

ECOLOGICAL PURIFICATION SYSTEM MODIFICATION OF SLOW SAND FILTER

A dissertation submitted to the

Faculty of Science & Technology

Uva Wellassa University

In partial fulfilment of the requirements for the award of the

Degree of Bachelor of Technology

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2012

ABSTRACT

Unsafe drinking water is a major cause of water-related diseases that predominantly affect people living in developing countries. Today there are many technologies available to treat unsafe water; however, most of these are suited for use with low turbidity source water. The treatment of high turbidity water (>40 NTU) is a challenge that was investigated in this research.

Slow sand filtration process is an established rural area water treatment, technology widely used in developing countries to treat low turbidity drinking water. This research investigates modifications to the ecological slow sand filter design to color and turbidity reduction in high turbidity water. During field tests conducted at Doluwa, in Kandy. A modified ecological slow sand filter with 1mm grain size sand layer for added filtration and gave condition to grow filamentous algae on top of the sand bed and reduce supernatant water level till half of present water level; achieved the greatest color and turbidity removals, according to these condition. Because of larger grain size (1mm) sand used for filter media, then suspended material was not mostly deposited on top of the sand bed in ecological slow sand filter.

The field tests, during April 2012, showed the Ecological slow sand filter was capable of reducing water turbidity by 85%, and color by 90% on average than unmodified slow sand filter. Average filtration rate, before algal mat was growth on top of the sand bed; $0.4014 \text{ m}^3 \text{ hr}^{-1} \text{ m}^{-2}$. After algal mat was growth on the top of the sand bed; the average filtration rate was $0.4007 \text{ m}^3 \text{ hr}^{-1} \text{ m}^{-2}$. So optimize filtration rate was $4007 \text{ m}^3 \text{ hr}^{-1} \text{ m}^{-2}$.

The filamentous algae was mainly affected to reduce color and turbidity in water. Modification of ecological slow sand filter in Doluwa, spirogyra was the dominant algae type growth on the top of the sand bed. During photosynthesis process, air bubbles were released by the algae from top of the sand bed. Therefore suspended material was attached with air bubbles and come to the supernatant water. Those suspended material was floated on the supernatant water. Scum was used to remove those suspended material from the ecological filter. So suspended material was not containing on the top of the sand bed.