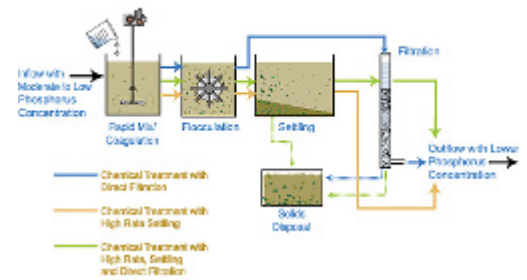


Chemical Treatment Followed by Solids Separation



Chemical Treatment / Solids Separation

The Chemical Treatment-Solids Separation (CT-SS) methodology uses chemical coagulation (rapid mixing) and flocculation (slow mixing) to precipitate dissolved phosphorus and other contaminants from stormwater. Precipitated floc particles settle readily, removing the phosphorus and other harmful contaminants. The CT-SS technology offers the advantages of low land requirements, operational flexibility, reliability, and the ability to reduce



Total Phosphorus levels substantially lower than can be achieved using other technologies. High capital, operations and maintenance costs as well as solids management and disposal are considered to be the technology's biggest drawbacks.

CTSS Flocculation Tanks

The chemical process uses metal (iron and aluminum) salts routinely used in municipal water treatment facilities. The phosphorus is converted to aluminum phosphate in the presence of alum, and to iron phosphate with ferric chloride addition. Once these compounds are formed, polymers are added to enhance flocculation and settling through a "bridging effect". Long polymer molecules provide bridges, linking the precipitated phosphorus to form longer flocs. Anionic polymers have been shown to be very effective in aiding primary settling when used in conjunction with iron and aluminum metal salts and several were evaluated for demonstration. A residual management program to evaluate dewatering and disposing of the settled flocs or solids focused on the by-product reuse offsite, onsite precipitation recovery/reuse, as well as onsite and/or offsite landfill and applications to agricultural lands.

The demonstration project conducted by the District evaluated the feasibility of using chemical coagulation and flocculation coupled with solids separation techniques (direct filtration, high rate-sedimentation, dissolved air floatation, and microfiltration) to remove TP from agricultural stormwater runoff (post-BMP water) and STA discharge (post-STA water).

CT-SS pilot trailers rated for up to 12 gpm were operated for 25 consecutive days at optimum operating conditions treating post-BMP waters ranging from 100 to 300 ppb of TP, and post-STA waters ranging from 15 to 40 ppb of TP.

Results

The District has conducted pilot-scale demonstrations of chemical treatment followed by direct filtration, high rate sedimentation, dissolved air floatation, and microfiltration solids separation. The CT-SS demonstration project revealed that the target phosphorus concentration of 10 ppb could be reached without filtration. This eliminates the expense of costly filtration from both construction and annual operations and maintenance budgets. Dissolved floatation was also eliminated from further evaluation due to poor Phosphorus removal performance. Therefore, chemical treatment followed by high rate sedimentation using inclined plate clarification was selected for implementation during the Standard of Comparison demonstration phase of the project. Both Post BMP and Post STA demonstrations resulted in effluents below the target total phosphorus concentration of 10 ppb without adversely impacting ecosystems downstream. This technology also demonstrated the ability to remove 80-90% of mercury from the waters it treated. A [final report](#) for this demonstration project is now available.