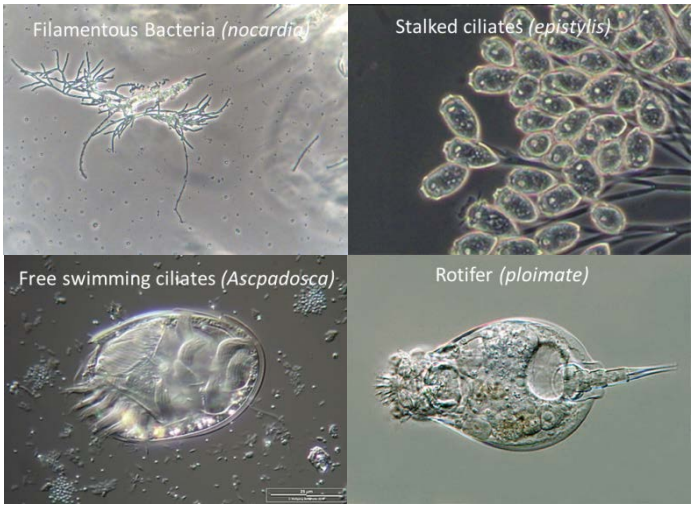
Practical Aeration Basin Control Methods

Industry: **Wastewater**
Product: **PH450G and DO402G**

Background Information

The core of the activated sludge process is primarily dependent on the control of the aeration basin. The most essential component of any activated sludge plant is the biomass, anaerobic and aerobic bacteria, that attaches themselves to the waste, and digest the waste resulting in relatively clean water as the by-product.

There are several types of bugs that are responsible for different duties. There are the carbon eaters (carbonaceous) and chemical eaters like ammonia (nitrogenous). Just like any other living organism they need certain conditions in order to sustain life and reproduce.



Introduction

Many components in a process must be in balance in order to obtain complete synergy; example biomass blends, air, return activated sludge (RAS), waste activated sludge (WAS) and throughput. The aeration basin is a holding and/or treatment pond that everything cycles through. It is essential to monitor and control several factors that can influence the efficiency of the biological conditions in the basin; for example:

Temperature: Normally the temperature will be between 10-40°C. Most biomass bugs achieve optimum efficiency in this range. Increasing or decreasing the temperature can result in the increasing or decreasing the rate at which the bugs eat and reproduce. Along with this all chemical reactions that are taking place at the same time are affected by the process temperature as well.

pH: For most systems the pH should be kept between 6.5 to 8.5 pH, when the pH is too high or too low, the biomass losses the ability to convert the food to energy and raw materials. A pH below 6.5 may cause the growth of fungi and fungal bulking, and will have to be adjusted using a caustic, lime or magnesium hydroxide.

Low Nutrients: If nitrogen and phosphorus are not presented in sufficient amount it can limit the growth rate of the biomass. A sign of nutrient deficiency includes foam on the aeration basin.

Dissolved Oxygen: DO is one of the most critical points of measurement; for most processes the target concentration will be between 1-3 mg/L. The concentration amount is an indication of the basin environment; whether it is in denitrification (excess nitrate, NO_3) or nitrification (excess ammonium, NH_4) environment. Essentially the DO measurement is set to a level to minimize the ammonium breakthrough. It is not uncommon to see NH_4 and DO measurements together.

The DO measurement should be maintained at the point of greatest oxygen demand in the system. Normally this is near the intake portion of the aeration basin, because when the process is in the secondary clarifier no oxygen is added and the biomass bugs are starved of oxygen. When the process is returned to the aeration basin via the RAS pumps the biomass is returned to an oxygen rich area and the bug consume vast amounts of oxygen right away.

Septicity/Toxicity: Septic wastes contain elevated amounts of sulfides and organic acids (such as acetic acid).Other organic materials and heavy metals are also toxic to the biomass, reducing their efficiency or even destroying them.

