Biological Forum – An International Journal **8**(2): 376-378(2016)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Six Steps Management Model for Quality Improvement of Drinking Water

***Moghira Badar*[*], *Imran Ali*[**] *and Muhammad Luqman*[***]**
[*]*Department of Environmental Management,*
National College of Business Administration and Economics, Lahore, PAKISTAN
[**]*Hailey College of Commerce, University of the Punjab, Lahore, PAKISTAN*
[***]*Department of Management Sciences, University of Sargodha, Lahore campus, PAKISTAN*

(Corresponding author: Moghira Badar, moghirab@yahoo.com)
(Received 05 November, 2016, Accepted 18 December, 2016)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: In our present study we had taken three types of water samples from Canal, water storage tanks and ground water. This management plane is discussed under different steps and applicable for safe drinking if water was taken from any three sources as canal water, ground water and water storages tanks. Water management plane comes from real observations from our results of this study which give us line of action for the necessary treatment of drinking water for domestic purposes. The Study on the canal water was different from study of ground water and water storages tanks, so it observed that during the midwinter the uniform temperature of the canal water is noted. This temperature of canal water will helps to control the algae and cyanobacteria growth. It is observed that during summer month's temperature of algae and cyanobacteria also increased the water contamination.

Key Words: Management, Model, Toxins, Quality, Coagulation, Chlorination

INTRODUCTION

Water is an essential part of lifecycle on this planet. The Earth's ocean's surface is approximately 361 million square kilometers. The oceans are the primary moisture source, for the precipitation that falls on the land masses. The world rain precipitation amounts to about 4.46 × 1014 tons per year. Out of this amount the quantity of 0.99×10^{14} tons falls on the land surfaces, while the remainder of 3.47×10^{14} tons falls on the ocean surface. Nearly fresh 3% of the Earth's water is found in water reservoirs such as lakes, rivers, streams, ponds and in the ground that are used for agriculture and drinking practices (M Badar *et al*., 2016a).

Poor quality drinking water contains many constituents that causes harmful affect the human health. These constituents or components are included minerals, organic substances and pathogens like disease causing microorganisms and chemical agents. A huge percentage of this population in developing countries are suffering from healthiness problems related with good quality deficiency of drinking water and existence of water contamination due to microbiological sources. Bad drinking water features are the death causes of an expected 5 million of children in the under developing countries.

These difficulties and problems are further serious due to rapidly increasing in population, which outcomes in mismanagement of maintain the water quality (M Badar *et al*., 2016 b).

The presence of toxins in the water reservoirs are used for the drinking and domestic purposes which represents a meaningful health hazard for human and animal population. Consumption of Drinking water is a possible major way of exposure the toxins. This is not acceptable for public requirement of safe drinking water and very need of the water treatment methods to remove microbes and toxins effectively from drinking water supplies and reservoirs (M Badar *et al*., 2016 c).

Several studies had been done on water contamination but no one studies and researches are conducted on the angle of toxin presence in water bodies in reservoirs, overhead tanks of the houses and effects of the microbial toxin on health as well as economics on rural area of Sheikhupura district. Therefore, it is needed of the time to have the study on economical methods of drinking water. The study is very useful assistance to increase the awareness of the concerned persons, facilities, water treatment operators and management officers, government and other related department.

It helps in prepare the management plans and help them to make right choices, especially in situations of microbial contamination of *E. coli*, *C. Botulinum* and *Cyanobacteria* and their related contamination as producing the toxins like Shiga, Botulinum and Microcystins (Moghira *et al*., 2016 a). The main purposes of this study is produced a management model that indicate different steps for removing the harmful material from drinking water sources.

MANAGEMENT MODEL

This model is very important for reserve the drinking water resources and further keeping the good quality as achieving the standards. Management model is designed based on manual way to take the handling of drinking water management prospective **(**Moghira *et al*., 2016 b) (Fatima *et al*., 2016). Sex step of this model is given as below,

Management Stage 1. Water Coagulation with Aluminum Sulphate

a. Aluminum sulphate have the general formula as $Al_2(SO_4)_3$. $18H_2O$ that is commonly known as alum and commonly used as coagulant in the treatment of water in developed countries. The reaction between sulphuric acid and Aluminum trihydrate is formed the Aluminum sulphate and its work to destabilize the particles suspended in the drinking water as the basic aim of coagulation. So the particles are package together and settle out due to greater particle weight and coagulation reaction between contaminated water and Aluminum sulphate. The particles are generally toxins as organic in nature and predominantly negatively charged.

