Impact Factor (SJIF): 5.301

International Journal of Advance Research in Engineering, Science & Technology

e-ISSN: 2393-9877, p-ISSN: 2394-2444

Volume 5, Issue 2, February-2018

DESCRIPTIVE INTERPRETATION OF PREMIUM FACTORS AFFECTING PURIFICATION SYSTEM FOR FLOWING SOURCE AND STATIC WATER SOURCE IN RURAL AREAS

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ABSTRACT: *Water Purification has been termed as a very dominant and required parameter for human life and survival. Water needs to be purified and quantified before its actual use. Water may be used as a resource in many industries, water has been used for drinking and water is also used for irrigation supply. Various roles of water changes as per its requirement and causes its use as a dominating resource for any work. The potential of stream self-purification is an important exhibitor for the river health. Various parameters need to be assessed before supply a water for drinking or industrial supply. In the present study quantification of various parameters has been done for purification system for static and flowing source. Various factors such as dilution, current effect, temperature, oxidation, reduction, sedimentation, sunlight, humidity etc. have been described as a affecting factor for purification system. There are two unused source of potable water supply in the study area (Jhalrapatan City) such as static source and flowing source. These sources and its usefulness on utilizing water for drinking purposes specially has been assessed. The results have been identified and concluded that these sources need to be self purified to increase their DO level and also to reduce the algae formation on static source and stagnation of water on flowing source should be either removed or it should be purified by using blowers and fountains for oxidation in river. The capacity of the river self-purifying may act as one of the exhibitors in monitoring the discharge standard. Also utility of filters has been checked for mass rural supply in the study area.*

Key Words: Dilution, Filtration, Self-purification, Sedimentation, Water source.

INTRODUCTION

The present study aims to identify the potential of available water resources present in the study area to use as a source of eminent water supply. The water purification of the static source can be done by oxidation, dynamic aeration and dilution whereas purification of flowing sources such as rivers, streams, estuaries occurs naturally via self-purification of streams. Also there are few

modern methods in which river can be also purified using synthetic method and approaches in which the factors affecting self-purification can be utilized for water purification.

Now a days due to increased contamination of water it is very difficult to get pure water as a drinking source. It needs various efforts to purify water before its use such as adoption of water treatment methods, water purification, dilution, reducing contamination of parameters. This study helps in assessing the potential of purification in river and static source present in city and also this study reveals that which filtration technique will be suitable for mass rural supply. Various studies have been carried out and research papers have been studies for evaluating the suitable ness in improving the parameters for purification. These reviews are depicted and described in next session.

LITERATURE REVIEWS

The capacity of the self-purification of the river may act as one of the indicators in regulating the discharge standards. (Shimin Tian et al, 2011). Surface water contains inorganic and natural mixes of regular inception as suspended issue and broke up substances. By and large, water in waterway and lake is defiled by squander, sewage, chemicals, hydrocarbons, prescription, hormones, anti-microbials, microscopic organisms, infections, manures, plant-defensive specialists, and so on and their rot items (Balke, 1990; 2003; Balke and Zhu, 2003; Remmler and Schulte-Ebbert, 2003). For drinking purposes, the pollutions in water must be expelled or pulverized by sanitizing forms as totally as could be allowed.

Characteristic cleansing impacts inside channel layers and in the subsurface are caused essentially by filtration, sedimentation, precipitation, oxidation-diminishment, sorption-desorption, particle trade and biodegradation. In plants for manufactured groundwater revive, the water being penetrated at first passes a misleadingly introduced layer of channel sand. This channel layer holds coarser particles by filtration. Compound responses between invaded water, strong inorganic and natural substances in the subsurface, and the groundwater streaming towards the extraction well may cause precipitation of sparingly dissolvable carbonates, hydroxides and sulfides administered by pH factor and redox potential inside the channel layer and the aquifer.

