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Particle removal properties of stormwater runoff with a lab-scale vortex separator

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ABSTRACT

A lab-scale vortex separator, based on a swirling motion to remove settleable particles, was used to remove suspended solids in urban stormwater runoff. However, the treatment is limited to the removal of large settleable particles. The synthesized stormwater runoff was made with tap water and the addition of road sediment. The vortex separator has internal components designed to enhance vortex separation by minimizing the turbulence, increasing the efficiency, and preventing captured pollutants from washout. As the flow continues to spiral down around the inlet baffle, a low energy vortex motion directs settleable particles into the protected sediment storage zone. Advanced vortex separation provided an extendable and stabilized flow path while protecting the captured pollutants for a wide range of flow rates. The range of the inflow rate was 30–115 l/m, and the size of the influent particles varied from 75 to 200 μm. Overall removal efficiencies of 51.8% for SS, 26.6% for COD, 70.5% for TP, and 35.6% for TN were achieved. The efficiency of particle removal for a high inflow rate was better than for a low inflow rate under the same condition of influent particles. The particle removal efficiency of the inlet baffle improved by about 5–10% compared to without an inlet baffle.

Keywords: Stormwater; Runoff; Separation; Particle removal; Vortex; Baffle

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