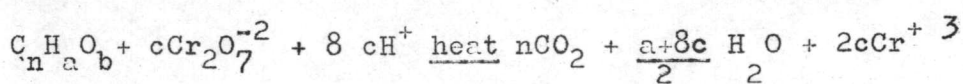


## CHAPTER 8

## DISCUSSIONS

The results from characterization studies of the soft drink wastes (in Appendix, table 19) showed that the characteristics of grab samples did not vary much from those of composite samples. This was because the samples came from the same settling tank and the concentration of the waste was uniform during collecting the samples. Characterization studies on composite samples are very important in cases where the results of the waste analysis are to be used for design purposes. Under estimation of the strength of the waste may lead to the overloading of treatment units and to their subsequent failure.

Results also indicated that the sludge studied had a very high COD value with the average of 10,000 mg./l BOD value of sludge was almost equal to centrifuged supernatant and it had a rather high value with an average of 300 mg./l. But COD value of sludge was quite different from supernatant, COD of sludge was about 30 times of supernatant. This resulted from the fact that dichromate used in COD determination was also used for oxidising organic compound in sludge rather than dissolved organics in supernatant.



Organic

Acid

matter

$$\text{Where } c = \frac{2}{3}n + \frac{a}{6} - \frac{b}{3}$$

BOD was quite low when compared with the concentration of suspended solids. In this particular study, pollution problems caused by the bottling waste was very serious because of the location and use of the receiving water.

The settleable solids in 30 minutes showed that the treatment plant was not in a good condition. Settleability is a serious problem. Microscopic examination showed that bulking was caused by a filamentous bacteria named Sphaerotilus natans which can grow well in both aerobic and anaerobic conditions.

#### General Digester Observations.

The temperature in the digester was maintained constant by a water bath through out the runs.

A slightly foul odour was detected in the digester at the beginning of aeration. This resulted from the anaerobic condition of sludge in the settling tank of the plant. But after one - day aeration, no odour was detected.

Preliminary observation showed that evaporation was a very serious problem. The volume of sludge reduced 20 % after one - day aeration. Distilled water was added twice a day to maintain the volume.

After one -day aeration the sludge became sticky like glue and after three - day aeration attached flocs were found on the wall of the digester. It differed from the nature of Sphaerotilus given by Ruchhoff and Kachmar (1941) that if the aeration was turbulent, it produced free flocs and if slight aeration, attached flocs were formed. This may be due to higher concentration of solids which is over 10,000 mg./l.

Actually, higher concentration of solids gave good settleability, but in case of *Sphaerotilus*, it was not so. *Sphaerotilus natans* is a slime and filamentous bacteria, it increases the bouyancy of flocs that makes the sludge settle slowly.

### Aerobic Digestion Studies

#### Temperature

In this study temperature had a little effect on treatment efficiency because the range of temperatures from 30°C to 35°C was so close that it was almost the same. According to Fair and Moore (1934), the treatment was in the intermediate Zone (28°C to 42°C). Unfortunately the experiment with the temperature over 60°C was not carried out because of the enzyme inactivation.

The results from table 4 to table 15 indicated that at 35°C the treatment efficiency was better than at 30°C.

#### Suspended Solids

The rate and percentage of reduction in volatile solids in sludge undergoing aerobic digestion for 15 days decreased as the starting total solids increased. There was a slight reduction as temperature increased from 30°C to 35°C.

At starting total solid of 1 %, the reductions at 30°C and 35°C were 35.6 % and 40.2 %.

At starting total solid of 2 %, the reduction at 30°C and 35°C were 24.6 % and 27.0 %.

At starting total solid of 3 %, the reduction at 30°C and 35°C were 19.3 % and 20.5 %.

The reduction of volatile matter compared favorable with the results reported for aerobic sludge digestion from sewage waste by Jaworski et al. (1960).

#### BOD and COD

BOD and COD values at 30°C and 35°C were less than 100 mg./l with starting total solids of 1 and 2 % after 15 days aeration. With starting total solids of 3 %, BOD and COD values were over 100 mg./l. The reduction in BOD and COD decreased as total solids increased.

from fig. 20, 21, 22 and 23 it was found that if the detention period increased over 15 days BOD and COD reduction increased also.

The reduction of BOD and COD values compared favorable with the results reported for aerobic sludge digestion from sewage waste by Jaworski et al. (1960).

#### pH

The pH values in this studies ranged from 8.0 - 8.5 throughout each run. These values compared favourable with the result reported by Jaworski et al. (1960). In their studies of sewage waste, the pH increased from 7.0 to a maximum value of 8.0 at 35°C and 15°C for detention period of to 10 days, but at 20°C , the pH value reached to 8.0 in 15 days aeration, and then decreased gradually to the value near 5.0

Unfortunately, in this study the detention period was only 15 days, therefore the low pH value was not found. Also, Ritter (1970) had reported about operating experiences in aerobic

sludge digestion that the detention period used in digestion was 15 to 30 days.

Settleability and Predominate Microorganism

In this study, the more detention periods did not improve settleability of solids. This was because of the slime filamentous bacteria, