



Applications of quantitative image analysis in wastewater treatment

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Quantitative image analysis (QIA) techniques gained an undeniable role in several fields of research during the last decade. In the field of wastewater treatment (WWT) processes, several computer applications were developed for the monitoring of microbial entities either individual cells, or several types of aggregates. New descriptors were defined that are more reliable, objective, and useful than the subjective and time-consuming parameters used classically to monitor the WWT biological processes. Examples of application include the objective prediction of filamentous bulking, known as one of the most problematical phenomenon occurring in activated sludge technology. It also demonstrated to be useful to classify protozoa and metazoa populations. In high rate anaerobic processes, based on granular sludge, it was possible to detect aggregation time and fragmentation phenomena during critical events, such as toxics and organic overloads. Currently, the major efforts on the development of QIA techniques in WWT technology are focused in its application coupled with coloured samples, obtained after staining and fluorescent techniques. Also, the use of quantitative morphological parameters in process control is being investigated. In fact, employ multivariate statistical analysis to data gathered by QIA during transient states of an anaerobic reactor determined a latent variable that encompasses a weighted sum of performance, physiological and morphological information. This new variable was highly sensitive to reactor efficiency deterioration, enclosing remarkable variation in the first hours of the disturbances. The high loadings raised by morphological parameters revealed that they should be considered to monitor and control load disturbances and toxic events in high rate anaerobic digesters.