

Study of Water Cycle for A College Campus in Nagpur City

Shradha Karekar¹ M.P.Bhorkar² Dr.R.R. Shrivastava³

^{1,3}M.Tech Scholar

^{1,2,3}Department of Civil Engineering

^{1,2,3}G.H. Rasoni College of Engineering Nagpur 440016

Abstract— Safe drinking water is essential to humans and other life forms. Around one billion people lack access to safe drinking water still today and 2.5 lack access to adequate sanitation, International water management Institute(IWMI) predicts that India’s population will be suffering from severe water scarcity. It is therefore essential to reduce surface and ground water use and substitute fresh water with alternative water resources. These alternative resources include reuse of grey water. The principle aim of present study is to assess the quality of drinking water in an Educational institute in Nagpur district and to analysed grey water collected from Boy’s Hostel to evolve reuse methodologies.

Key words: Grey water, Reuse, Physico-chemical analysis, microbiological analysis

I. INTRODUCTION

Water is important for every human being. Urbanisation and industrialisation spoil the quality of water. Safe drinking water is the primary need of every human being but water is becoming rare resource in the world. It is therefore essential to reduce surface and ground water use in all sectors of consumption, to substitute fresh water with alternative water resources and to optimise water use efficiency through reuse options. These alternative resources include rain water and grey water.

Present study is carried in the Educational Institute in Nagpur district situated in Hingna Road, Digdoh hills, Nagpur Maharashtra. Study is carried out to analyse the present water cycle for the Educational institute. For this analysis is done at every stage of water cycle i.e. Source, supply and after use(focus is on grey water only).

The college has its own source of water(dug well) situated near CRP camp, Dyandeep Nagar Nagpur. From the source water is bring into the campus area though the pipelines and stored into the storage tank where primary treatment is given to the water by adding lime and alum in water. The institute has Reverse Osmosis units. After R.O. treatment water is used for drinking purpose. Thus physico-chemical analysis and Microbiological water analysis is carried out at three level i.e. source (dug well), storage tank and tap water (R.O water). Analysis is done at fifteen days interval. After analysis water sample results are compared with WHO standards to find out the quality of water is fit for drinking or not. If results are not in favour, then water will be suggested to undergo a treatment process. Further for waste water analysis (grey water only), samples are collected from kitchen basin chamber, bathroom basin chamber as well as combined chamber of kitchen waste water and bathroom waste water from Boy’s hostel which is situated in the campus of Educational Institute. Analysis is carried out to identify the possibilities for combined/separated grey water treatment and to check the possibilities of reuse of grey water for gardening, floor washing, flushing of toilets etc.

II. AIM AND OBJECTIVE

- 1) To analysed the water cycle of a college campus.
- 2) To identify qualitative measures of water supply and processes for the same.(specific to water source).
- 3) To set preventive measures for water pollution.
- 4) To identify required treatments/processing towards sustainable practices.
- 5) To set consideration for future expansion of water supply system.

III. MATERIALS AND METHODS

Water samples from Source(dug well), storage tank and from tap (R.O.) were collected for fifteen days interval. The Physico- Chemical parameters like Turbidity, Total solids, pH, Alkalinity, Hardness, Chloride, BOD, DO and microbiological parameters like Fecal coli and E.coli were analysed in the laboratory.

Waste Water samples(grey water) were collected from kitchen basin chamber, bathroom basin chamber and combined chamber of kitchen waste water and bathroom waste water at peak hours of Boy’s Hostel activities. These samples were analysed for parameters like BOD, COD, Total Volatile Solids, Suspended Solids and plant nutrients (N,P,K).

IV. RESULT

PARAMETERS	WELL WATER	STORAGE TANK	AFTER R.O
Turbidity(NTU)	3.08	3.44	0.99
Total Solids(mg/lit)	808.86	814.88	777.09
pH	7.92	7.59	7.23
Alkalinity(mg/lit)	692.20	697.49	292.10
Hardness(mg/lit)	648.83	677.75	391.28
Chlorides(mg/lit)	266.12	270.67	293.79
BOD(mg/lit)	4.14	3.73	0.27
DO(mg/lit)	6.55	6.59	6.86
Fecal Coli(no/100ml)	8.29	8.79	0
E.Coli (no/100ml)	0	0	0

