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To Carry Out Forensic Investigation of The Ground Water at Nagaon Area and Suggest Remedies to Avoid its Future Disaster

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ABSTRACT: It is a known fact that clean water is completely essential for healthy living. Yet there is a scenario that millions of people worldwide are deprived of this due to over exploitation, poor management system and by ecological degradation. As groundwater is one of the important source of drinking water, it has also failed to escape from the pollution. In recent decades, outcome of many reports of groundwater contamination have took place. Since water quality is of a vital concern, a study based on assessment of groundwater quality with respect to certain parameters was carried out. Samples from bore wells were investigated for parameters such as pH, Turbidity, Dissolved Oxygen, Biochemical Oxygen Demand, Chemical Oxygen Demand, Residual Chlorine, Total Dissolved Solids. In the present work the ground water samples were collected from wells of village Nagaon situated near industrial area, where the effluent drain ends up into a pond and percolate down into shallow aquifers. Water samples were collected from eighteen different stations with respect to the location by catch and grab method in Nagaon village, Hatkanangale taluka, district Kolhapur. The collected water samples were analyzed. From the analytical results, it was revealed that the values of certain parameters were within the limit while some were exceeding. Especially one of the site in the village showed exceeding limits of chlorine which was about 0.8 mg/l respectively beyond standard limits. Fluctuations in the values of the parameters were due to certain environmental factors as well as due to unplanned anthropogenic activities. The results are discussed.

KEYWORDS: Groundwater quality, Dissolved Oxygen, Total Dissolved Solids

I. INTRODUCTION

Ground water is one of the natural source of pure and clean water that sinks into the soil and is stored, slowly flows and renewed underground water reservoirs. Ground water is mostly chemically non polluted when drawn from greater depth. Human beings have made aquifer as their prime requisite due to unavailability of reliable source of water as that of the ground water. So during past several decades, ground water quality has emerged as one of the most important and confronting environmental issue.

Ground water forms a major source of drinking water supply for both urban and rural people in India. This use is increased with improved assessment and advances in pumping techniques. The surface water is being polluted at rapid rate thus; the ground water extraction is increased. Ground water exploitation, its misuse and pollution is becoming more serious. As most of the people rely on ground water, the quality of public health depends to the great extent on the quality of drinking water, so it is imperative that the quality of drinking water must be systematically collected and monitored. Problems created by the ground water pollution have become a grave concern as it is amplifying due to urbanization, industrialization, solid and hazardous waste disposal, over use of chemical fertilizers etc. Some chemical constituents in our drinking water when present in excess amounts cause irreversible damage to human being. Mondal et al (2005) and Prasanna et al have focused on industry as source of ground water contamination. Improper industrial waste management can also act as a potential source to contaminate the underground water. Protection of ground water has become a high priority management goal.

The main objective of the present work was to assess the ground water quality in the rural settlements in the Kolhapur city. Many reports have headed up concerning the contamination and transcending limits of certain parameters in the village of Kolhapur district. Investigation of specific parameters was done to determine the concentration which is generally not taken into consideration.

II. OBJECTIVE

- To determine properties of ground water table from the tested area.
- To determine extent of contamination of the ground water table.
- To carry out analysis of the ground water and to compare it with irrigation and drinking water standards.
- To comment on the permissible limits of tested water sample for using it for drinking and irrigation purpose.
- To find a remedial measure for the contamination in the water sample.

III. METHODOLOGY

In this present study Menon Pistons Ltd ventured into the manufacture of pistons in 1971. As a part of its endeavor to provide its customers with integrated piston assemblies. Around 1000 people in the villages near Menon Piston Pvt. Ltd were suffering from lower yield as well throat irrigation. So as to rectify the problem we collected 18 water samples from the wells and bore wells lying within 5 km² area from the disposal point of Menon Piston Pvt. Ltd.

This work done by using following steps.

Step 1: Collection of water sample.

Step 2: Test carried out on water sample.

Step 3: Result Analysis.

Step 4: Recognize the problem.

Step 5: Solution to the problem.

Step 6: Conclusion.