The oxygen substance of the water is conclusive for oxidation procedures and exercises of microorganisms. The nearness of decreasing substances, for example, humic issue, causing an absence of oxygen, is in charge of synthetic diminishments. pH factor and redox potential impact these responses, as well. Water can be invaded into aquifers with the assistance of bowls, pipes, dump and wells (Balke, 2004).

STUDY AREA

Jhalrapatan is a town in Jhalawar district in the south of Rajasthan state in India. Its population is approximately 30,000. Elevation of the city is 317 m (1,040 ft) with coordinates coordinates 24.55°N 76.17°E. The city is famous for the temples situated and holy historic background.

There are two major water resource present in the city one is Chandrabhaga, non perennial seasonal river and other is Gomati Sagar Lake forming the outskirt of the city Also one important river named Kalisindh river is situated near the city on which Kalisindh Dam has been built which is around 10 kms from the city. Major drinking water supply of city commences from this river.

SELF PURIFICATION SYSTEM

When the water source or body is polluted, the river source can be purify itself by mechanical, physical, biological and chemical actions such as intense flowing, sunlight action, dilution, deposition, currents and adsorption, which is called the self-purification (Gu, 1985). The ability and capability of the self-purification is primly related to the parameters and characteristics of the stream or river which is the, flow rate, flow discharge, silts, sediment-load and living entities in the rivers. For a certain river, the ability of the self-purification is assessed. When the total amount of contamination is beyond the self-purification ability of the stream/ river, the stream/ river will be contaminated. The self-purification is a measure to assess the pollution content and accommodation of the river.

Factors Affecting Self Purification:

1. Dilution: If the sewage is mixed with large volume of water or it is dilute sewage then it remains always in the aerobic condition and anaerobic condition never comes because the DO remains present in the water will be in permissible limits to cause oxidation.

2. Currents: The self purification of river directly depends upon the currents of flowing river. When there is no current, sewage matter deposited near the outfall causing formation of the sludge banks and causes foul odours. In the slow current sedimentation takes place causing growth of algae resulting in the products of oxygen.

3. Temperature: As the organism activities depends upon temperature then the self purification of river will also depends upon the temperature. At lower temperature the organism activities are slow due to the slow rate of decomposition. In the summer season temperature will be high leading to more self purification of the river. In the study area Jhalrapatan city temperature rises even up to 48-49 degree Celsius in summers and remain constant for atleast 2 to 3 months which may be helpful in self purification of the available river and pond. Whereas in winter season there is lesser self purification.

4. Sedimentation: With the slow currents the heavier solids settle in the stream bed and it leads to prevailing anaerobic decomposition in the stream. The product of decomposition are again mixed with the water by current. If dilution if sufficient, anaerobic condition will not develop.

5. Sunlight: The pathogens are killed if they are exposed to sunlight exposure helps in self purification process. Algae also grow in sunlight causing the production of oxygen.

6. Oxidation: The organic matter immediately mixed with the stream starts getting oxidized to the development of oxidizing organisms present in water. The process prevails till the complex

oxidation of organic matter. The oxygen demand is satisfied and stream becomes purified due to this phenomenon.

7. Reduction: It occurs in stream due to hydrolysis of organic matter biologically and chemically, anaerobic organisms start the splitting's of comple organic substances present in the sewage. The oxygen produces odor's and gases thus stabilization comes into picture.

8. Absorption: Absorption of the decomposed matter in the river for purification is also one of the prominent factor for self purification.

9. Other Factors: other factors such as humadity and climatic reforms may also affect the natural process of self purification.

WATER FILTRATION

Water filtration is need for mass rural supply. Potassium permagnet can be used in wells of villages or rural supply. Filtration turbidity, colloidal metals, non-settleable, dissolved metals, organic compounds can be removed. There are basically three types of filters (1) Slow Sand Filters or Gravity Filters, (SSF) (2) Rapid Sand Filter (RSF), (3) Pressure Filters (PF). The utilities of these three are depicting in Table 1.

