

ACTIVATED SLUDGE MONITORING IN A WASTEWATER TREATMENT PLANT USING IMAGE ANALYSIS AND PARTIAL LEAST SQUARES

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ABSTRACT

The wastewater treatment plant activated sludge is a complex ecosystem mainly of bacteria and protozoa. Bacteria agglomerate as settleable robust aggregates leading to low organic matter and turbidity final effluents. However, when the operating conditions are not perfect some malfunctions may occur leading to bulking problems. Classical methods to survey the bacteria aggregation and contents resided on manual counting which are, rather tiring, imprecise and time-consuming urging the development of faster automated image analysis methods. Therefore, the prime objective of this work resided on surveying the activated sludge filamentous bacteria and aggregates contents and morphology, and establish relationships between the biomass and some operating parameters by multivariable statistical techniques.

One of the main conclusions of this work resided on the determination of a filamentous, rather than a zooglycal, bulking problem in the course of this survey. This conclusion could be withdrawn by the strong resemblance between the sludge volume index and the filaments/aggregates contents ratio behaviour throughout the experiment time and by the high filamentous bacteria/suspended solids ratio (above 10000 mm/mg) which clearly indicates the existence of a filamentous bulking problem. Furthermore, an in-depth statistical analysis revealed that the filamentous bacteria/suspended solids ratio parameter may be used, at some extent, to monitor the SVI behaviour in a wastewater treatment plant aeration tank, whereas the suspended solids could be satisfactory monitored by the total aggregates area parameter.

However, these results refer only to a wastewater treatment plant experiencing a bulking phenomenon and further studies should be developed in normal plants.