



STUDY OF VARIOUS PURIFICATION SYSTEMS FOR RESIDENTIAL BUILDING

Pratik Sursaut¹, Zibran Shaikh², Siddharth Tode³, Mahesh Nalamwar⁴¹Student, Department of Civil Engineering, J.C.O.E.T., Yavatmal, Maharashtra, India, psursaut4@gmail.com²Student, Department of Civil Engineering, J.C.O.E.T., Yavatmal, Maharashtra, India, zibransheikh777@gmail.com³Student, Department of Civil Engineering, J.C.O.E.T., Yavatmal, Maharashtra, India, siddharthtode17@gmail.com⁴Guide, Department of Civil Engineering, J.C.O.E.T., Yavatmal, Maharashtra, India. Mahesh.nalamwar@gmail.com**Abstract**

Water is one of the most important natural resources known on the earth. It is the vital needs of all living beings. Every living beings required water for his development and survive the life. If the quality of water is not good then it become harmful for drinking and other activities. The water standard may describe is in the form of biological, physical and chemical characteristics. Hence it become necessary to find the suitability of purify water for drinking. In this paper so many different types of purification methods for residential building is studied, and suggesting the guideline for selection of water.

Keywords: UV- Ultra Violet, Ro- River Osmosis, UF-Ultra-Filtration etc.

1. INTRODUCTION

Water is essential natural resources for sustaining life and environment that we have always thought to be available in abundance and free gift of nature. Earth covers 71% of water which is near about 1.4 billion Km³, out of 71% of water just 2.5% is fresh water which is comes from river, glaciers, and snowfields. After overall rainfall only 1% of water is available for use, such as drinking, washing but this amount is not wholly pure or portable.

Each human body consist more than 60% of water (that is nearly about 48 litres of water). But due to shortage of water some problems are created like lower energy level, dehydration, digestive disorders, infections, etc. every year 3.4million peoples are die from water related diseases and out of this deaths comes from developing countries like INDIA. Day by day these problems are rising and the only way to counter is to find a safe source of drinking water. But sources of water are minimum that's why we need to purify the water from present sources and this can be done by using purifiers.

Water purification is the transition of the dirty harmful water into clean safe water. Water purification means free the water from any kind of impurities it contains. We purify the water to get rid of contaminants that can be detrimental to our health.

2. LITERATURE REVIEW

The literature review was carried out by referring journals, reference books and IS codes. The work carried out by different researchers is summarized as below.

Hardikkumar V. Shrimali was studied on Reverse Osmosis Technology. Water shortage has been a problem for many communities and humans have been searching for the solution for a long time, so in this paper intends to provide an overall vision of RO technology as an alternative method for purifying the water.

Sukanchan Palit was conclude in this paper presents the instinctive and innovative vision of RO technology as a visionary technique to treat wastewater. The present short review outlines the applicability of RO system.

Adegbola, Adedayo Ayodele and Olaoye, Rebecca Adepte have suggest in this Paper investigates the Effectiveness of Ultraviolet (UV) water Sterilizers as a suitable replacement of chlorine disinfection in the removal of microbiological contaminants in domestic water supply. The results indicated that UV water purification method was more effective only when pre-filtration of raw water was introduced.

C. Guiguia, J.C. Roucha, L. Durand-Bourlierb, V. Bonnelyeb, P. Aptel have been studied in this paper an in-line coagulation UF process has improve membrane performance and water quality for surface water.

IS 10500:2012 DRINKING WATER SPECIFICATIONS (second revision) this nomenclature prescribes the requirements and the methods of sampling and test for drinking water.

3 METHODS OF PURIFICATION: Following are the various methods which are generally used at home to purify the water.

3.1 Household Purification

Following are the common methods which are generally used at home to purify the water.

Boiling: This is a straight forward and effective method of water disinfection for drinking purpose. It is most prevalent in developing countries, though some time in cases of water contamination in particular area it is also used in developed countries. We can also use it as a safety method when we go to a place where the water quality is not known. The process involves heating water in container to its boiling point. Boiling water does not remove any foul taste or smell that may be containing in the water. It also does not remove metals and sediment or herbicides. It is the surest way of killing bacteria and all other disease causing microorganisms which is present in water. Generally water is boiling for 5 to 10 minutes.

