International Journal of Science, Environment and Technology, Vol. 3, No 4, 2014, 1415 – 1418

ISSN 2278-3687 (O)

Review Article

ADVANCEMENT IN DRINKING WATER TREATMENTS FROM ANCIENT TIMES

Jadhav A.S.
Department of Environmental Science,
Shivaji University, Kolhapur
E-mail: patilaasawari@gmail.com

Archaeological excavations found early human settlements located at sites with reliable sources of drinking water nearby (Bromehead, 1942. Excavations from the Neolithic time have also found a striking correspondence between settlements and wells. (Malmberg, 1984).

Human civilisation established around the water sources. The importance of ample water quantity for drinking and other purposes was apparent to our ancestors. An understanding of drinking water quality was not well known or documented. In the past the quality of water was tested considering only aesthetic problems (an unpleasant appearance, taste or smell) it took thousands of years for people to recognize that aesthetic problems alone were not accurate judges of water quality. Water treatment originally focused on improving the aesthetic qualities of drinking water. Therefore, in 4000 B.C. attempts were made to improve the taste and odour of drinking water.

Ancient Sanskrit and Greek writings recommended water treatment methods. Dating back 6,000 years such writings describe early water treatment as: "Impure water should be purified by being boiled over a fire, or heated in the sun or by dipping a heated iron into it and then allowed to cool, or it may be purified by filtration through sand and coarse gravel." The Susruta Sanhita, Sanskrit writings about medical concerns, dates from approximately 2000 B.C. and offers evidence of water treatment (*Kathy,2006).* Paintings on Egyptian tombs dating to 1500 B.C. showed men filtering water using wick siphons. Egyptians at this time also reported to have used the chemical alum to assist in settling particles and improve the clarity of water. The Egyptians repeatedly used the chemicals like alum and differs from variety of clays, bauxite or alum from alunite known today potassium alum ($K_2SO_4.Al_2(SO_4)_3.24H_2O$), Sodium alum($Na_2SO_4.Al_2(SO_4)_3.24H_{20}$), Chrome alum

*Received June 11, 2014 * Published August 2, 2014 * www.ijset.net*

($K_2SO_4.Cr_2$ $(SO_4)_3.24H_2O$), Ammonium alum ($NH_4Al(SO_4)$. $12H_2O$).These coagulants are still used nowadays. *(Bharthi,2000).*

As far as water purification methods are concerned those involving naturally occurring substances such as mixtures of herbs including Amla and Vetiver were used. These herbs were introduced in water in wells for purification purposes. Other methods used for water purification, based on herbs and naturally occurring products and materials are Nirmali seeds, rhizomes of algae's, roots of water lily and different types of stones such as quartz crystals, garnet and peals.

Among all the plant materials that have been tested over the years, powder processed from the seeds from *Moringa oleifera* has been shown to be one of the most effective as a primary coagulant for water treatment and can be compared to that of alum (conventional chemical coagulant) (Madsen et al., 1987; Oslen, 1987; Postnote, 2007).

For disinfection purpose, boiling was considered to be the best method followed by exposure of water to sunlight or introduction of water in iron and copper pots. It is well known that copper interferes with the life cycle of bacteria *(Saeki et.at.2002.)* In fact the use of brass container to store the water was already a common practice in ancient Indian civilisation. By 2000 B.C., the people of India were filtering water through charcoal and preserving it in copper pots.

During the 1700s, filtration was established as an effective means of removing particles from water. From these modest beginnings the thought for better, safer, and more plentiful drinking water was evolved. But the transition from an individual household water purification to community level took many centuries. In 1685, a physician from Italy, Luc Antonio Porzio, published the first known illustration of sand filters, and by the mid-1700s, Frenchman Joseph Amy was granted a patent for a filtration system using sponges. Architect James Peacock was granted the first British patent in 1791 when he described a water filter using carefully placed graded layers of sand and gravel.

Paisley, Scotland is well-known as the first city to receive filtered water for an entire town. The Paisley filter began operation in 1804 and was an early type of slow sand filter. Throughout the 1800s, hundreds of slow sand filters were constructed in the UK and on the European continent. An intermittent slow sand filter was constructed and operated at Lawrence, Massachusetts in 1893 due to continuing typhoid fever epidemics caused by sewage contamination of the water supply (Baker, 1981).

