

Study of activated sludge flocs by image analysis

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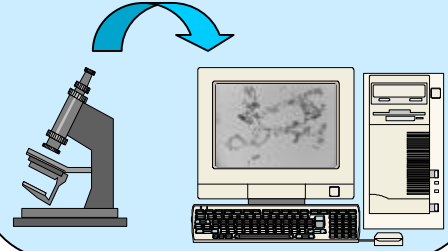
1 Introduction

The efficiency of the secondary clarifier is the key of the good functioning of a wastewater treatment plant. Filamentous bacteria, when in excess, cause the bulking and make the sludge difficult to settle: large amount of suspended solids are then discharged in the receiving body. However the visual monitoring by an operator is a tedious task.

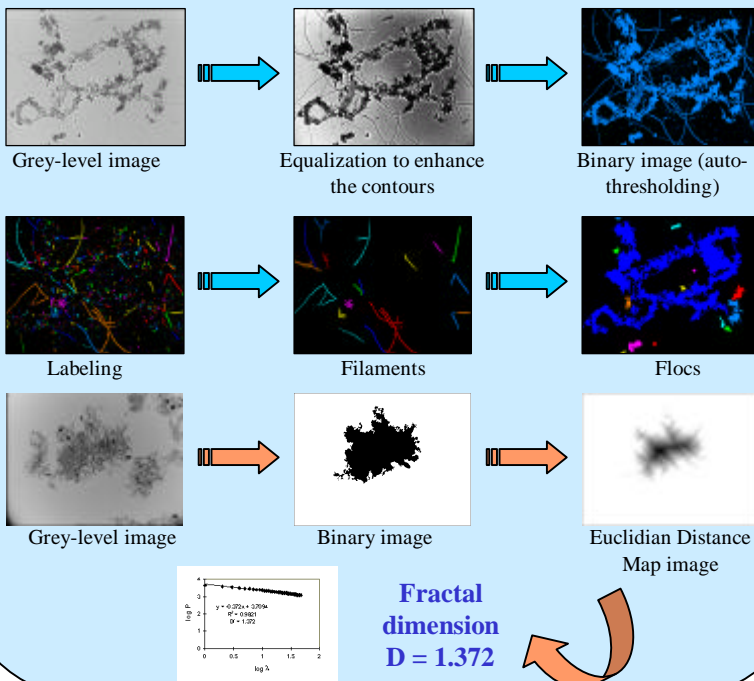
An automated procedure has been developed to study the sludge structure on images and to compare it with settleability properties. The image analysis routine provides information on the size and shape of the flocs and on the abundance of filaments.

2 Materials & Methods

The sludge is observed by optical microscopy. To grab the images, a video camera is connected to a PC. The program is developed in the VISILOG5 environment (Noésis, Les Ulis, F).



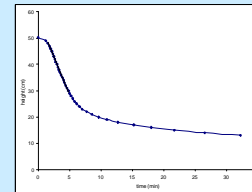
3 Automated Image Analysis



4 Parameters

In Settleability Tests

The initial settling velocity was measured, through the $h(t)$ curve (based in Kynch theory).



Exponential Model

$$v = k \cdot e^{-nC}$$

Power Model

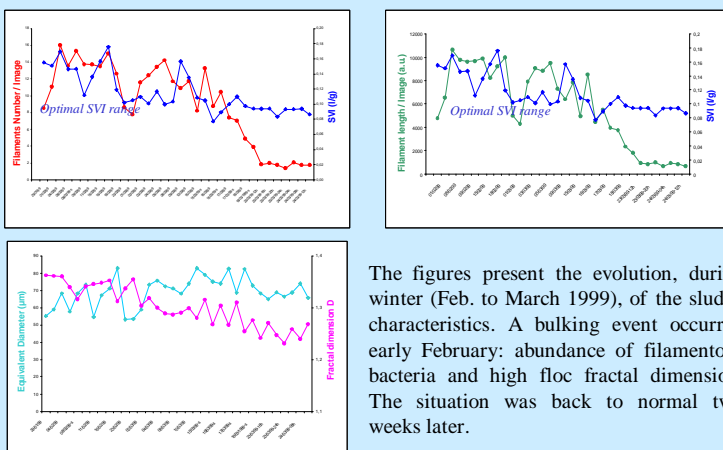
$$v = k \cdot C^{-n}$$

The **Sludge Volume Index (SVI)** and the factors n and K of each model have been calculated.

By Automated Image Analysis

Number and length of filaments, equivalent diameter, fractal dimension, circularity, elongation, etc.

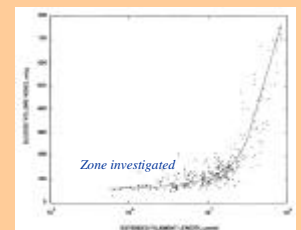
5 Results



6 Conclusions et Perspectives

An automated image analysis procedure has been developed to monitor the quality of activated sludge. This tool provides quickly important data on the abundance of filamentous bacteria and the shape of flocs.

A systematic study of the sludge quality can then be undertaken, on full scale plants as well as in lab-scale experiments, to widen the operational range.



From Palmer & Jenkins, 1980)

In parallel the automation of the determination of another important index for activated sludge quality, the **Sludge Biotic Index (SBI)**, based on the relative abundance of different species of protozoa, is going on.