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Purification of Water Samples

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***Abstract*: In this work, samples of water were collected from three different tube-wells at two different times of the year. The first set of samples was collected in the month of November, 2018 & the second set was collected in January, 2019. Over the due course of time various parameters regarding the water quality were analyzed & the Indian Standards: 10500 (Drinking water specifications) was referred to in order to check the acceptability of water.**

***Keywords*: Water quality, drinking water, TSS, TDS, Turbidity, Conductivity, chloride, sulphate, iron, manganese.**

1. Introduction

The project was based on testing the quality of water. Two different samples were collected from 'Narsanda Town' situated near Vadtal. The first set of samples was collected after the rainy season in the month of November, 2018. And the second set was collected in January, 2019.

A. Water quality

Water quality refers to the chemical, physical and biological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose. It is most frequently used by reference to a set of standards against which compliance can be assessed. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact and drinking water. Different properties were analyzed & compared during the course of the project. Some of the properties & methods Analyzed are as follows,

- Total Dissolved Solids
  1) carbon filters
  2) reverse osmosis
  3) distillation
- Total Suspended Solids
  1) membrane filtration
  2) low pressure DA
- Determination of pH
  1) Using pH meter
- Conductivity
  1) Using Conductivity meter
- Turbidity
  1) Sand filtration
  2) Cloth filtration
- Iron content
  1) Ion exchange
- Manganese content
  2) birm filters

Fig. 1. P^H meter


Fig. 2. Conductivity


Fig. 3. Turbidity meter

Table 1
Sample A (Results vs. Desirable limit IS 10500)

Property	Sample collected in November, 2018	Sample Collected January, 2019	Desirable Limit (IS 10500)
Total Suspended Solids	2 grams/litre	1.1 grams/litre	Not more than 150 mg/l
Total Dissolved Solids	7 grams/litre	8.8 grams/litre	Not more than 2 g/l
pH	7 (Neutral)	7 (Neutral)	6.5 – 8.5
Conductivity	0.306 mS/cm	0.385 mS/cm	0.05 – 0.5 mS/cm
Turbidity	1.5 NTU	1.1 NTU	Not more than 5 NTU
Sulphate content	2.57 mg/l	2.83 mg/l	Not more than 200 mg/l
Chloride content	92.47 mg/l	97.47 mg/l	Not more than 250 mg/l
Iron content	1.1 mg/l	0.6 mg/l	Not more than 0.3 mg/l
Manganese content	0.266 mg/l	0.235 mg/l	Not more than 0.1 mg/l

Table 2
Sample B (Results vs. Desirable limit IS 10500)

Property	Sample collected in November, 2018	Sample Collected in January, 2019	Desirable Limit
Total Suspended Solids	3 grams/litre	2.2 grams/litre	Not more than 150 mg/l
Total Dissolved Solids	9 grams/litre	12.1 grams/litre	Not more than 2 g/l
pH	Slightly less than 7 (Acidic)	Between 5 & 6 (Acidic)	6.5 – 8.5
Conductivity	0.308 mS/cm	0.414 mS/cm	0.05 – 0.5 mS/cm
Turbidity	2.6 NTU	2.1 NTU	Not more than 5 NTU
Sulphate content	34.75 mg/l	41.3 mg/l	Not more than 200 mg/l
Chloride content	162.45 mg/l	172.45 mg/l	Not more than 250 mg/l
Iron Content	2.76 mg/l	1.66 mg/l	Not more than 0.3 mg/l
Manganese Content	0.467 mg/l	0.381 mg/l	Not more than 0.1 mg/l

Table 3
Sample C (Results vs. Desirable limit IS 10500)

Property	Sample collected in November, 2018	Sample Collected in January, 2019	Desirable Limit
Total Suspended Solids	2 grams/litre	1.4 grams/litre	Not more than 150 mg/l
Total Dissolved Solids	6 grams/litre	7.7 grams/litre	Not more than 2 g/l
pH	Between 7&8 (Basic)	7 (Neutral)	6.5 – 8.5
Conductivity	0.282 mS/cm	0.363 mS/cm	0.05 – 0.5 mS/cm
Turbidity	1.9 NTU	1.5 NTU	Not more than 5 NTU
Sulphate content	8.24 mg/l	12.02 mg/l	Not more than 200 mg/l
Chloride content	142.46 mg/l	147.45 mg/l	Not more than 250 mg/l
Iron content	0.55 mg/l	0.5 mg/l	Not more than 0.3 mg/l
Manganese content	0.301 mg/l	0.286 mg/	Not more than mg/l

2. Working model purification of samples

A. Working

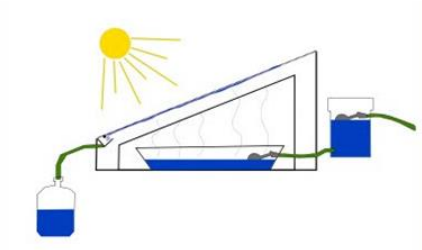

Fig. 4. Working

Solar water decontamination system is a water purification system at household level based on solar radiation treatment and water distillation with additional use of solar heating. It is a combination of two water purification processes, the Solar Water Disinfection System (SODIS)and the solar distillation process. Solar water distillation uses a solar still to condense pure water vapour and settle out harmful substances to make clean, pure drinking water. This process is used when the water is brackish containing harmful bacteria, or for settling out heavy metals and also for desalination of sea water. Solar water pasteurization involves the use of moderate heat or radiation to kill disease - causing microbes. This heat is provided from cookers that trap solar energy. This method has proven to kill bacteria, viruses, worms and protozoa.

3. Conclusion

It can be seen that the amount of total suspended solids has decreased from November, 2018 to January, 2019 in all the three samples. The reason might be the dirt particles which are more significant in the rainy season than in the summer.

- As far as the TDS (total dissolved solids) is concerned, the value of TDS increases across the three samples. Lower flow volume & evaporation might be the reason.
- If we take a look at the pH value, it decreases a bit in samples B & C, but is pretty much constant in sample A.
- Conductivity increases in the second set of samples and so is TDS along with that. The reason being evaporation and lower flow volume again.
- Turbidity decreases in the second set of samples. The reason might be the lower TSS.
- There is a significant increase in both the sulphate content & chloride content in the second set of samples. TDS increases and so is the amount of salts dissolved in water.
- If we compare the three samples, then the water from A seems to be the purest as it is colorless on both the occasions, is neutral & has the least TSS.
- Sample B might be termed as the most impure among the three.
- Hence, the required properties of all the three samples collected at two different times of the year were analysed and compared & appropriate measures were suggested wherever required.

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