Sludge Characterization by Image Analysis

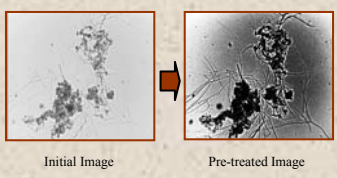
M. da Motta[1], A.L. Amaral[3], D. Ho[1], M.N. Pons[1], H. Vivier[1], N. Roche[2], E.C. Ferreira[3]

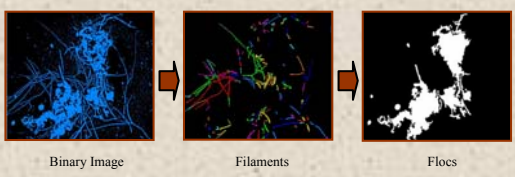
[1] INPL, ENSIC, LSGC, Groupe TASC, BP 451, F-54001 Nancy cedex, France
[2] IUT de Marseille, GCGP, Université de Marseille, BP 157, F-13388 Marseille, France
[3] Centro de Engenharia Biológica, IBQF, Univ. do Minho, Braga, Portugal

Filamentous Bacteria and Floc Analysis

The clarifier is an essential unit of biological wastewater treatment plants. It associates three functions: thickening for sludge recycle to the biological reactor, clarification of the effluent and sludge storage. The over-development of filamentous bacteria is one of the main problems associated with clarifiers around the world.

Floc-Morph v.1

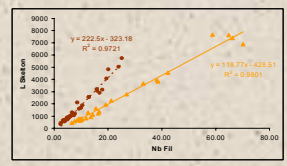


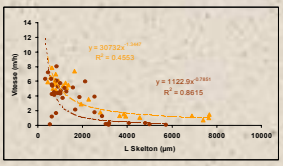


Pilot Plants

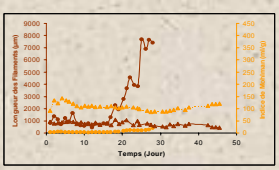
- **Reactors: Canal, Tank 35 liters**
- **Secondary Settling Tank 9 liters**

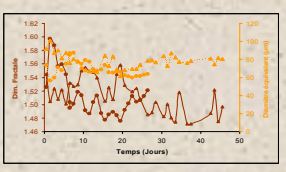
Inoculum Growth-Temperature Influence





Reactor Influence

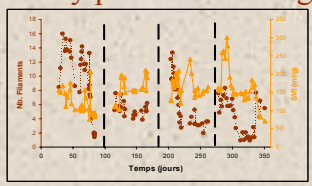




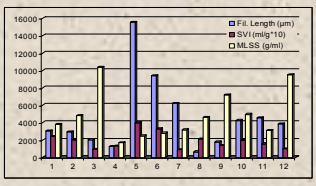
•Tank •Canal

Full Scale Plants

Nancy plant monitoring

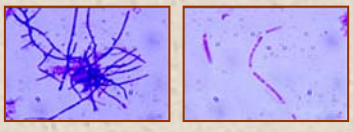


Others Plants



Gram Stain

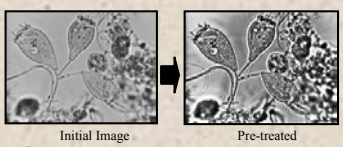
Positive Negative



Protozoa Identification

Protozoa are important micro-organisms taking part to the ecosystem balance in wastewater treatment plants. A procedure for their semi-automated identification and counting, based on image analysis is proposed. The main difficulty is the segmentation of the protozoa as most of them are in contact with the sludge. The protozoa are characterized by the size of their silhouette and shape factors.

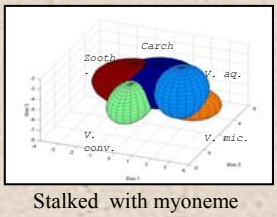
ProtoRec v.2



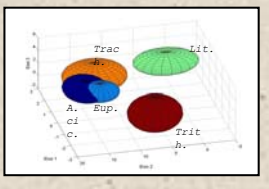
Some relations between protozoa and plant efficiency (Madoni, 1994)

Predominant group	Efficiency	Possible cause
Small flagellates	very low	Bad oxygenation of the sludge, too high loading, presence of fermenting substances
Small swimming ciliates (< 50 µm)	low	Contact time too short ; bad oxygenation of the sludge
Large swimming ciliates (> 50 µm)	low	Too high loading
Crawling ciliates	good	
Crawling + attached ciliates	good	
Attached ciliates	decreasing	Unsteady state (discontinuous feeding, sludge wastage)
Small amoebae (with and without flagellum)	very low	Too high loading, not easily biodegradable
Amoebae with shell	good	Low loading, diluted mixed liquor, good nitrification

AD - difference between groups



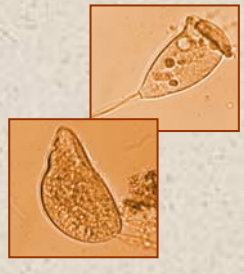
Stalked with myoneme



Stalked without myoneme

Recognition

Protozoan	Recognition quality	Recognition rate (%)	Treatment quality
crawling	good	81	
stalked favorable	good	77	+
Trithigmostoma	good	73	+
Litonotus	good	92	
Trachelophyllum	good	77	-
Epistylis	good	70	+
Opercularia	Reasonable	60	-
V. convallaria	very low	20	
V. microstoma	low	33	-



Acknowledgements :