The case study involves several steps:

Step 1: Collection of water sample:

The details of water collection are given below:

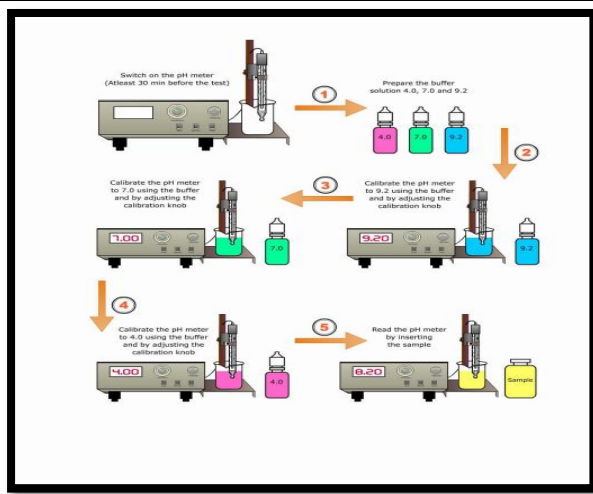
Sr.No	Name of the farmer	Source of	Depth of	Distance
1	Chougule Ramchandra	Well	30 ft	3.3 km
2	Pawar Sadashiv	Bore well	400 ft	3.5 km
3	Chougule Mahadev	Bore well	250 ft	3.8 km
4	Chougule Vilas	Well	30 ft	4.5 km
5	Jadhav Dilip	Well	70 ft	4.8 km
6	Chougule Vilas	Well	40 ft	5 km
7	Pawar Yuvraj	Well	30 ft	3.3 km
8	Thombare Akash	Well	40 ft	2.8 km
9	Pawar Ganpat	Well	40 ft	2.5 km
10	Chougule Kashinath	Bore well	180 ft	3.1 km
11	Powar Mahadev	Well	20 ft	3 km
12	Bagade Rajaram	Bore well	150 ft	4.1 km
13	Chougule Uttam	Bore well	200 ft	2.6 km
14	Chougule Sahadev	Bore well	300 ft	3.7 km
15	Ladave Dattatrey	Bore well	230 ft	2 km
16	Bhandvaldar Maruti	Bore well	185 ft	1.5 km
17	Chougule Pankaj	Bore well	250 ft	1.2 km
18	Gudale Dilip	Bore well	280 ft	1 km



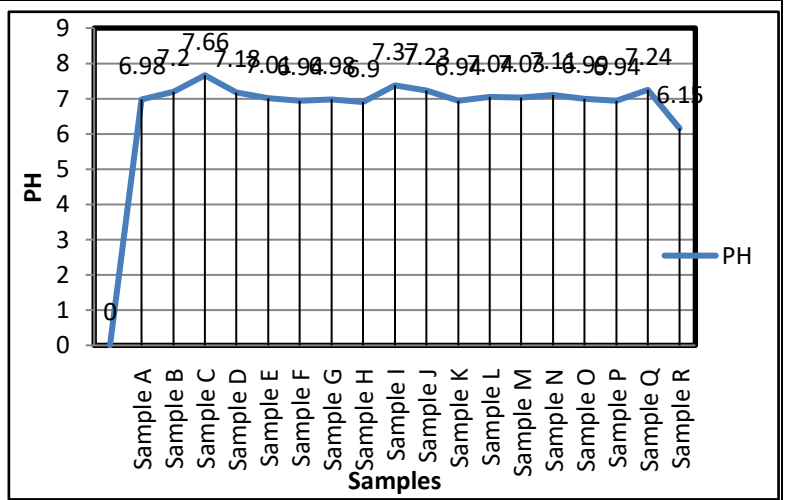
Location map of Menon Piston. Pvt. Ltd MIDC Kolhapur along with the location of the collected water samples (Source: Google Maps)

Step 2: Test carried out on water sample:

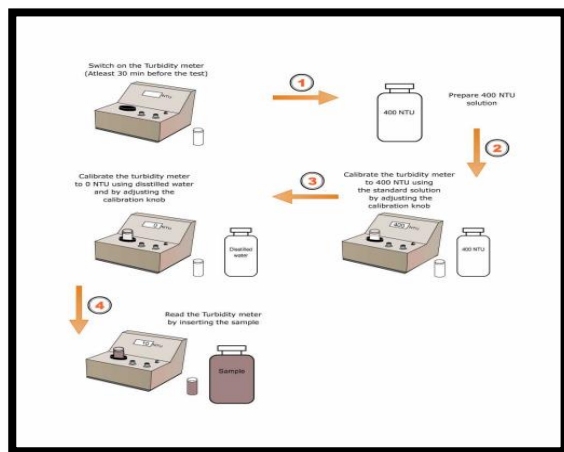
- 1) pH test by digital pH meter.
- 2) Turbidity test by Nephelometric turbidimeter.
- 3) Residual chlorine by Orthotolidine test.
- 4) Dissolved oxygen by titration method (DO).
- 5) Biochemical oxygen demand (BOD).
- 6) Chemical oxygen demand by reflux apparatus (COD) and
- 7) Total Dissolved Solids (TDS).



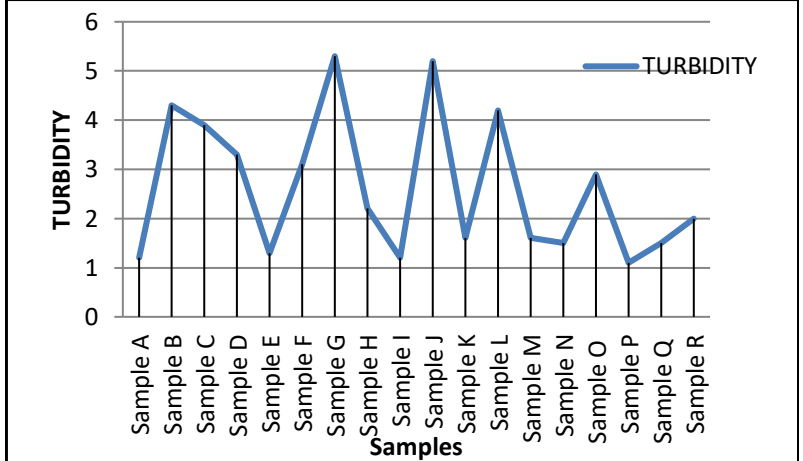
Procedure chart of pH



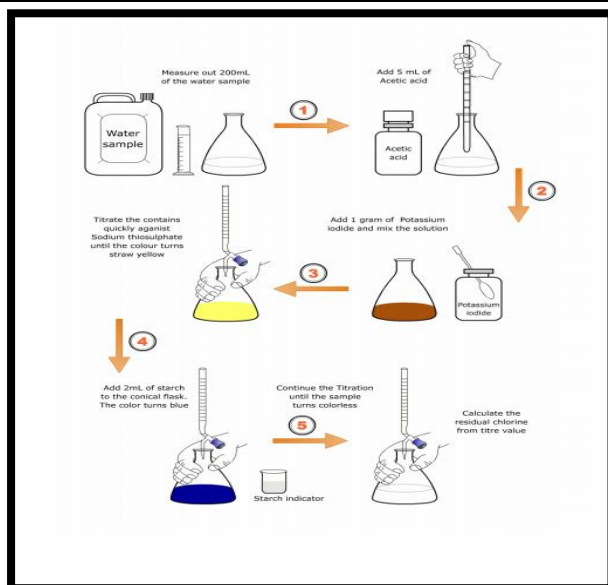
Graphical representation of pH values of the collected samples



