ALKALINITY

Alkalinity Requirement

In flow through systems to maintain the minimum bed pH greater than 6.6, the minimum H_2CO_3 alkalinity supplement required per influent COD will depend on the nature of the waste, i.e., on the carbohydrate and protein content and potential to generate H_2CO_3 alkalinity on breakdown. Minimum alkalinity supplementation for the pure carbohydrate waste with zero alkalinity was reported as 1.2 mg (as $CaCO_3$) per mg of COD in the influent [Wentzel *et al*., 1994]. For predominantly carbohydrate waste with zero alkalinity but substantial potential for alkalinity generation; the alkalinity supplementation requirement may reduce accordingly. The amount of H_2CO_3 alkalinity generation cannot be predicted and must be determined experimentally.

It is well known that the buffer capacity due to bicarbonates is the most important physico-chemical factor to maintain stable digestion conditions. In fact, the overload of volatile acids (either directly entering the reactor in the feed or produced from more complex substrates) which the digester can withstand is proportional to the bicarbonate concentration in the mixed liquor [Weiland and Rozzi, 1991]. Monitoring HCO_3 concentration allows an indirect evaluation of total volatile acids, as every equivalent of VFA which build-up during an overload will destroy (and replace) one equivalent of bicarbonate.

For the reactors starting with OLR less than 9 kg COD/m^3.d, to maintain pH near neutral, alkali should be supplied up to 1g $CaCO_3$/g COD. The alkalinity requirement reduces with increase in operation time of the reactor. Alkalinity requirement is more for reactors starting with higher OLR (greater than 9 kg COD/m^3.d). Hence, it is uneconomical to start reactor and higher loading rates because of higher cost of chemicals required [Ghangrekar, 1997].

The alkalinity consumed that at the bottom of the sludge bed gets regenerated at the top of the reactor which may create problems of foaming in the gas collector inside the reactor, particularly under the high loading. Hence, it is suggested that alkalinity should preferably less than 2000 mg/L as $CaCO_3$ [Ghangrekar, 1997].