

The Dependency of the Solar Based Disinfection on the Microbial Quality of the Source Water

Authors : M. T. Amina, A. A. Alazba, U. Manzoor

Abstract : Solar disinfection (SODIS) is a viable method for household water treatment and is recommended by the World Health Organization as cost effective approach that can be used without special skills. The efficiency of both SODIS and solar collector disinfection (SOCODIS) system was evaluated using four different sources of water including stored rainwater, storm water, ground water and treated sewage. Samples with naturally occurring microorganisms were exposed to sunlight for about 8-9 hours in 2-L polyethylene terephthalate bottles under similar experimental conditions. Total coliform (TC), Escherichia coli (E. coli) and heterotrophic plate counts (HPC) were used as microbial water quality indicators for evaluating the disinfection efficiency at different sunlight intensities categorized as weak, mild and strong weathers. Heterotrophic bacteria showed lower inactivation rates compared to E. coli and TC in both SODIS and SOCODIS system. The SOCODIS system at strong weather was the strongest disinfection system in this study and the complete inactivation of HPC was observed after 8-9 hours of exposure with SODIS being ineffective for HPC. At moderate weathers, however, the SOCODIS system did not show complete inactivation of HPC due to very high concentrations (up to 5×10^7 CFU/ml) in both storm water and treated sewage. SODIS even remained ineffective for the complete inactivation of E. coli due to its high concentrations of about 2.5×10^5 in treated sewage compared with other waters even after 8-9 hours of exposure. At weak weather, SODIS was not effective at all while SOCODIS system, though incomplete, showed good disinfection efficiency except for HPC and to some extent for high E. coli concentrations in storm water. Largest reduction of >5 log occurred for TC when used stored rainwater even after 6 hours of exposure in the case of SOCODIS system at strong weather. The lowest E. coli and HPC reduction of ~ 2 log was observed in SODIS system at weak weather. Further tests with varying pH and turbidity are required to understand the effects of reaction parameters that could be a step forward towards maximizing the disinfection efficiency of such systems for the complete inactivation of naturally occurring E. coli or HPC at moderate or even at weak weathers.

Keywords : efficiency, microbial, SODIS, SOCODIS, weathers

Conference Title : ICSWRM 2014 : International Conference on Sustainable Water Resources Management

Conference Location : Melbourne, Australia

Conference Dates : December 11-12, 2014