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Monitoring activated sludge systems from wastewater treatment plants: automated image analysis procedures and their relation with operating parameters

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The activated sludge system is a biological process increasingly used in wastewater treatment plants. It is known that the activated sludge process efficiency is dependent on the aggregates physical properties, as well as on an adequate balance between the different types of bacteria in order to ensure good settling sludges. Furthermore, the biomass visualisation and inspection under an optical microscope coupled to automated image analysis methodologies is evermore used. That is so because this powerful tool can be used to identify and quantify biomass morphology and physiology changes and also their interactions with operational conditions. In this work, an image analysis programme was developed in *Matlab* environment, allowing the identification and morphological characterisation of microbial aggregates and filaments in three different wastewater treatment plants. Both aggregates and filaments contents were determined as well as Euclidian geometry parameters and the collected data was organized into three aggregates size classes. The developed image analysis methodology provided for a continuous monitoring of the activated sludge contents and aggregates morphology. Furthermore, the obtained results allowed for the assessment of suspended solids contents and settleability properties such as the SVI and settling velocity.