Operation of the vertical subsurface flow and partly submersed stormwater wetland with an intermittent recycle

Yaoping Chen\textsuperscript{a,c}, Heidi B. Guerra\textsuperscript{a}, Kyung Sok Min\textsuperscript{b}, Youngchul Kim\textsuperscript{a,*}

\textsuperscript{a}Department of Environment Engineering, Hanseo University, Seosan City, Chungnam, 356-706, Korea
Tel. +82 41 660 1432; Fax: +82 41 660 1440; email: ykim@hanseo.ac.kr
\textsuperscript{b}Department of Environment Engineering, Kyungpook National University, Daegu, Korea
\textsuperscript{c}School of Earth and Environment Science, Anhui University of Science and Technology, China

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\textbf{ABSTRACT}

In this study, a vertical subsurface flow (VSF) stormwater wetland having a partially submersed zone in the bottom was operated for 90 d. This wetland is designed to recycle the effluent on the basis of designated antecedent dry days (ADDs). A total of four groups of bench-scale VSF wetlands filled with different media such as woodchip, pot gravel, synthetic fiber and volcanic stone were made. Each group of wetlands having the same media was operated with different recycle scheme. Operational results show that at the beginning of the wetland operation for about 30 d, there was a maturation or acclimation phase as usually observed in a filter and biofilm process. After the acclimation phase, the wetland displayed stable functions. Regardless of the media and operational mode employed, all groups of wetland were found to be able to reduce 70\% of TSS in the stormwater. For nutrients removal, different medium showed different performances. Woodchip was most effective for TN removal (more than 25\%), while it is the poorest in the removal of organic matters due to the release from the medium by itself. Pot gravel, synthetic fiber and volcanic stone showed similar performances in organics removal (more than 72\% for Total COD). Synthetic fiber was poor in ammonia removal in the beginning of operation because it was probably dissolved from the fiber (Nylon and Amine synthetics). Pot gravel and synthetic fiber showed a better performance on the removal of TP (more than 64\%) than woodchip and volcanic stone. Volcanic stone released a significant amount of phosphorus during the operation. The effect of recycling on the pollutants removal was also analyzed. Generally, the recycling frequency turned out to have no significant effect on the biodegradation of organic matters and biological nitrogen removal, which is considered to be due to the fact that the stormwater contains some toxic substances that inhibit microbial growth.

\textbf{Keywords}: Dry days; Recycle; Stormwater runoff; Vertical subsurface flow; Wetland; Media

\textsuperscript{*}Corresponding author.

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