

Investigation of Flow Distribution on Retention Time and Hydraulic Behavior of a Horizontal Subsurface Flow Constructed Wetland (Case Study: Isfahan)

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Abstract

In addition to kinematic description of biological reaction, flow pattern plays an important role in designing constructed wetlands. This study investigates the effects of flow distribution on constructed sub-surface horizontal flow wetland with a length of 26 m, width of 4 m and 1% bed slope in order to understand internal hydraulic functioning patterns. Inlet configuration is selected as a variable parameter. Three different cases of inlet and outlet configurations were 1) midpoint, 2) corner, and 3) uniform. Outlet has been fixed in all configurations. Uranine tracer was used to determine the influences of flow distribution by drawing hydraulic retention time curve in different cases. Results showed that mean residence times for each configuration were equal to 4.53, 3.24 and 4.65 days, respectively. Retention time distribution curve provided conditions, not only for showing dispersion patterns throughout system but also for interpreting hydraulic parameters like hydraulic efficiency and effective volume. According to the retention time curve, effective volume was 87.5% in configurations 1 and 3, and 62.1% in configuration 2 following numerous short-circuiting ratios. Finally, the best configuration of inlet-outlet layout to improve the performance of effluent treatment and use the geometry effectively was found to be the uniform-midpoint based on physical experiments followed by midpoint-midpoint as the second best.

Keywords: Hydraulic parameters, Short-circuiting paths, Tracer, Retention time.

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