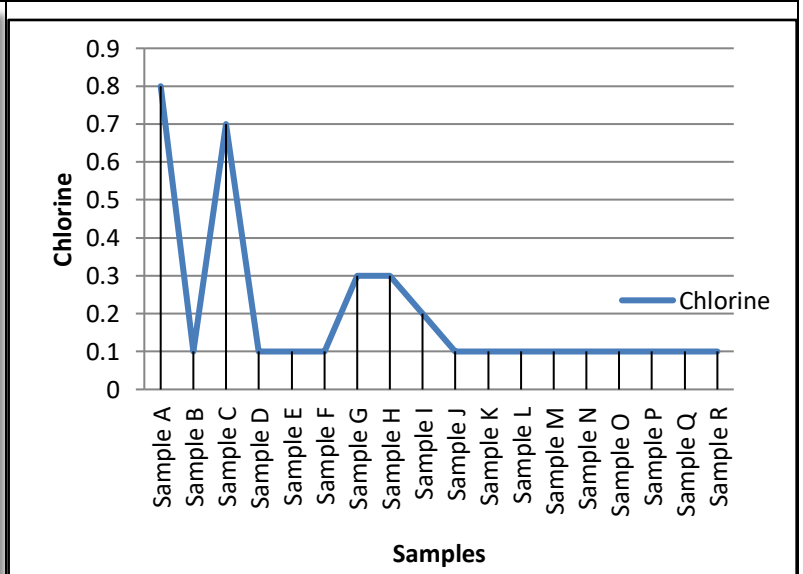
Procedure chart of turbidity test



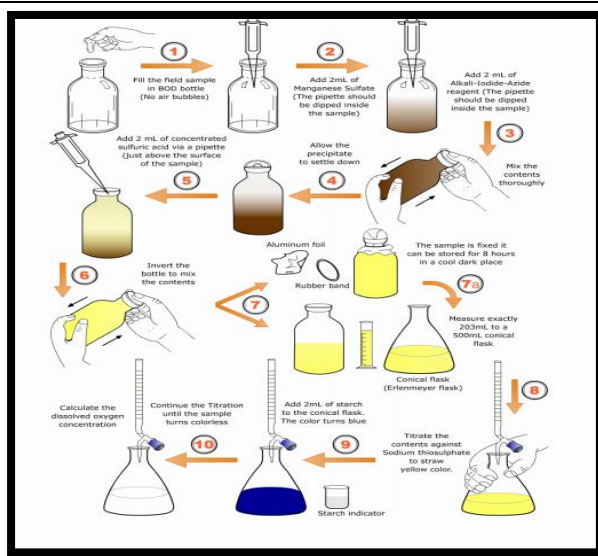
Graphical representation of turbidity values of the collected samples



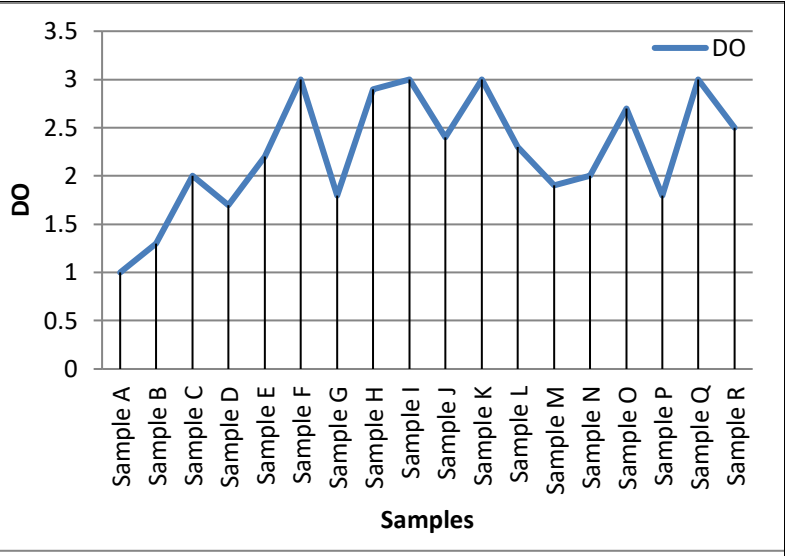
Procedure chart of residual chlorine test



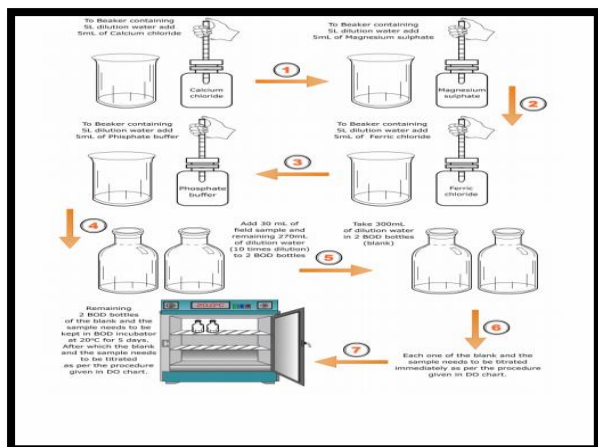
Graphical representation of residual chlorine values of the collected samples