Table 1: Comparison of Slow Sand Filter, Rapid Sand Filter and Pressure Filters

Sr. No.	Parameters	Slow Sand Filter	Rapid Sand Filter	Pressure Filter
1	**Shape Used**	Rectangular	Rectangular	Circular
2	**L/B Ratio**	1.5 to 3 (Usually 2)	1.5 to 3 (Usually 2)	Dia.: 2 to 2.5 m Height: 2.5 to 8 m
3	**Filter Medium**	Sand	Sand	Sand
4	**Size of Filter Medium**	0.2 to 0.4 mm	0.35 to 0.60 mm	0
5	**Cu (Coefficient of Uniformity) of Filter Medium**	3 to 5	1.3 to 1.7	1.3 to 1.7
6	**Total Depth of Filter**	90 to 110 cm	75 cm	75 cm
7	**Gravel Base**	Provided	Provided	Provided
8	**Particle Size**	3 to 65 mm	3 to 40 mm	3 to 40 mm
9	**Thickness of Base**	30 to 75 cm	60 to 90 cm	60 to 90 cm
10	**Gradation of Sand**	Top 10 to 15 cm layer is finer	Upper layer finer and lower coarser	Upper layer finer and lower coarser
11	**Area of Filter**	100 to 200 Sq. m	10 to 80 Sq. m	10 to 80 Sq. m
12	**Size (Area)**	30 m x 60 m	5 to 8 m	5 to 8 m
	No. of Filter Unit	-	N= 1.22 √Q	N= 1.22 √Q
13	**Filtration Rate**	100 to 200 lt/hr/m^2	3000 to 6000 lt/hr/m^2	6000 to 15000 lt/hr/m^2
14	**Design Period**	10 to 15 Years	Upto 15 Years	Upto 15 Years
15	**Design Discharge**	Maximum Daily Demand	Maximum Daily Demand	Maximum Daily Demand
16	**Head Loss**	Low at start, 10 to 15 cm	2.5 to 3 m	2.5 to 3 m

17	**Supernatant Water**	1 m	1m, Neagtive head: 0.8 to 1.2 m	> 1 m
18	**Impurities Removed**	Bacteria Suspended Solids	Bacteria, Suspended Solids	Bacteria, Suspended Solids, Floated particles
19	**Efficiency**	98 to 99 %, Turbidity upto 50 ppm	80 to 90 %, Turbidity upto 40 ppm	80 to 90 %, Turbidity upto 35 to 40 ppm
20	**Pretreatment Required**	Pre chlorination	Coagulation, Sedimentation	Coagulation
21	**Cleaning Method**	Scrapping Top Layer (Once in 1 to 3 Months)	Backwashing by Water/ Air (within 1 to 3 Days)	Backwashing by Water/ Air (within 1 to 3 Days)
22	**Water for Cleaning**	0.2 to 0.6 % of Daily filtration	1 to 5 % of Daily filtration	1 to 5 % of Daly filtration
23	**Suitability**	Small treatment plants, low turbidity, color	Large Scale plants, Mass Supply	Swwiming pool water, Softening industries
24	**Backwashing/ Scrapping**	Backwashing not done scrapping is done	Mechanical Backwashing (30 Min. is required)	Mechanical Backwashing (30 Min. is required)

Rapid Sand Filter (RSF) is best suited for rural mass supply as per parameters study. The quantitative productivity of the channel sand layer is impacted by the penetrability of the channel sand, the method of rain fall, the growing up of green growth, and so forth. The rate of filtration drops over the span of time, and after a specific period the channel layer must be cleaned or supplanted.

ARTIFICIAL GROUNDWATER RECHARGE POTENTIAL

Other than the refinement impacts, simulated groundwater revive additionally empowers a superior water administration (Zhu and Balke, 2005). Amid periods with mean waterway water release and mean groundwater levels, as much water can be invaded and normally cleansed as required by the buyers. As to later periods with low waterway water release, an excess of water can be invaded into the aquifer. This task amid periods with mean and high stream water releases builds the measure of put away water that is recorded by a rising groundwater level

