Royal ENVIRONMENTAL SYSTEMS, Inc.
A Division of Royal Enterprises America

ecoStorm plus
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Remove solid and dissolved phosphorus using ecoStorm® plus

Stormwater runoff from urban and rural pervious and impervious surfaces carries many pollutants, including suspended sediments, heavy metals, and phosphorous. Non-point source phosphorus loading has been linked with deteriorating surface water quality. This phosphorus-laden runoff contributes to weed growth and to the blooming of blue-green algae in lakes and streams.

Several studies have shown that in general, metal and phosphorus attachment to sediment increases with a decreasing sediment particle size, since a smaller sediment particle has a greater surface area per weight relative to a larger sediment particle. Previous studies have generated sorption isotherms indicating that as phosphorus concentration in solution increases, sorption increases. Likewise, the concentration of the sorption increases with a decreasing particle size. Because phosphates attach themselves to soil particles, areas that produce high sediment loads – such as construction sites, fertilized fields, and sandy areas – tend to produce high phosphorus loads in their runoff. Orthophosphates in vehicle exhaust and decaying organics (leaves and grass clippings) also tend to have high phosphorus concentrations.

The ecoStorm® plus Stormwater Filtration System removes both solid particles and dissolved substances containing phosphorus and other pollutants. The ecoStorm plus filter is unique in its ability to combine physical and chemical processes, including **sedimentation**, **adsorption** and **precipitation**.

How ecoStorm plus works

In the process of adsorption, porous concrete surfaces adsorb soluble phosphorus and pollutants such as dissolved heavy metals. The filter buffers the pH of the stormwater, which is typically acidic, hence promoting precipitation and the accumulation of dissolved pollutants. The filter allows water to seep slowly through the porous concrete media, providing a greater opportunity for interaction between the water and the alkaline composition of the filter. Thus, a chemical transformation occurs and the particles become an insoluble compound, promoting precipitation into the sediment sump, retaining the sediment until maintenance is performed.

Why ecoStorm plus is the best choice

High total phosphorous removal efficiency: Testing has shown typical dissolved phosphorous removal efficiency in the 60% range. For best phosphate removal, a flow rate of approximately 1/10 the nominal – or approximately 40 gpm in a 60” diameter structure – must be utilized. For a typical stormwater runoff application, phosphates are discharged to the system at very low flow rates, providing sufficient time to achieve this efficiency. A drop in efficiency may occur with continuous flows. To maintain the optimum efficiency, a 12-hour regeneration period is required every 24 hours along with proper filter maintenance.

High retention of captured pollutants: Unlike the process followed by the ecoStorm plus, removal processes based only on adsorption will eventually cause higher pollutant concentrations if the media is not maintained properly. Small particles show a good adsorption rate of dissolved phosphates due to a high surface area, relative to a larger particle by weight. However, it is a general misconception that by simply trapping fine sediments, a system will permanently show consistent removal efficiency for phosphorus. The adsorption process is reversible, and if the media containing the trapped pollutant is not maintained properly, the media will eventually cause a higher pollutant concentration to be discharged. Thus, within a few storm events, phosphates previously adsorbed will be discharged again, causing a higher effluent than influent concentration.

Extensive field testing is ongoing, but initial phosphorus removal data indicates that ecoStorm plus filters remove phosphates more efficiently than zeoliths and are comparable to expensive filter material designed especially for phosphorus removal, such as GEH and Ferrosorp. Having precipitation as an integral component of the ecoStorm plus system reduces phosphorus discharge, thus extending the filter's life expectancy.