VI ENGINEERING SIGNIFICANCE

6.1 Process Efficiency

The results of experimental study clearly pointed out that anaerobic filter process was the most ideal process in treating strong organic wastes particularly tapioca starch wastes, under tropical conditions. In treating tapioca starch wastes having COD 1,000-8,500 mg/l the anaerobic filter was capable of removing 92 to 97 percent of the COD at loading as high as 4 kg COD/cu.m./day or 250 lb COD/1,000 cu.ft./day. If the BOD_5 is assumed to be 67 percent of the COD the BOD_5 loading will be equal to 2.7 kg/cu.m./day or 170 lb/1,000 cu.ft./day. Hence, the process loading and efficiency of the anaerobic filter are comparable to those of other conventional processes such as activated sludge process, trickling filter, and anaerobic contact process as reported by STEWART (1964), GALLER and GOTAAS (1964), Mc CARTY (1964) and SCHROEPFER (1959).

It should be emphasized that in full-scale application the process efficiency may not be as high as that found in the laboratory-scale filter. One cause of the drop in efficiency in full-scale application may be the short-circuiting of the influent . TAYLOR (1971) reported that only 64 percent COD removal was achieved in full-scale treatment of wheat starch-gluten waste using three anaerobic filters each having 30 ft. diameter and 20 ft. height. The filters were loaded at 237 lb COD/-1,000 cu.ft./day.

6.2 Advantages of the Process

The anaerobic filter process has many advantages over other aerobic and anaerobic process as follows:

1) The process functions efficiently at room temperature with comparable efficiency to that of other processes.

2) The system has a long solid retention time without any need for sludge recycle thus, reducing the operating cost.

3) There is a small amount of excess biological solids which can be directly disposed off.

4) The process can withstand shock loads with only a slight effect on its efficiency.

5) The microbial system can quickly regain its efficiency after a long period of no incoming load. Under the same conditions an activated sludge process would fail.

6) The power consumption is very low since no oxygen is required and the total head loss through the filter is not more than 15 cm.

7) The nutrient requirement is much less than that required for aerobic processes.

6.3 Disadvantages of the Process

The anaerobic filter process has some inherent disadvantages that limits its application to some extent.

1) The effluent is turbid due to high concentration of suspended solids. In the case of tapioca starch wastes suspended solids in the effluent may be as high as 185 mg/l. Therefore, the effluent may have to be clarified before disposal.

2) The effluent may be odourous and corrosive due to hydrogen sulfide. This undesirable gas will have to be stripped off before disposal.

3) Due to a slow growth rate of anaerobic bacteria, hydraulic retention time is one of the most important limiting factor (YOUNG and Mc CARTY, 1969). As a result the process is not economical for treating dilute wastes having COD less than 1,000 mg/l.

4) The anaerobic filter is suitable for treatment of low suspended solids wastes. The filter is prone to clogging when treating high suspended solids wastes.

6.4 Process Design

In full scale application the following design criteria are recommended;

Under controlled environmental conditions

Organic loading	4	kg COD/cu.m./day
Minimum HRT	24	hours
Filter height	2.0	meters
Treatment efficiency	85	percent
Crushed stone media	1-2	inches

Under raw waste conditions

Organic loading	1.5-2	kg COD/cu.m./day
Minimum HRT	48	hours
Filter height	2.0	meters
Treatment efficiency	85	percent
Crush stone media	1-2	inches

It should be emphasized that the optimum organic loading should be determined for each particular waste. The optimum loading would depend on characteristics of the waste and operating environmental conditions particulary pH and nutrient.