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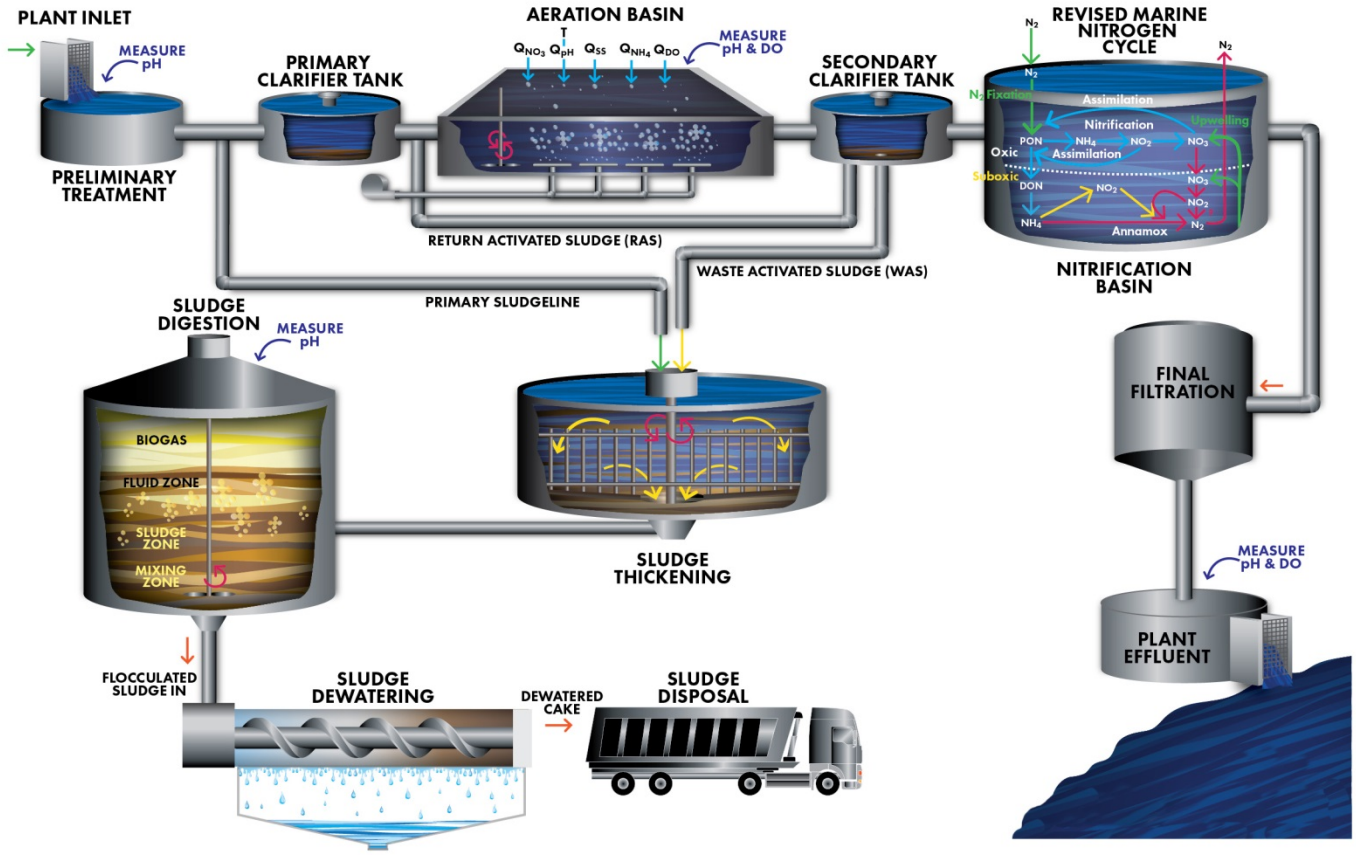

Summary

Having too much oxygen in the process is not a problem for the biological system; however the cost for generating the oxygen is one of the largest expenses. By obtaining a good representative average of the dissolved oxygen present in the basin could save the plant large amounts of money. For this reason multiple measurements points are sometimes put into place.

Product Recommendations

pH:

Transmitter:

FLXA202/FLXA21 two-wire pH transmitter (intrinsic safety)
PH450G four-wire pH transmitter (general purpose)

Sensors:

FU20/FU24 Four-in-one pH sensor

Holders: (for FU20 sensor)

PB30 Floating Ball, when using S200256L8 adapter

Dissolved Oxygen:

Transmitter:

FLXA202/FLXA21 two-wire DO transmitter (intrinsic safety)
DO402G four-wire DO transmitter (general purpose)

Option #1:

Sensors:

DO30G Galvanic Sensor

Holders:

PB30 Floating Ball
FD30 Immersion Fitting

Option #2:

Sensors:

DO70G Optical DO Sensor
Hamilton VisiFerm Optical DO Sensor

**Please note that an external 24 VDC power supply, like the Yokogawa DOX10, must be used with the sensor.*

Holders:

PB30 Floating Ball **Available as special**
FD40 Immersion with K1523JA adapter

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