Microscopy

AnoxKaldnes™ Services

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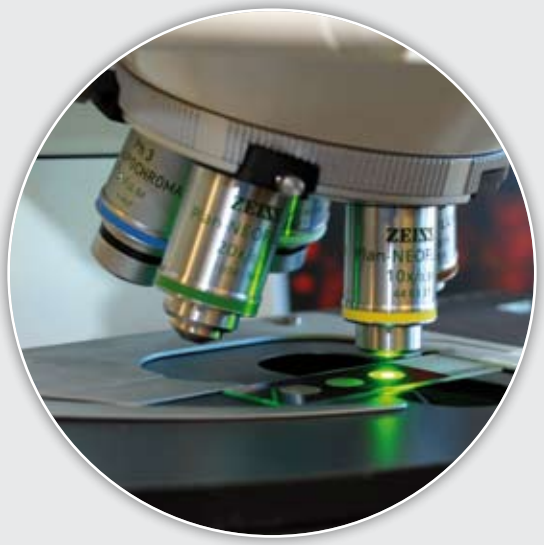


Microscopy protocol

Determination of:
Floc size
Floc shape
Floc/biofilm structure
Zoogloeal structures
Inorganic content

Assessment of the number of:
Filaments
Fungi
Free-living bacteria

Flagellates
Free-living ciliates
Stalked ciliates
Amoebas, naked
Amoebas, testate

Rotifers
Gastrotrichs
Nematodes
Other metazoans

Filament identification

FISH methodology

Powerful tool

The microscope is a powerful tool for monitoring and evaluation of biological wastewater treatment processes.

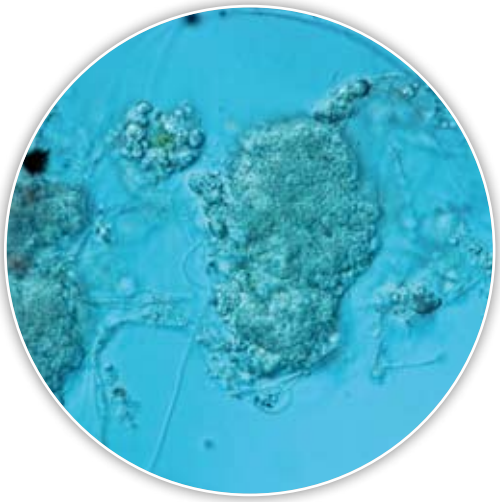
The microscopy protocol is a key diagnostic tool when AnoxKaldnes evaluate the performance of biological wastewater treatment processes in our bench scale testing.

The microscopy protocol is also used for routine monitoring and biological trouble-shooting in full-scale treatment plants. The cause for problems with solids separation, sludge bulking, low COD removal and other process failures may be found by performing a microscopy analysis.

For the trained eye, microscopy is an easy, fast and efficient way to evaluate a biological wastewater treatment process.

Flocs; An introduction

Sludge flocs are ideally 150-500 µm in diameter, having a compact structure. Such flocs usually result in a sludge volume index of 50-100 mg/L. Even lower indexes can be obtained (down to 10-15 mg/L) but such extremely compact flocs are often associated



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with some debris that doesn't stick to the flocs, causing a turbid supernatant. Filamentous bacteria are the most common cause for high indexes (sludge bulking). The most troublesome filaments in industrial and municipal treatment plants are *Sphaerotilus natans* and *Microthrix parvicella*, respectively.

Other floc structures causing separation problems are tiny, diffuse, weak or sprawled flocs that may be caused by e.g. extremely turbulent aeration, overload, short wastewater retention time, low dissolved oxygen concentration, detergents, very easily degradable organics or toxic chemicals in the influent.

Zoogloeal structures are slimy, extracellular polysaccharides (EPS) produced by bacteria when they are

nitrogen or phosphorous depleted. EPS may also be produced when bacteria are growing very fast and become limited by other factors.
Crystal clear effluents have low numbers of free-living bacteria. Turbidity is caused either by floating or small flocs or by high numbers of bacteria. In the latter case, too long retention time or low numbers of filter-feeding micro-animals may be the cause. Certain bacteria are indicators of malfunction in the process, for example the easily recognizable spirochaetes or the motile *Beggiatoa* that both are signs of oxygen depletion.

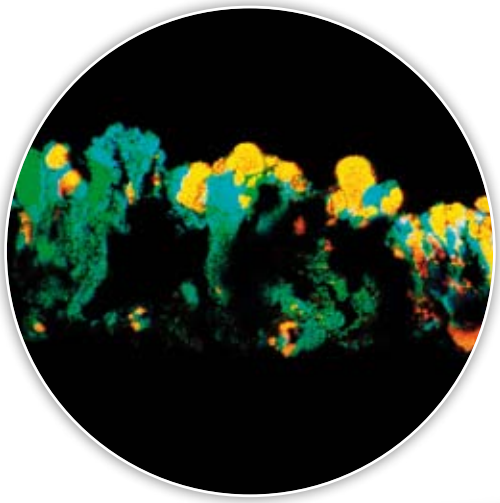
More than bacteria

Filter-feeding micro-animals are necessary to control the amount of free-living bacteria. The micro-fauna is more susceptible to toxic compounds, oxygen limitation and high temperatures than bacteria and if they die, the treatment process deteriorates.

Rotifers are the most efficient filter-feeders followed by stalked, colony-forming ciliates.

FISH

FISH (*Fluorescent In Situ Hybridization*) is a method where genetic probes are used to identify certain bacteria. The main use in biological wastewater treatment processes is to quantify the amount of nitrifying bacteria present, and to identify filamentous bacteria.



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