

### OTHERS :

Deposit control

Biocide

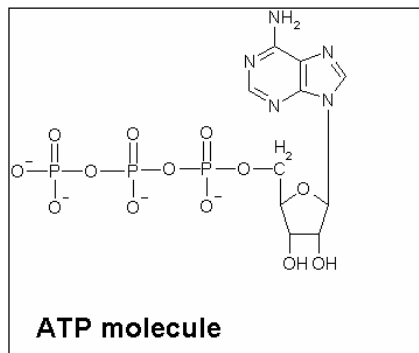
Deinking  
Chemical

Defoamer

Formation Aids

Felt & Wire  
Conditioning

Microbiological treatment in wastewater is an inseparable component of WWTP of paper mills. Both soluble and insoluble organic waste are not easily removed by physical or chemical means without heavy capital investments. The cleansing role can be cheaply carried out by the humble micro-organisms, particularly bacteria, in water. The mechanism bacteria



deploys is called Metabolism which is made up of catabolism and anabolism. Catabolism is break-down of molecules while anabolism is the reversed; build-up larger molecules. Both phenomena help to clean up waste water. In anabolism, all living things need energy, which are derived from ATP, a Phosphorus compound found in all living things. The bacteria also requires enzymes which are essentially protein, to perform anabolism. Since protein are synthesized from amino acids, thus sufficient Nitrogen in the waste water is also crucial for the bacteria to function. Therefore both Phosphorous and Nitrogen are called macro-nutrient for wastewater micro-organisms, they

have to be present in relative abundance in order for the healthy growth of aerobic bacteria population.

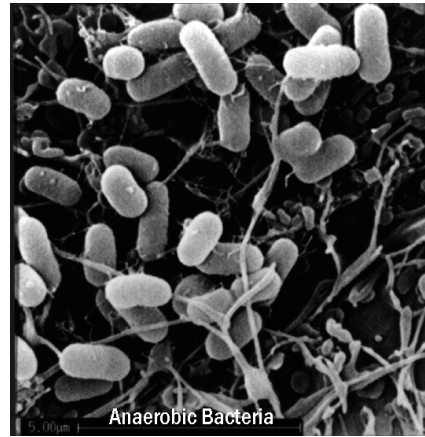
In paper mills, the origins of Phosphorous and Nitrogen are reduced from the Pulping and Cleaning stages of paper making, therefore they are deficient to sustain a healthy population of bacteria in their WWTP. Phosphorus can be supplemented with the addition of in-organic phosphates like Sodium Metaphosphate, orthophosphates and other cheaper salts of phosphorous. The supplement of Nitrogen is trickier as most living things cannot absorb inorganic nitrogen. Organic nitrogen like urea have to be supplemented.

It is also important to check the concentration of N and P regularly to avoid over-dosing of these 2 elements to cause Eutrophication; a condition whereby the water-way is depleted of oxygen as a result of excessive growth of algae. The optimum discharge level of the 2 elements of N and P should not exceed 1.0 and 5.0 ppm respectively.

Other than macro-nutrient, there is also a need to maintain a low level of micro-nutrients in the wastewater for bacterial growth. These micro-nutrients include trace metal and vitamins. Metallic element like Mg, Zn and Se. Magnesium assists in the processing of ATP in living things. While both Zn and Se are important in the making of enzymes; especially the latter without which, it can cause atrophy; a condition whereby the cell de-

stroy itself. All the micro-nutrients are toxic chemical if they exist beyond allowable limits which are measured in ppb (Parts Per Billions). The organic forms are more assimilable than the inorganic forms.

Though plant can produce most of its vitamins, however some anaerobes do not have the capability to make vitamins e.g. Vitamin B is supplemented as micro-nutrient for the healthy anaerobic wastewater treatment.



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