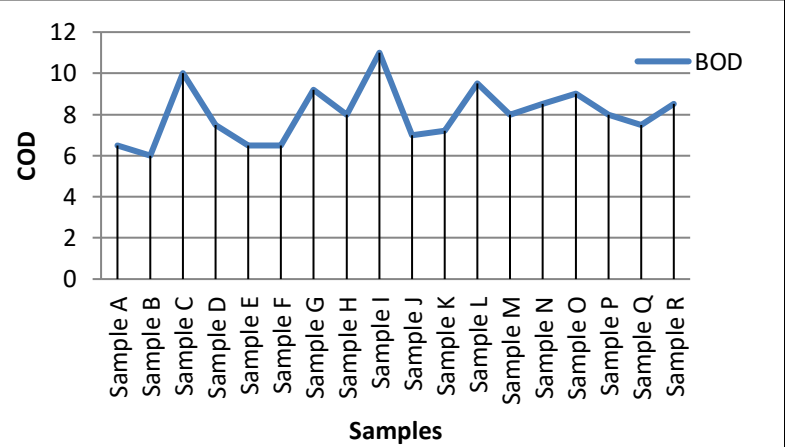
Procedure chart of dissolved oxygen test



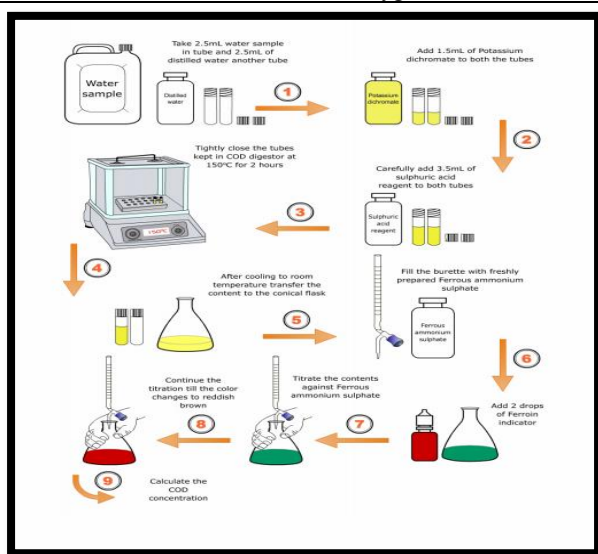
Graphical representation of dissolved oxygen values of the collected samples



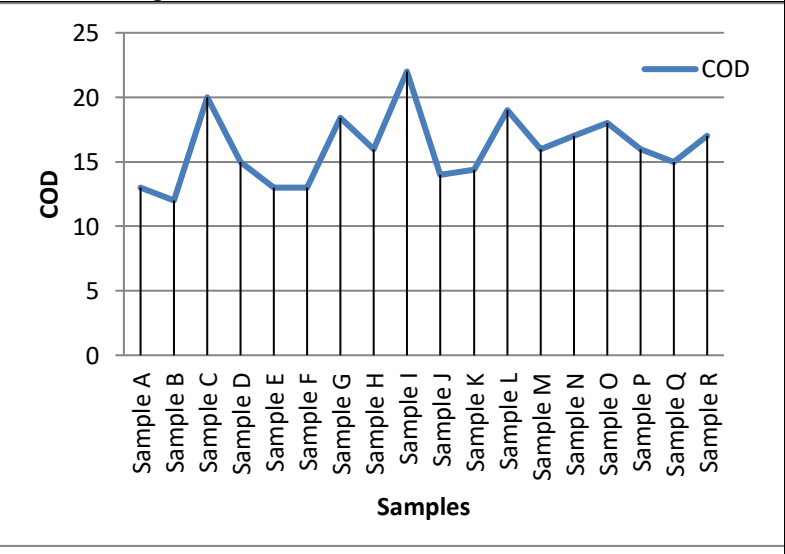
Procedure chart of biochemical oxygen demand test