Table 1: Average Characterization of Water Sample

PARAMETE RS	KITCHE N W W	BATHROO M WW	COMBINE D WW
BOD(mg/lit)	26.09	20.72	22.65
COD(mg/lit)	203.94	193.44	195.57
TVS(mg/lit)	162.15	155.05	160.05
SS(mg/lit)	58.83	78.90	56.65
N(mg/lit)	4.87	2.48	4.61
P(mg/lit)	3.10	3.32	2.99
K(mg/lit)	6.30	5.75	6.11

Table 2: Average Characterization of waste Water Sample

A. Graphical Representation of Water Sample:

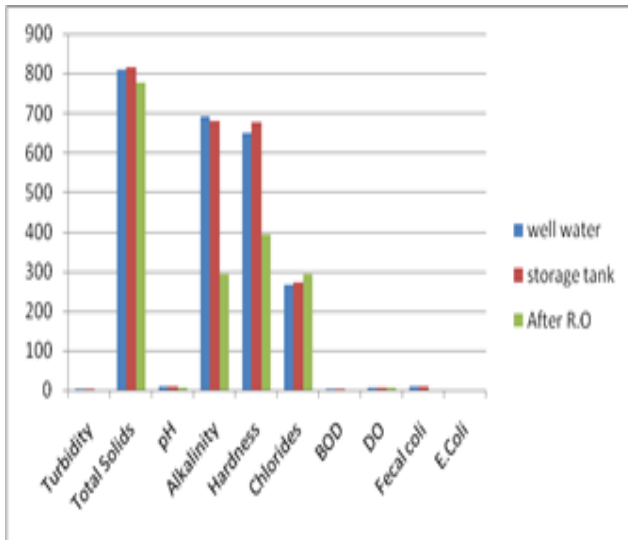


Fig.1: Graphical Representation of characteristics of Water Sample

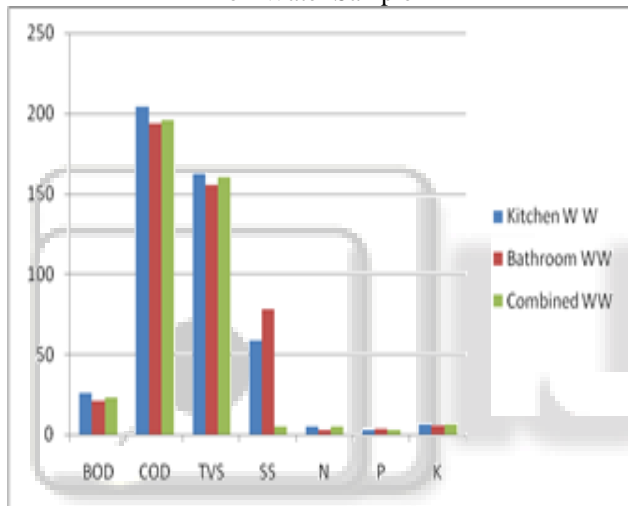


Fig.2: Graphical Representation of Characteristics Of Waste Water Sample

V. OBSERVATIONS

A. Observations For Water Sample:

- Turbidity is within limit at well water, storage tank water, after R.O water.
- Total solids present within limit at well water, storage tank water, after R.O water.
- pH is within limit at each stage of water supply system.
- Alkalinity is found higher in well water, storage tank water but within limit after R.O.
- Hardness is found higher in well water, storage tank water but within limit after R.O.
- Chloride concentration is within limit at well water, storage tank water, after R.O water.
- Fecal coli is found in well water as well as storage tank water and Nil after R.O.
- E coli found Nil at every stage of water supply system.

B. Observations For Waste Water Sample:

- BOD value found more in kitchen waste water compared to bathroom waste water.

- COD value found more in kitchen waste water compared to bathroom waste water.
- Plant nutrients (N, P, K) concentration found more in kitchen waste water compared to bathroom waste water.

VI. CONCLUSION

The water samples were analysed for physical, chemical and biological parameters and their results are compared with WHO drinking standards. All the parameters except Alkalinity and Hardness are found within permissible limit at source as well as storage tank. Alkalinity and Hardness found high in source water and storage tank water but Alkalinity and Hardness is within permissible limit after Reverse Osmosis treatment. Hence it is found that water used in the institute is potable. The quality of water in college campus is maintained using Reverse Osmosis Treatment.

