

Analysis on characteristics of SS, N, and P reduction in soil and RBS: Bench scale test

Sangjoon Chung^{a,c}, Isong Choi^b, Jongmin Oh^{b*}, Hongkyu Ahn^a, Hyoseop Woo^a,
Younkyoo Choung^c

^aWater Resources & Environment Research Department, Korea Institute of Construction Technology,
1190 Simindae-Ro, Ilsanseo-Gu, Goyang-Si, Gyeonggi-Do, 411-712, Republic of Korea

^bDepartment of Environmental Science and Engineering, Kyunghee University,
Seocheon-Dong, Giheung-Gu, Yongin-Si, Gyeonggi-Do, 446-701, Republic of Korea
Tel. +82 (31) 201-2125; Fax +82 (31) 203-4589; email: jmoh@khu.ac.kr

^cDepartment of Civil & Environmental Engineering, Yonsei University, Seoul, 120-749, Republic of Korea

Received 31 May 2011; Accepted 12 June 2011

ABSTRACT

This study quantitatively identified the reduction characteristics and tendency of pollutants without any indoor external disturbance through the manufacturing of RBS (or VFS), which is recognized as one of the main methods to reduce the environmentally-friendly, sustainable non-point pollutants, with a bench scale. With this intention, two kinds of experiments were conducted using the grass soil unit assuming the RBS (or VFS) and the unit is composed of only soil as a contrastive group. The pollutants including SS, T-N, NH_4^+ , NO_3^- , T-P and PO_4^- were targeted and their concentration was thus artificially controlled. Through the first 60-min short-term experiment, the outflow forms from the unit, that is, the reduction characteristics of the pollutants according to the surface runoff, intermediate runoff and subsurface runoff, were identified. Through the second long-term experiment, several test conditions conducted in the first experiment were conducted for 720 min and the results were then analyzed in comparison with the results of the first experiment. According to the experiment results, the grass-covered RBS showed a higher pollutant reduction efficiency than the bare soil in short-term runoff. In the case of surface runoff, especially, the reduction efficiency of SS and NH_4^+ was higher by 1.8 times respectively in grass soil than soil. The average reduction efficiency of SS, T-N and T-P in long-term surface runoff showed -8, 2 and 0% respectively in soil unit and 19, 7, and 4% respectively in the grass-soil unit: the reduction efficiency of SS decreased a lot in comparison to the case of short-term runoff while the efficiency of T-N and T-P did not show any significant change. In addition, even though the reduction efficiency of the non-point pollutants of RBS was high, it was difficult to numerically generalize the effect. Especially, the change tendency of SS was nearly linear in the short-term runoff but not linear in the long-term runoff: the severe undulation was clearly shown. On the other hand, T-P and PPO_4^- showed the drastically increased reduction efficiency in the beginning of the runoff in the subsurface and then the situation was continued for a long time duration, so it was identified relatively easily compared to SS. The experiments were conducted as a bench scale under the consistent experiment conditions, so the results could be changed in the real field, and the more experiment results need to be accumulated through the consideration of the various parameters in order to generalize the actual reduction efficiency of RBS (or VFS).

Keywords: RBS; VFS; Bench scale; Soil; Grass; SS; T-N; NH_4^+ ; NO_3^- ; T-P; PO_4^-

* Corresponding author.