Bleaching Powder (Potassium Permanganate): In this method water is purify by adding bleaching powder, 5% solution is used in dose 2.3gm/1000 litres of water contact time of 1/2 hour.

Alum: It is used for turbid water in a dose of 0.1-0.4 grains/5 litres of water.

3.2 MEMBRANE TECHNOLOGY PURIFICATION:- In a membrane separation process, a feed consisting of a mixture of two or more components is partially separated by means of a semi permeable barrier through which one or more species move faster than the one species. Membrane process is used as solids/liquids separation process. In this case, water is more readily transported through the membrane than solids (both suspended and dissolved)

3.3 RO PURIFICATION: RO it means reverse osmosis. This is a well known purification technology best suitable for treating of hard water. It removes the dissolved impurities like salts and chemicals from water. RO is can remove many types of dissolved species from the water. RO works using membranes to purify water. High pressure pump to increase the pressure on the salt side of the RO and force the water across membrane and remove the minutes of impurities such as arsenic, nitrates, and sodium. But it's not effective as the against bacteria and viruses because on breakage of membrane impurities and bacteria can easily pass through it. This is accomplished by household water pressure pushing the tap water through a semi permeable membrane. The membrane allows only the water to pass through, not the impurities, these impurities flushes down the drain. Today, RO water purifiers are used in millions of homes and provide only clean and safe drinking water.

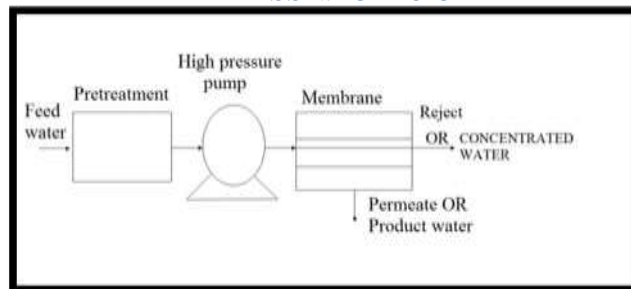


Fig-1: Schematic Diagram of the RO Process

Advantages:

1. Provides clean and safe drinking water.
2. Increased water consumption.
3. Requires simple maintenance.

Disadvantages:

1. Not effective against bacteria and viruses.
2. Lots of wastage water produced.

3.4 UF PURIFICATION: UF it stands for ultra-filtration. It is the method of separating suspended particles and impurities through a membrane. UF is the clean and simple technology it doesn't change the water properties.

Advantages:

1. UF water purifier doesn't require electricity to purify water.
2. These purifiers are very useful in area where having bad electricity problems or conditions.
3. In this technology no any chemicals are used to purify the water.
4. The maintenance cost of this technology is very low and it will not break easily.

Disadvantage:

1. The only issue water purifiers are that it's not capable of removing dissolved salts from drinking water.

3.5 UV PURIFICATION: The sun rays on eliminate bacteria, viruses, fungus, etc. UV radiation can about the same thing in normal UV stands for ultraviolet. UV works using UV radiation, this radiation deactivate bacteria, virus and organisms. The UV purifiers are suitable for lakes water, rivers water, and harvested rain water. It is used where the popularity growing steadily. It is the very simple but effective process, with the system destroying 99.99% of harmful microorganisms.

Advantages:

1. UV is the one of the few affordable technology for the effectively kills the maximum bacteria, viruses, and other harmful microorganisms.
2. It requires less energy.
3. Easy to operate.

Disadvantages:

1. It can't be used with water containing high TDS level.
2. It doesn't have water storage.
3. Requires electrical connection.

4. MARKET STUDY OF PURIFICATION SYSTEMS

Followings are the relevant companies are provides the purifier services:

Kent, Aquaguard, Pureit, Livepure, Lg, Blue Star, Tata Swach, Usha Shriram, Whirlpool, Panasonic, Active Pro, Aqua Ultra, Eureka Forbes, Hitech, Infyshield, Kinsco, Namibind, Newcon, Nexus Pure, Ozean, Pk Aqua, Pns, Purella, Pureultrafresh.