In 1799, Philadelphia, Pennsylvania, was the first U.S. city to build a public water system that distributed water through a system of pipes. Richmond, Virginia, on the James River, was the first town in the United States to build a centralized water treatment facility using sand and gravel filters in 1832.The first modern mechanical filtration plant in the U.S. was built at Little Falls, New Jersey for the East Jersey Water Company (Fuller, 1902). In 1924, John R. Baylis developed a fixed grid backwash assist system which consisted of pipes with nozzles that injected jets of water into the filter material during expansion. (Baylis, 1959).

During the late nineteenth and early twentieth centuries, scientists discovered that turbidity was not only the reason of water contamination but the actual reason was the particulate matter such as faecal matter, could harbour many pathogens. Therefore, the design of most drinking water treatment systems built during the early 1900s was driven by the need to reduce turbidity.

While filtration was a fairly effective treatment method for reducing turbidity, disinfectants like chlorine that played the largest role in reducing the number of waterborne disease outbreaks in the early 1900s. In 1908, chlorine was used for the first time as a primary disinfectant of drinking water in Jersey City, New Jersey. The use of other disinfectants such as ozone also began in Europe around this time. *(EPA, 2000)*

In the 1970s and 1980s, improvements were made in membrane development for reverse osmosis filtration and other treatment techniques such as ozonation. Some treatment advancements have been driven by the discovery of chlorine-resistant pathogens in drinking water that can cause illnesses like hepatitis, gastroenteritis, legionnaire's disease and cryptosporidiosis. Other advancements resulted from the need to remove more and more chemicals found in sources of drinking water.

Today, a variety of methods are used for household level water purification like coagulation, flocculation, sedimentation, filtration, membrane filtration, Reverse Osmosis, Nano Filtration, Adsorption, Ion Exchange, Disinfection, etc. World Health Organization now endorses effective household water treatment as a means of achieving the health gains associated with safe drinking water to those not yet served by reliable piped-in water.

References

[1] Baker, M. N. (1948.), The Quest for Pure Water, American Water Works Association, New York,

[2] Baylis, John R. (1959). "Review of Filter Bed Design and Methods of Washing." Journal AWWA. 51:11 1433-54.

[3] Bharthi N.C., The physics Indian Heritage of Science and Technology, Bhara (publisher), New Delhi , India 2000

[4] Bromehead, C.E.N. (1942), The Early History of Water Supply, Geographical Journal 99,142-51.

[5] EPA, "The History of Drinking Water Treatment", United States Environmental Protection Agency-Office of Water Feb. 2000

[6] Fuller, George W. (1902). "The Filtration Works of the East Jersey Water Company, at Little Falls, New Jersey." *Transactions of the ASCE.* 29 (February)): 153-202.

[7] Kathy Jesperson ,Search for Clean Water Continues, National Environmental Services Center, 2006.

[8] Malmberg Torsten (1942), Water, Rhythm and Territoriality, 66 The Early History of Water Supply, 99 Geographical J. 142, 142 (March 1942).

[9] Torsten Malmberg, Water, Rhythm and Territoriality, 66 Geografiska Annaler. Series B, Human Geography 73, 76 (1984); Andrew Sherratt, Water, Sail and Seasonality in Early Cereal Cultivation, 11 WORLD ARCHAELOGY 313, 314 (Feb. 1980)

[10] Madsen M, Schlundt J, and Olmer EF (1987). Effect of water coagulation by seeds of *Moringa oleifera* on bacterial concentration. J. Trop. Med. Hygiene. 90(3):101-109.

[11] Olsen A (1987). Low technology water purification by bentonite clay and *Moringa oleifera* seeds flocculation as performed in sudanese village: effects of *Schistosoma Mansoni cericariae*. Water Res. 21: 81-92.

[12] Postnote (2007) Access to water in developing countries. No.178 Internet: www.parliament.uk/post/pn178pdf accessed on 24th October, 2007.