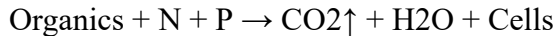


## Mechanisms by Which Microbe Lift Effects Sludge Reduction

---

A number of wastewater treatment plants using the Microbe Lift product have reported sludge reduction as one of the benefits. The explanation of how this is realized is complex and deals with issues of thermodynamics in cellular respiration and substrate utilization as a function of F/M ratios.

When any bacteria are grown on a substrate there are two potential paths for the carbon to take as indicated by the following equation:



According to this equation, some of the carbon goes off as carbon dioxide and some is assimilated into the cells because it is used in the synthesis of proteins and other building blocks of the cell. The amount that goes into each is partly determined by the cell maintenance energy required by the cell. In order to keep the cells intact by resisting entropy it is necessary to expend energy just like we have a certain caloric intake requirement to survive and maintain our current weight. If there is an excess of substrate the cell will produce additional biomass just like if we eat more than we need we will gain weight. How much new biomass is produced for the amount of organics matter utilized is referred to as the yield coefficient, Y.

The proportion of the carbon that goes into one of these processes vs. the other is determined by an F/M ratio but NOT the F/M ratio normally calculated for the system by dividing the lbs. of BOD coming into the system by the total lbs. of MLSS in the system. What is more important in determining sludge production is the equilibrium F/M ratio that is a function of the equilibrium concentration of organics in the mixed liquor.

And just what is the equilibrium concentration of organics in the mixed liquor? The equilibrium concentration of organics in the mixed liquor is based on the effluent concentration of organics, NOT the influent concentration. While this is the cause of consternation to many people it is important to remember that effluent is nothing more than mixed liquor with the solids settled out. When a cell exists in a food rich environment i.e. one with a higher equilibrium F/M ratio it has enough energy to satisfy its cell maintenance and excess energy with which to synthesize new cellular materials.

This is further supported by Monod kinetics, which correlate growth rate with substrate concentration. All Monod profiles demonstrate that at higher substrate concentrations the growth rate is higher until a point is reached where the growth rate is rate limited vs. concentration limited.

Since it is common for plants using Microbe Lift to lower their effluent BOD values it is also lowering the equilibrium F/M ratio, often times with equivalent or less solids concentrations. This puts the level of energy closer to that required for cell maintenance and leaves less for new cell synthesis resulting in a lower yield coefficient for system applying Microbe Lift.