

River Bank Filtration a Pre-Treatment Solution for Water Treatment in Gaur River

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Abstract— River Bank Filtration has emerged as an economical and sustainable water pre-treatment technology for drinking water supply. In this method, subsurface water of a water body moves into the well by seepage. Bank filtration wells adjacent to a river or lake pump the stored ground water abstracted from the surface through aquifers. This study highlights the role of Bank Filtration method in regulating water quality and quantity improvement. Besides, attempts have been made to discuss the mechanism, significance and the development of Bank filtration technology in the Gaur River, Barela area of Jabalpur city in the state of Madhya Pradesh. The study area contributes 62.7 km² of total area and situated between 79°58'6.72" and 80°4'59.10" E longitude and 23°1'46.15" and 23°6'25.03" N latitude with elevation range from 400 m to 560 m above MSL (mean sea level). Gaur River is in decaying Condition due to establishment of dairy industries near the banks of the river and direct release of untreated waste water in the river.

Index Terms— River Bank Filtration, water treatment, drinking water, sustainable solution.

I. INTRODUCTION

Good quality water sources are getting scarcer and pollution of the water sources is increasing due to overexploitation of water resources to meet the increasing water demand and insufficient sanitation services provision. On the other hand, water quality guidelines are getting more stringent due to the increasing number of emerging contaminants in water and consequently the cost of water treatment is increasing. In many developing countries, disinfection (very often chlorination) is the only treatment applied to public water supply. In this context, there is a need for a robust water treatment technology which is effective, low-cost and could be operated and maintained relatively easily in developing countries

II. RIVER BANK FILTRATION IN INDIA

Several Indian cities such as Rishikesh, Haridwar, Kanpur, Allahabad and Varanasi along the river Ganga and New Delhi, Mathura and Agra along the Yamuna river receive SW by direct abstraction for drinking and other domestic purposes; but the direct use of such type of water is not safe especially during low water flow condition due to high concentration of untreated waste.

At these places, RBF technology has been considered as a suitable method to supply water of good quality^{9,27– 31}. Besides, BF has also become popular in Nainital adjacent to

Naini lake³² and Muzaffarnagar by the river Kali³³; Ahmedabad and Vadodara in Gujarat state are also implementing this method. Several production wells have been installed on the bank of the Ganga River in Patna for the supply of drinking water.

III. LITERATURE REVIEW

Water Treatment is defined as the selection of sampling sites and sampling frequency to determine physical, chemical, and biological properties of water. In the literature, several studies have shown much promise for the removal of fractions of natural organic matter from surface waters by bank filtration (Kuehn, 2003; Ray et al., 2002; Cosovic et al., 1996). Trace organic pollutants in bank filtration have been studied in various research projects since improved analytical methods allow their detection in ranges below 1 mg/l. Many recent studies have revealed the occurrence of pesticides or industrial chemicals (Hiemstra et al., 2003; Heberer et al., 2001; Verstraeten et al., 2002) in bank filtrate. While these approaches represent an attempt at demonstrating the efficacy of RBF as a treatment technology for reducing pathogen concentrations in drinking-water sources, it is generally acknowledged that they do not provide adequate assessments of pathogen removal by RBF. Due to the huge number of possible contaminants in river water, a necessary restriction has to be made on organic substances that may be relevant to drinking water production (Sacher and Brauch, 2002 and 1999; Sacher et al., 2001a). Contrast media were found to be very polar, persistent and difficult to remove in waste water treatment (Jekel and Wischnack, 2000). Nowadays, the major raw-water resource for drinking-water supplies whereas bank-filtrated (or Infiltrated) water is about 16 percent (Sacher and Brauch, 2002; Brauch et al., 2001). Compared to this, the direct abstraction of river water is of minor importance (less than 1 percent). Ziegler (2001) showed the magnitude of this effect for parts of the Berlin water cycle by simulating the theoretical concentration increase in drinking water for a substance that is not removed during soil passage.