To manage coagulation, where the water is turbulent then adding alum for treatment of drinking water. Alum Coagulation is basically pH dependent process and most important to manage the pH in the range 6.0 to 7.0 for getting the best results. If sufficient alkalinity is present in the water that to ensure the pH do not fall out then the alum is added for water treatment. If natural alkalinity in water does not have, then lime is added before the alum coagulation.

Management Stage 2. Flocculation with Electrolytes

After coagulation, flocculation process occurs and it is helped by the addition of a polyelectrolyte after the adding Aluminum sulphate coagulation for its speedy process. Basically, Polyelectrolytes are organic molecules with long chain high molecular weight. Effective dose of Polyelectrolyte is about 0.1 to 0.2 mg/l with adding the alum dose in water.

Management Stage 3. Sedimentation

The management concept of this step is the larger particles of greater settling velocities that are in position of suspension in the bottom of the vessel whereas less settling velocities of smaller particles are suspended to the top position. Suspended particles is produced a sludge that can be remove mechanically.

Management Stage 4. Filtration

Manage the filtering material correctly from filtration process as 2 cm sand and 3cm granular carbon layers is used then water should be passing through filtration process. Water from the clarifiers is channeled through the filters for additional suspended solids removal and the water percolates down through graded sand that traps any flocculation.

Good quality and low turbidity drinking water are produced by filtration process with free from contamination.

Management Stage 5. Final Water Treatment

This management step is involves the disinfection of drinking water with controlling the pH values. The drinking water is making the disinfection, it means to destroy disease causing micro-organisms, and makes it safe to drink.

In this study, use sodium hypochlorite as active agent for this process and it is also used for filtrations on commercial level. It is estimated that nearly 3.5 kg of NaCl salt can produce chlorine with 1 kg quantity in the process of chlorination.

Management Stage 6. Addition of Fluoride

Hydrofluosilicic acid is source of fluoride which can dissolve in drinking water source after chlorination that helps to reduce the possibility of dental decay. According to New Zealand water quality standards, a specific amount of fluoride is important for public health and for healthy of their teeth.

PHYSICO-CHEMICAL FACTORS

Following physical factors are very important for right and correct implementation of management of drinking water model because these factor are conditional requirement that given as below (M Badar *et al*., 2016 h).

Temperatures. It is reported in this study the samples of water is effected increasing by increasing the strength of sunlight as temperature average raises from 16^oC to 50 ^oC during study in sampling area. The environments form microbe's growth, incubation temperature particularly have effect on their existence with metabolites as toxins. During summer season, microbes were isolated in high numbers at temperature 22 to 27^oC and very small in number identified in winter season (M Badar *et al*., 2016 d).

High temperature is commonly documented as a vital adjusting feature of microbial progress like bacterial, algal evolution. Environments under water high temperatures can increase microbial growth and but, at the minimum temperature where microbial movement seen is observed varies in the different co-ordination. It is reported that increases in bacterial activity occurred in the day during algal blooms in White Clay Creek. The microbes react speedily to indicate at higher temperatures with dissolved organic matter are helped to increase growth. The quality of natural organic matter as well organic pollutants in surface water is degrades by solar radiation. In summer seasons, waterborne bacterial pathogens growth was achieved but not as same in mid-winter that is indicated the potential influence of temperature on waterborne microbial pathogens occurrence (M Badar *et al*., 2016 e).

pH. The 6.5-8.5 pH of most drinking water ranges, if some changes occur within this value as result of carbonate, bicarbonate or carbon dioxide dissolving in system of water supplies because of increased carbon dioxide concentration in water shows lower pH and as a decrease values reason high. Basically, the pH is the corrosively of the water, so small changes in pH has no non-stop influence on consumers health. At below pH 8.0, it is ensure about water clarification and chlorine disinfection occurs (M Badar *et al*., 2016 f).