Waste water samples analysis results shows that, the waste water can be reusable after giving some primary and secondary treatment. Filtration is the best used practice for the reused of waste water (grey water) as this possessed the advantages of Easy operation and maintenance, Economical, Provides extensive physical treatment, Treated grey water is of better quality, Use of locally available filter media, No requirement of external energy source.

REFERENCES

- [1] Dattatraya Bharti(1), Isub Ali Sayyad(2), G. G. Gaikwad(3), D. R. Taikar(3) And J. Dhore(4) "Physico-Chemical Characteristics Of Bore Well Water Quality In Nagpur Region (South Zone)" J. Chem. Pharm. Res., 2011, 3(2):922-927
- [2] P. Jain, *J. D. Sharma, D. Sohu And P. Sharma "Chemical Analysis Of Drinking Water Of Villages Of Sanganer Tehsil, Jaipur District" Int. J. Environ. Sci. Tech. © Winter 2006, Vol. 2, No. 4, Pp. 373-379
- [3] Arunabh Mishra* And Vasishta Bhatt "Physico-Chemical And Microbiological Analysis Of Under Ground Water In V.V Nagar And Near By Places Of Anand District, Gujarat, India" Issn: 0973-4945; Coden Ecjhao E-Journal Of Chemistry Vol. 5, No.3, Pp. 487-492, July 2008
- [4] Sharma Shraddha1, Vishwakarma Rakesh2, Dixit Savita3 And Jain Praveen4 "Evaluation Of Water Quality Of Narmada River With Reference To Physicochemical Parameters At Hoshangabad City, Mp, India" Research Journal Of Chemical Sciences Vol. 1(3) June (2011) Issn 2231-606x
- [5] K. Saravanakumar1 And R. Ranjith Kumar2 "Analysis Of Water Quality Parameters Of Groundwater Near Ambattur Industrial Area, Tamil Nadu, India" Indian Journal Of Science And Technology Vol. 4 No. 5 (May 2011) Issn: 0974- 6846
- [6] P. N. Palanisamy*, A. Geetha, M. Sujatha, P. Sivakumar And K. Karunakaran# "Assessment Of Ground Water Quality In And Around Gobichettipalayam Town Erode District, Tamilnadu" E-Journal Of Chemistry Vol. 4, No.3, Pp. 434-439, July 2007
- [7] U.S.Pujeri*, A.S.Pujar, S.C.Hiremath And M.S.Yadawe "The Status Of Pesticide Pollution In Surface Water (Lakes) Of Bijapur" Volume: I: Issue-2: Aug-Oct -2010 Issn 0976-4550

- [8] Sandeep K.Pandey¹ *, Shweta Tiwari² “Physico-Chemical Analysis Of Ground Water Of Selected Area Of Ghazipur City-A Case Study” Nature And Science, 2009;7(1), Issn 1545-0740
- [9] Dr. A. G. Bhole “Status Of Drinking Water In Various Schools Of Nagpur –A Case Study” National Conference On Case Studies In Environmental Management
- [10] [Http://ianrpubs.Unl.Edu/Water/G1539.Htm](http://ianrpubs.unl.edu/water/G1539.htm)
[Http://Www.Walrus.Com/Gatherer/Interpret.Html#Whatis](http://www.walrus.com/gatherer/interpret.html#whatis)
- [11] 10500, 1991: Indian Standards For Drinking Water.
- [12] “Experiments In Microbiology Plant Pathology And Biotechnology” By K.R.Aneja
- [13] “Water Supply Engineering” By Puli Venkateshwara Rao, M.E. (Struct. Engg.)
- [14] ‘Guidance Manual Of Grey Water Reuse In Rural School’ By National Environmental Engineering Research Institute Nagpur And United Nations Children’s Fund, Unicef, Madhya Pradesh, India.
- [15] Who’s Standard Guidelines For Potable Water. (1984 Guidelines As Modified In 1993).
- [16] ‘Manual On Water And Treatment’ (Third Edition) Cpheeo, Government Of India, May – 1999.
- [17] ‘Manual On Water And Waste Water Analysis’ – Environmental Engineering.
- [18] ‘Manual On Grey Water Recycling And Reuse ‘By Association Of Rainwater Harvesting And Water Utilisation.