IV. OBJECTIVE

□ To provide a sustainable solution for treatment of water at a low and effective manner and also to reduce the load of treatment plant to treat the raw water from the existing river (Gaur) near Barela, Jabalpur.

□ River Bank Filtration (RBF) has emerged as an economical and sustainable water pre-treatment technology for water treatment

□ Overall recommendations were developed to help other utilities evaluate this technology as a potential lower cost alternative for minimizing treatment cost.

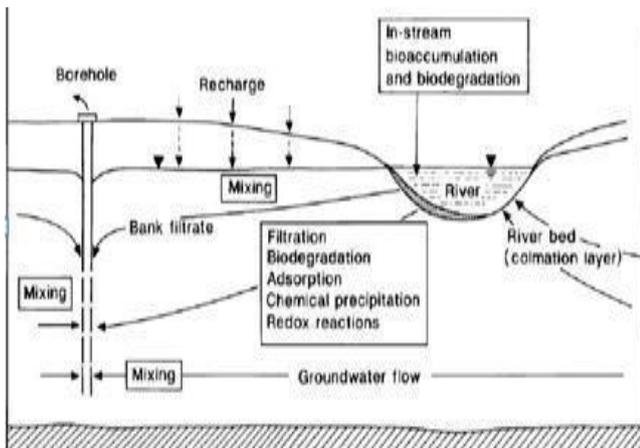
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V. METHODOLOGIES

Most RBF systems are constructed in alluvial aquifers located along riverbanks. These aquifers can consist of a variety of deposits ranging from sand, to sand and gravel, to large cobbles and boulders. Ideal conditions typically include coarse-grained, permeable water-bearing deposits that are hydraulically connected with riverbed materials.

- Selection of site for the bank filtration
- Sampling of water from the selected site
- Sample analysis taken from the site
- Commercial river traffic (a source of pollution; dredging may also be necessary)
- Flow velocity and bed load
- Characteristics. Seasonality of river flow
- To analysis load on treatment plant to treat the water from the river for drinking purposes
- Percentage of usage of chlorine to treat water



VI. ADVANTAGES OF RIVER BANK FILTRATION

RBF method not only improves the physicochemical quality of water but also its biological quality during underground passage from the SW body to the abstraction well. Some of the important advantages of BF technology are given herein

- Removal of particles and turbidity, bacteria and other protozoa
- Reduction of biodegradable organic compounds
- RBF serves as a pre-treatment step in the drinking water treatment system. It therefore lowers the maintenance compared to the conventional treatment methods. It is helpful in reducing the use of chemicals and accumulation of disinfection by-products in drinking water.

Finally, it can be concluded that BF technique is very useful due to the following reasons-

- Natural, sustainable and low-cost method.
- Effective elimination of pathogens and other organics
- Disinfection is sufficient in most cases.

VII. CONCLUSION

The treatment effectiveness of RBF on Gaur River on account of the changes in the quality of river water due to river water level and the variations in the physical (Temperature, suspended solids), chemical (type and concentration of compounds) and biological (type and concentration of virus, bacteria and protozoa) properties (Schubert,2005).

River Bank filtration is a highly dynamic process on basis of results from the combination of several applicable processes such as clogging of the riverbed, the dilution with the ground water after infiltration, subsurface filtration (Filtration adsorption, biodegradation, ion exchange oxidation /reduction) and additional treatment steps.

VIII. RECOMMENDATIONS

- River Bank Filtration is a low cost pre-treatment system it can reduces the suspended solids before entering the water in the treatment plant
- As the condition of the River Gaur due to presence of organic waste, River Bank Filtration reduces the load of settling in the water in the treatment plant.
- River Bank Filtration is also effective in reducing the virus bacteria and their concentration in the water, which reduces the amount of chlorination in the water treatment.

River Bank Filtration is also helpful in reducing the amount of coagulation presently used to stable the water quality within the drinking permissible limit as per the Govt guideline.