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Biofiltration with *Cyperus alternifolus* for nutrient removal and water reuse in suburban areas

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Biofilter, which capitalizes on the principle of constructed wetland in pollutant removal, reduce the concentration of pollutant in wastewater passing through by a combination of physiochemical processes and biological processes. Apart from physical adsorption, sedimentation and filtration occurred on the supporting media; biofilms are developed on the supporting media in biofilter and are responsible for the nutrient removal processes. A biofilm forms when multilayers of bacteria, algae and fungi plus microfauna embedded in a polymer matrix develop at a surface or as mobile biofilms or aggregates. Aggregates of microorganisms grow at a solid-liquid interface, the support materials of biofilms are packed in the reactor in which the metabolic processes are supposed to take place. Besides, plants in wetland system also contribute to the overall pollutant removal function, though the proportion of pollutant removals (N & P) by plant uptake and harvesting was just around 10-15%. Vegetations in wetland system serves to leak oxygen to the root zone, provide substrate for microbes, act as natural filter for suspended solid, alter the hydraulic retention time and take up nutrients such as nitrogen & phosphorus. The plant roots and the substrates in biofilter systems provide a large surface area, which would certainly encourage the development of biofilm at the surface-water interface. By introducing plants into biofilter system, on one hand can enhance pollutant removal efficiency and on the other hand can also reduce maintenance and increases the life of the filter. Sequencing batch technology, which commonly used in activated sludge treatment system, has proven to be a viable alternative to continuous-flow systems in carbon and nutrient removal from domestic and industrial wastewaters. The wastewater is filled into and drawn away from the system alternatively and hence resulting "wet" and "dry" conditions in sequential pattern. The intermittent pulse feeding sometimes is called as tidal flow feeding, has been adopted in the vertical flow bed system to maintain adequate aeration and avoid clogging. The pollutant removal processes in the filter bed are also diversified in tidal flow reactor with regular changes of system environment. For instance, co-current nitrification and denitrification can be achieved within the time frame of one cycle through simple adjustment of aeration density. Miller and Wolf (1975) have also shown that nutrient adsorption capacity of vertical filter bed can be regenerated if the system is allowed to rest and dry regularly during the operation. In this study, a lab-scale vertical flow cinder bed was set up to treat domestic wastewater. Cyperus *alternifolius was* planted into the three of the six biofilter column beds operating with alternative changes of wet and dry periods. Three operating modes (tidal flow patterns) with different durations of wet and dry periods were investigated for their performances of pollutant removals, including biochemical oxygen demand (BOD5), chemical oxygen demand (COD), ammonia (NH3-N), nitrate (NO3 -), total phosphorous (TP) and total suspended solids (TSS).

Biography

Yiu Fai Tsang is currently an Assistant Professor in the Department of Science and Environmental Studies at the Hong Kong Institute of Education (HKIEd). He has received his PhD from the Hong Kong Polytechnic University (PolyU). He has further worked as a Visiting Scholar in the Department of Agricultural and Biological Engineering at the University of Illinois at Urbana-Champaign (UIUC). Prior to joining HKIEd, he was a Research Fellow in the Department of Civil and Environmental Engineering at PolyU. In addition, he is the Program Leader of Master of Social Sciences in Community Education for Environmental Management.

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