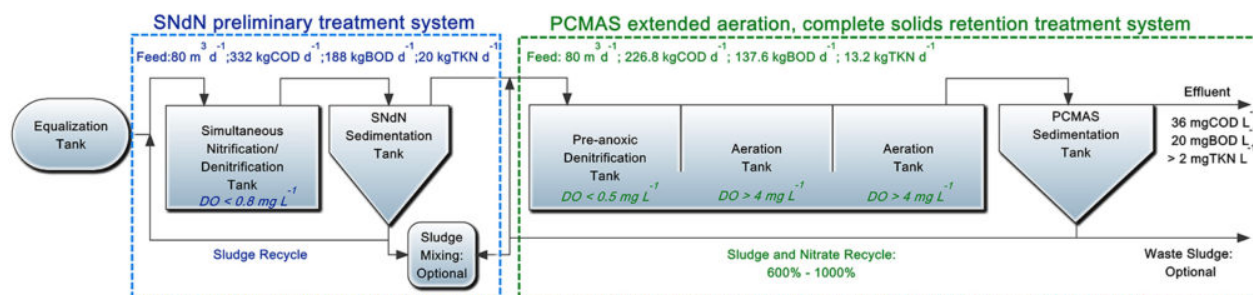


Complete solids retention activated sludge process

While biological treatment offers great treatment performance with relatively low cost, it also entails significant sludge production due to the growth of bacteria and the accumulation of inactive sludge (influent inert solids and cell debris from dead biomass). The excessive accumulation of sludge hinders sedimentation efficiency and can also create problems concerning mixing and aeration of a wastewater treatment plants' (WWTPs) bioreactors. Consequently, large quantities of accumulated sludge have to be disposed (waste sludge) frequently from a biological treatment plant, in order to maintain acceptable effluent quality. The disposal of waste sludge on landfills has been widely applied worldwide, but it may create undesired and negative environmental, economic and social impacts, such as soil and water pollution, increased treatment cost (more than 50% of construction and operational cost goes for sludge treatment) and threats on human health. Recently, the target of minimizing sludge production has intrigued scientists and engineers, as it can resolve the problem of sludge disposal at its source.



WWTP flowchart

One of the most promising approaches is the complete solids retention activated sludge process. The principal idea of this technology is the almost complete retention of sludge in the WWTP, resulting high biomass concentrations in the bioreactors and starvation conditions, i.e. low nutrients availability in comparison to the bacteria population. These conditions trigger biochemical and biological processes that minimize sludge production, such as bacteria decay/lysis, predation phenomena and the degradation of some of the considered unbiodegradable particulate organics (cell debris). Toward the goal of almost zero sludge production, based on CSRAS process, a reevaluation of WWTPs design and operation has to be performed. Key component for achieving complete solids retention is the enhancement of sedimentation tank. The geometrical characteristics of the sedimentation tank and the high sludge recycle rates that cause "forced sedimentation" of sludge, are those aspects that have to be reevaluated. Furthermore, efficient control of the WWTP has to be performed, concerning both sedimentation efficiency and treatment performance, based on state point analysis and on microscopic examination. State point analysis is a useful tool for determining WWTPs operational limits, while microscopic analysis provides the

insight for successful microbial manipulation, i.e. the selective cultivation of desired microbial species.

Amanatidou E., Samiotis G., Trikoilidou E., Pekridis G., Tsikritzis L
*Environmental Chemistry and Wastewater Treatment Lab.,
Environmental Engineering and Pollution Control Department,
Western Macedonia University of Applied Sciences, Koila, Kozani, Greece*

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