The normal of pH is very important because of water flow in pipes system may affect quality of pipes which used in water supplies, so it must need proper pH monitoring system for maintaining the pH of water. pH of water may change its taste, Oder and appearance (M Badar *et al*., 2016 g).

CONCLUSIONS

During this study, it is observed some factors that affect chlorination and microbial disinfection as contaminated canal water for drinking purpose needs dose 3mg/l of chlorine for complete disinfection without residues and 1.5 mg/l dose of chlorine is required for treating the drinking water of storage tanks without any toxicity causing by chlorine residues.

Alum is categorized into as acid salt due to it has sulphate group and then change into sulphuric acid, then this acid reacts with the alkalinity present in the water. Last management step in coagulation is adding from 5 to 30 mg/l as the differing quantities of Aluminum Sulphate in the drinking water samples. Manage the mixing for a set time the solutions are allowed to settle and then correct dose put inside because dose of coagulation depend on how water is polluted.

REFERENCES

M Badar, Fatima Batool, Muhammad Idrees, M Ahsan Zia, Hafiz Reehan Iqbal. (2016 a). Managing the Quality of Chromium Sulphate during the Recycling From Tanning Waste Water, *International Journal of Advanced Engineering Management and Science* **2**(10): 1711-1718.

M Badar, M Ahsan Zia, Muhammad Idrees, Fatima Batool, Hafiz Rehan Iqbal. (2016 b). Treatment of Drinking Water in Economical Cost Perspective. *International* Journal of Environment, Agriculture and Biotechnology, vol. **1**(3): 555-558.

M Badar, M Saeed iqbal, Fatima Batool. (2016 c). Development the Economical Chemical Treatment Plant for Chromium Recovery From Tannery Waste Water. *International Journal of Environment, Agriculture and Biotechnology*, **l**(3): 559-64.

Moghira Badar, Qamar Mahmood K, Fatima Batool. (2016 a). Effect of Toxins (Microcystines, Shiga & Botulinum) on Liver Functions. *International Journal of Advanced Engineering Research and Science* **3**(11): 1-4.

M Badar, Irshad Khokhar, Fatima Batool, Muhammad Idrees, Yasir Ch. (2016 d). Microbiological Botulinum Toxins Removing From Drinking Water Sources by Treatment of Coagulation Process, *International Journal of Advanced Engineering Research and Science* **3**(11): 5-11.

M Badar, Fatima Batool, Muhammad Idrees, Hafiz Reehan Iqbal, M Ahsan Zia. (2016 e). Effect of Boiling on Removing of Botulinum Toxins from Drinking Water Samples. *International Journal of Science and Research* **5**(10): 1969-1973.

M Badar, Fatima Batool, Muhammad Idrees, Hafiz Reehan Iqbal, M Ahsan Zia. (2016 f). Effect of Boiling on Removing of Microcystins Toxins from Drinking Water Samples. *International Journal of Science and Research* **5** (10): 1952-1956.

M Badar, Irshad Khokhar, Fatima Batool. (2016 g). Shiga Toxins Removing From Drinking Water Sources by Treatment of Coagulation Process. *Science International* **28**(4), 3947-3953.

Moghira Badar, Irshad Khokhar, Safder Shah Khan, Mahmood-ur-Rahman, Fatima Batool and Yasir Ch. (2015 b). Removal of cyanobacterial toxins from drinking water sources by aluminium sulphate treatment. *Brazilian Journal of Biological Sciences* **2**(3): 119-129.

M Badar, Irshad Khokhar, Fatima Batool**.** (2016 h). Managing the chlorination dose for disinfection of microbes in drinking water. *Science International* **28**(5): 3947-3953.

Fatima Batool, Muhammad Idrees, M Ahsan Zia, Hafiz Reehan Iqbal. (2016). Operational Management of Chromium Recycling From Tannery Wastewater, *International Journal of Advanced Engineering, Management and Science* **2**(10), 1719-1724.