Pre-filtration is the filtration of water before the simulated groundwater revive. It happens in shallow bowls with an impermeable base made, e.g., of solid, which are loaded with a layer of rock and sand of around 1 m thickness as channel material. Entering over a course, the water streams on a level plane through the channel layer to a gatherer pipe situated at the contrary side of the bowl. In hilly territories simulated aquifers can be built up in limit valleys of creeks and streams. For this reason, little dams of 3 to 5 m tallness are developed in the valley for holding residue which is transported by the waterway amid surge periods. After the open space upwards the dam is topped off with sand and rock, the water put away in the pore space of this dregs can be utilized. Contrasted and a vast water repository, the capacity limit is diminished to 20%~30%

of the entire space. Be that as it may, then again, dissipation is diminished and water can be put away for a more drawn out period. Release funnels with valves introduced in the dam at various levels, permit the withdrawal of water controlledly and changed in accordance with the need.

Artificial groundwater revive is used for some, reasons: drinking water supply, change of crude water quality, stockpiling of pure water, aquifer recuperation, invasion of tempest water spillover, protection of characteristic wetland, transfer of treated sewage effluents, development of pressure driven obstructions against ocean water interruption. Contrasted and different strategies for water treatment, simulated groundwater revive is naturally reasonable and less expensive than synthetically actuated coagulation, ozone floc filtration, the utilization of switch osmosis, bright pillars, ultra-filtration, or enacted charcoal. Artificial groundwater revive has demonstrated extremely fruitful at numerous locales in Germany over a time of over 100 years.

METHODS ADOPTED AND RECOMMENDATION

For the self purification of river or stream various factors affecting purification should be catalyzed by artificial means. There may be various methods which can be adopted to initiate the self purification of rivers/ static source.

Enhancement of Purification in River (Flowing Source): Sewage could be diluted, Currents should be generated in river to initiate the process of self purification, temperature must be increased and specially in summers the water can be cleaned as temperature goes higher. Sedimentation and disposal of heavier seawage must have to be avoided because it will prevail the anaerobic decomposition. If proper dilution will be provided then anaerobic condition can be avoided. Exposure to the sunlight must be there which will cause killing of pathogens.

Enhancement of Purification in Pond (Static Source): Sewage must not be dumbed in the static or pond source. Dilution is enough as water content is high but it should be utilized for aeration by adopting methods like fountain water sprinking. Cascade type structures can be formed to initiate aeration. If sewage will be dumbed then there are prevailing chances of being gening sedimented. It will lead to the condition of anaerobic decomposition which is not good for the water purification. Due to this the self water purification is less in ponds and lakes compare to river, stream or other flowing sources. Temperature and sunlight could be the best factor which may prevail and accelerate decomposition.

RESULTS AND CONCLUDING REMARKS

The self purification of water bodies proves to be a complex process that often involves physical, mechanical, chemical, and biological processes working at the same time. As Dissolve Oxygen drops below 4.2 mg/L the forms of life that can survive begin to be reduced. A minimum of about 2.0 mg/L of DO is required to maintain higher life forms. Artificial ground water recharge is also ound to be the best method to improve the ground water contamination. Among the three sources of water i.e. static source, flowing source and groundwater source, self-purification occurs least in ground water source. It can be enhance by using artificial ground water recharge

techniques. Oxygen demanding wastes remove DO; plants add DO during day but remove it at night; respiration of organisms removes oxygen. In summer, rising temperature reduces solubility of oxygen, while lower flows reduce the rate at which oxygen enters the water from atmosphere. Various factors have been studied which may cause deficiency of DO in the river system and also the methods to accelerate these factors has been described in detail. Self-purification which is a natural process can be enhance by artificially enhancing the factors affecting it which may be dilution, current effect, temperature, sedimentation, sunlight, oxidation, reduction and absorption.

Also it is found that the Rapid Sand Filter (RSF) best suited for the mass rural supply for the study area. Also if the bacterial removed and pathogenic contamination is found even after purification though RSF then the water can be treated by sand filters or gravity filters for small colony supplies. Also chlorination can be done to remove the various potential problem causing unhygienic conditions.

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