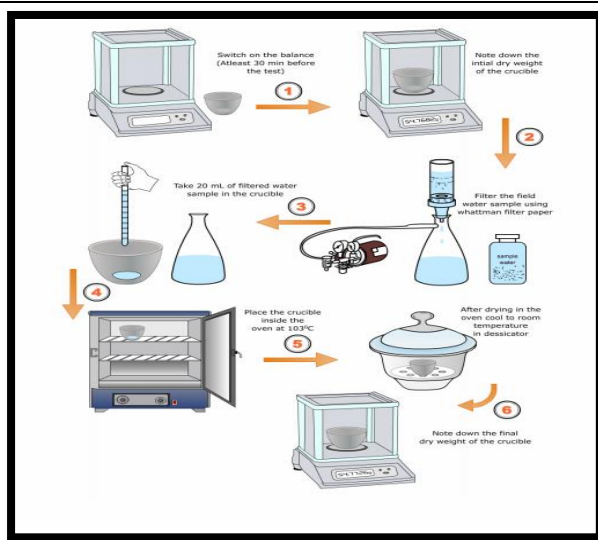
Graphical representation of biochemical oxygen demand values of the collected samples



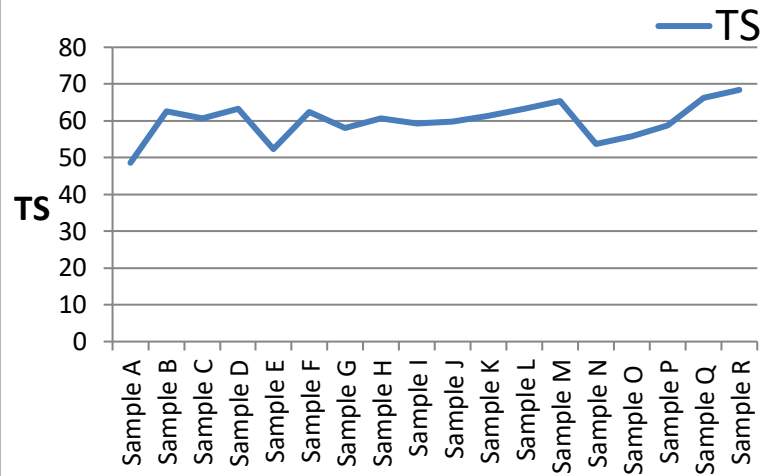
Procedure chart of chemical oxygen demand test



Graphical representation of chemical oxygen demand values of the collected samples



Procedure chart of total dissolved solids test



Graphical representation of total dissolved solids values of the collected samples

IV. RESULT ANALYSIS

Sample	pH	Turbidity	Residual chlorine	DO	BOD	COD	Total
Sample A	6.98	1.2	0.8	1	6.5	13	200
Sample B	7.20	4.3	0.1	1.3	6.5	12	200
Sample C	7.66	3.9	0.7	2	10	20	200
Sample D	7.18	3.3	0.1	1.7	7.5	15	200
Sample E	7.01	1.3	0.7	2.2	6.5	13	200
Sample F	6.94	3.1	0.1	3	6.5	13	300
Sample G	6.98	5.3	0.3	1.8	9.2	18.4	200
Sample H	6.90	2.2	0.3	2.9	8	16	300
Sample I	7.37	1.2	0.2	3	11	22	200
Sample J	7.23	5.2	0.1	2.4	7	1 4	300
Sample K	6.94	1.6	0.1	3	7.2	14.4	200
Sample L	7.04	4.2	0.1	2.3	9.5	19	200
Sample M	7.03	1.6	0.1	1.9	8	16	200
Sample N	7.11	1.5	0.1	2	8.5	17	200
Sample O	6.99	2.9	0.1	2.7	9	18	200
Sample P	6.94	1.1	0.8	1.8	8	13	200
Sample Q	7.24	1.5	0.1	3	7.5	15	200
Sample R	6.15	2	0.1	2.5	8.5	17	200

Step 4: Recognize the problem:

Exceeding limits of chlorine and its harmful effects on human and crops: -

The long term effects of chlorinated drinking water have just recently been recognized. According to the U.S. Council of Environmental Quality, "Cancer risk among people drinking chlorinated water is 93% higher than among those whose water does not contain chlorine. "What if that clear, clean-looking liquid you use every day – to quench your thirst, to bathe and shower in, and to wash your dishes and laundry in contributed to dozens of everyday ailments, including.

- Heart attacks,
- Tiredness, dizziness or headaches.
- Eye, sinus and throat irritation.
- Childhood asthma.
- Damaging hair cuticles and the cause or worsening of dandruff.
- Skin rashes, headaches.
- Liver problems.

