel in children.

1.3 Treatment Consideration

We can treat the ground water by the following techniques

    I.   pH – digital pH meter

    II.   Turbidity- digital meter

    III.   Total Dissolved solid- digital meter

    IV.   Total hardness- digital meter

    V.   Fluoride- digital meter

In evaluation of different ground water treatment processes the main factors to be considered as-:

a) Overall costs both capital as well as recurring expenses.

b) Requirement of hand pump and quality standard of hand pump.

c) Availability of chemicals and laboratories for testing water quality.

d) Availability of area for installation of water treatment plant.

e) Man power requirement, skilled and unskilled.

f) Skilled lab technician's requirement.

g) Water testing kits and digital meters.

h) Bearing on local conditions such as climate, overcrowded area.

i) Ease of operation

LOCATION OF SAMPLE

For water treatment and analysis we took 5 samples which cover Railway Colony, Chattar Vilas Garden Nayapura, Vigyan Nagar, Chambal Garden and Mahaveer Nagar. From each area one hand pump is selected for water quality monitoring during the study period. All sampling are of kota city

- Railway colony- residential area

- CV Garden- recreational area

- Vigyan Nagar- institutional area

- Chambal Garden- recreational area

- **Mahaveer Nagar- institutional area**

PROJECT NEED

The hand pumps were continuously pumped prior to the sampling, to ensure that ground water to be sampled was representative of ground water aquifer.

a) Sample was collected in washed and dried plastic bottles.

b) All bottles were labelled on cap as well as on bottle.

c) During sampling, hands should not be touched inside of the cap or the bottle.

d) Bottle were kept in dark before testing of water

For an undisturbed sample all sample were collected between 8AM to 10AM. It was always consider not to sample during the rainy day and next day of it. All sample from all sampling stations have been collected on the same day only

Location / Parameters	pH(mg/l)	Turbidity(NTU)	TDS (mg/l)	Fluoride(mg/l)	Total Hardness(mg/l)
Railway colony	8.5	10	117	1	130
CV Garden	8	10	223	1.5	350
Vigyan Nagar	7.5	10	99	0.5	230
Chambal Garden	7.5	10	68	0.5	110

Mahaveer Nagar	7.5	25	105	1	200

Table 1: classification of parameters at different pumps

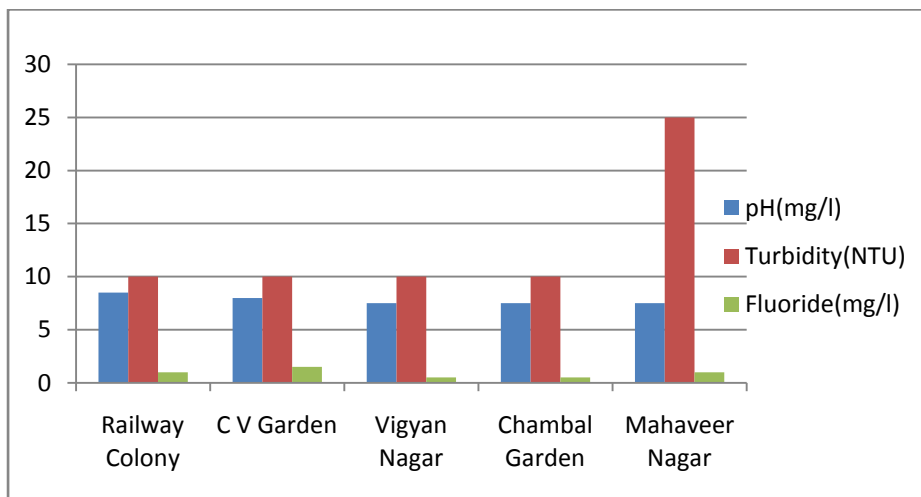*NTU- Nephlometric Turbidity Unit

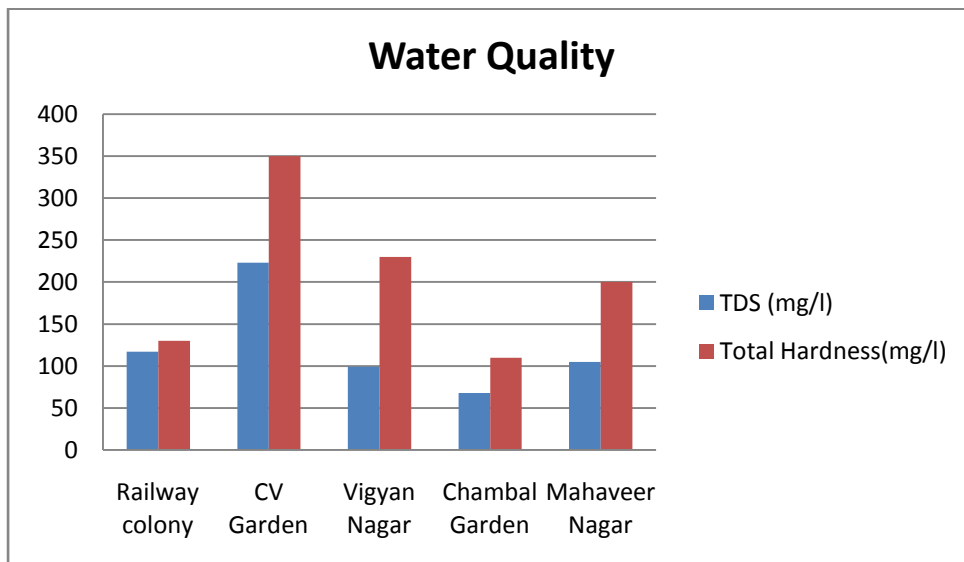Figure-1: Graph show the quality (pH, Turbidity, Fluoride) deterioration after passing through the city