5. GUIDLINE FOR SELECTION OF PURIFIERS

Table-1: Guideline for selection of purifiers

SPECIFICATION			
MANUFACTURING COMPANY	KENT	LG	LIVPURE
MODEL NAME	MAXX UV WATER PURIFIER	WAW73JW 2RP WATER PURIFIER	LIVPURE HERO STAR RO WATER PURIFIER
PRICE	9500/-	25900/-	14600/-
STORAGE CAPACITY	7 LIT	8 LIT	7 LIT
PURIFICATION STAGE	2	3 BASIC	7
FILTERATION CAPACITY	120 LIT/DAY		12 LIT/HOUR
PURIFICATION TECHNOLOGY	UV+UF	RO+UV	RO+UV+UF+TASTE ENHANCER
SILENT FEATURES	FULLY AUTOMATIC, ALARM FACILITY, LED INDICATOR FOR	DUAL PROTECTION STAINLESS STEEL TANK, DIGITAL STERILIZATION	INDICATORS (POWER ON, PURIFICATION, TANK FULL.)

	POWER AND PURIFICATION DISPLAY	NG CARE, 2IN1 WATER SOLUTION	
WEIGHT	7 KG	10 KG	
MADE BY	ABS FOOD GRADE MATERIAL	STAINLESS STEEL	FOOD GRADE MATERIAL
TDS REMOVAL LEVEL	UP TO 199 PPM	500 TO 1999 PPM	NA
WARRANTY	1 YEAR	1 YEAR	1 YEAR

Table-2: Guideline for selection of purifiers

SPECIFICATION			
MANUFACTURING COMPANY	HUL PUERIT	BLUESTAR	EUREKA FORBES
MODEL NAME	ULTIMARO+UV WATER PURIFIER	MAJESTO MA4BSA M01	AQUAGUARD ENHANCE
PRICE	20,500/-	17,900/-	17,999
STORAGE CAPACITY	8 LIT	8 LIT	7LIT
PURIFICATION STAGE	6	6	7
FILTERATION CAPACITY	9 TO 12LIT /HR		15 LIT/MINUTE
PURIFICATION TECHNOLOGY	RO +UV	RO+UV	RO+UV WITH TDS REGULATOR
SILENT FEATURES	DIGITAL ALERT SYSTEM, SOFT TOUCH WATER DISPENSING	AQUA TEST BOOSTER, COPPER IMPREGNATED, DACTIVATED CARBON, SUPER FINE SEDIMENT REMOVAL	DUAL WATER PURIFICATION, COMPACT AND SAVING DESIGN, AUTOFILL FEATURES

WEIGHT	10 KG	9KG	8 KG
MADE BY	ABS FOOD GRADE MATERIAL	ABS FOOD GRADE MATERIAL	ABS FOOD GRADE MATERIAL
TDS REMOVAL LEVEL	UPTO 2000 MG/ LIT	500 TO 1999 PPM	500 TO 1999 PPM
WARRANT-Y	1 YEAR	1 YEAR	1 YEAR

6. CONCLUSION

1. In this paper we are attempting to analyze the various purification methods and suggesting the methods are suitable at residential building from the comparing the various purifiers.
2. Gives the guidelines for selection of the purifiers from comparing with each other, from this comparison we come to know that if the water is underground then RO based water purifier is best option for buying and if water is from lake or municipal supply then UV based water purifier is best option for buying.

7. REFERENCES

- [1] Hardikkumar V. Shrimali, "A Brief Review on Reverse Osmosis Technology" *International Journal of Research in Advent Technology*, E-ISSN: 2321-963, Vol.3, No.5, May 2015
- [2] Sukanchan Palit, "A Short Review Of Applications Of Reverse Osmosis And Other Membrane Separation Procedures", *International Journal of Chemical Sciences and Applications*, ISSN 0976-2590, Online ISSN 2278 – 6015, Vol 3, Issue 2, 2012, pp 302-305
- [3] IS 10500: 2012 Drinking Water Specification (second revision)
- [4] Adegbola, Adedayo Ayodele1 and Olaoye, Rebecca Adepte2. "Investigating The Effectiveness Of Ultraviolet (UV) Water Purification As Replacement Of Chlorine Disinfection In Domestic Water Supply", *International Journal of Engineering Science and Technology (IJEST)*
- [5] C. Guiguia*, J.C. Roucha, L. Durand-Bourlierb, V. Bonnelyeb, P. Aptela, "Impact of coagulation conditions on the in-line coagulation/UF Process for drinking water production."
- [6] www.kent.com (official website)
- [7] www.Aquaguard.com (coustemer services official website)