Dr. Price later headed up a study using chickens as test subjects, where two groups of several hundred birds were observed throughout their span to maturity. One group was given water with chlorine and the other without. The group raised with chlorine, when autopsied, showed some level of heart or circulatory disease in every specimen, the group without had no incidence of disease. The group with chlorine under winter conditions, showed outward signs of poor circulation, shivering, drooped feathers and a reduced level of activity. The group without chlorine grew faster, larger and displayed vigorous health. This study was well received in the poultry industry and is still used as a reference today. As a result, most large poultry producers use dechlorinated water. It would be a common sense conclusion that if regular chlorinated tap water is not good enough for the chickens, then it probably is not good enough for us humans!

Too much chlorine in water can damage tree leaves and other tissues. The extent of tree damage from chlorine depends on the concentration, duration of exposure, manner in which the tree takes up the chlorine, and season of the year. Chlorine is a trace element essential to tree nutrition, but too much chlorine is poisonous.

Plants take up chloride as Cl^- ion from water as well as from soil solution. It plays some important roles in plants, including in photosynthesis, osmotic adjustment and suppression of plant disease. However, high concentrations of chloride can cause toxicity problems in crops and reduce the yield. The leaves of trees are the first structures to show effects of chlorine toxicity. They will show a burned or scorched appearance with brown, dead tissue on the tips and edges, as well as between the leaf veins. Affected leaves may also be stunted, turn yellow and drop off early. Chlorine dissolved in water reacts with soil elements to form chloride compounds taken up by tree roots. Excess chlorides lead to the symptoms of chlorine poisoning. Certain tree species are particularly sensitive to chlorine poisoning. Among them are most varieties of Sugarcane, maple tree and box elder trees. Also chlorine-sensitive are ash, crabapple, dogwood, horse chestnut, mulberry, pin oak, sweet gum and yellowwood. Leaves may be smaller than usual.

Damage to plants from chlorine gas is less common than damage from other air pollutants, such as sulfur dioxide, fluoride, and ozone. Chlorine is, indeed, a micronutrient required for plant growth, but necessary only in minute quantities. Therefore, there is a need to reduce the chlorine content in plants so as to increase the yield.

Step 5: Solution to the problem.

Activated carbon filters are generally employed in the process of removing organic compounds and/or extracting free chlorine from water, thereby making the water suitable for discharge or use in manufacturing processes. Activated carbon works via a process called adsorption, whereby pollutant molecules in the fluid to be treated are trapped inside the pore structure of the carbon substrate.

Active charcoal carbon filters are most effective at removing chlorine, sediment, volatile organic compounds (VOCs), taste and odor from water. They are not effective at removing minerals, salts, and dissolved inorganic compounds. Active charcoal carbon filters are most effective at removing chlorine, sediment, volatile organic compounds (VOCs), taste and odor from water. They are not effective at removing minerals, salts, and dissolved inorganic compounds. Activated carbon can be used to remove chlorine with little degradation or damage to the carbon. Dechlorination occurs rapidly and flow rates are typically high. However, this process requires an extensive amount of surface area, and organics in the water will eventually fill up and block the pores of the carbon. Ultimately, the AC filter will need to be replaced as its ability to dechlorinate the water will slowly decline. Spent carbon can be re-activated; however, re-activated filters should only be used in waste-water treatment applications. One disadvantage is that as the chlorine is removed from the topmost layer of the media, the AC provides a damp environment ideal for the growth and proliferation of bacteria. Bacteria can cause problems in medical applications, or when using carbon as a pre-treatment to reverse osmosis.

V. CONCLUSION

From the test results it is concluded that the pH, turbidity, Dissolved oxygen content, Biochemical oxygen demand, Chemical oxygen demand, Total dissolved solids are within permissible limits of Drinking water standards as well as irrigation water standards. The chlorine content of the water is nearly four times greater than the required chlorine. So,

precautions should be taken to reduce the chlorine content and its harmful effects on human beings. By making use of Activated Carbon Filter the chlorine content can be reduced, although it has limitation such as AC filters are not good at removing chemicals that are not attracted to carbon (e.g. sodium, nitrates, heavy metals, fluoride, etc.), but still Activated Carbon Filter has no of benefits such as it act as Natural filter media, it has Low-cost & easy maintenance and it is Good at filtering out other carbon-based, organic chemicals and chemical disinfectants like chlorine as well as some microorganisms. Hence it is recommended.

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