Figure-2: Graph show the quality (Total Dissolved Solids, Total Hardness) deterioration after passing through the city

POPULATION PROJECTIONS

According to census 2001, the population was 6,94,316 and in 2011 the population was 10,01,365 while it is expected in 2021 it should be approximate to 14,00,000

TREATMENT OF GROUND WATER

There are different processes for ground water treatment-:

1. Screening

It removes large solids that are carried in with the ground water. The screen removes large floating objects.

2. pH

Soda ash and sodium hydroxide raise the pH of water to near the neutral value when injected into a water system. For pH level of water greater than 8.5, you can reduce the effect of excessive alkalinity by installing either a special ion exchange unit design to reduce alkalinity or a chemical feed pump system that inject a weak acid solution.

3. Turbidity

For treatment of turbidity we use flocculation and coagulation. The coagulation neutralise the negative charge on the colloidal particles, colloidal suspension and finely divided form that can be readily removed by settlement. Common coagulants are aluminium and ferric salts and synthetic organic polymers.

4. Hardness

Hard water treated with an ion exchange water softener with sodium added. The temporary hardness (carbonate hardness) can be remove by boiling or by adding lime, permanent hardness (due to sulphates chlorides and nitrate of calcium and magnesium) can be removed by lime soda process, zeolite process or de-ionization process.

5. Fluorides

Excessive concentration of fluorides can be removed by using calcium phosphate, bone charcoal, synthetic tri-calcium phosphate, fluoric, ion-exchanger, lime, aluminium compound and activated carbon.

6. Disinfection

Disinfection is the last process for treatment water to reduce pathogens which are micro-organism which can be a risk to human health. For disinfection mainly chlorine is use as it can remove more than 99% of all impurities from the water producing an effluent of almost drinking water quality.

Common Water Treatment Techniques-:

- Ultra filtration

- Ozone treatment

- Micro filtration

- Chlorination

OBSERVATION AND ANALYSIS

In the study a total 5 sampling station have been decided covering residential, institutional and recreational areas of Kota city. Fluorides concentration has been observed between 0 to 1 at all stations which is under acceptable limit, except CV Garden where its value has been found 1.5. So it can be said here that Kota has better condition in case of fluorides.

pH value has been observed between 6.5 to 8.5 at all sampling station which is under acceptable limits.

Hardness of ground water is mainly due to bicarbonate of Calcium and Magnesium. Total hardness values have been found above the acceptable limits

Turbidity is found higher in all the sample due to reach ground water level. Symptoms such as nausea, cramps, diarrhoea and associated headaches.

TDS shows concentration of dissolved minerals and salts in water. Rajasthan is facing problems of higher TDS in its most of the parts. It slows down the digestion process and causes bone problems. In all sample collected, the value of TDS is lower than the acceptable limits.

Fluoride concentration has been observed slightly high only in station of CV Garden. So it can be said here that Kota has better condition in case of fluoride from the rest cities of Rajasthan where it is a main problem causing ill effects on bones and teeths.

II.CONCLUSION

a) Drinking water quality index developed can be utilized for providing rating to quality of water for drinking purpose and provide a result which can be understood by a common man.

b) Water testing kits are time saving, easy to operate, economic for analysis and can be used for primary identification of water characteristics which can be useful for further study.

c) In hand pump water of Kota city quality of water is mainly being affected by high value of turbidity (upto 25 NTU), total hardness (upto 480mg/l).

d) For Railway Colony, CV Garden, Vigyan Nagar, Chambal Garden, Mahaveer Nagar, quality of water has been found in poor category.

e) Mahaveer Nagar is over populated due to major coaching centres are concentrated in this area. To meet water demand most of the hostels, institutes, commercial places and household use ground water through boring.

f) It is suggested that for drinking purpose, people of Kota city should use ground water only after treatment

g) A proper municipal solid waste collection system should be implement by government agencies to improve overall life quality index of people in Kota city.

h) Public toilets should be provided in slums areas to avoid release of human excreta in open drains and in recreational places to maintain hygienic environment.

III.FUTURE SCOPE

Pollution of water and their reutilization is a big issue as the demand of water is increasing day by day so this is a good topic of research in present study. In our next step we are planning a small project for ground water treatment and after this we recommend techniques which will suite for small and medium town cities on basis of various factors.

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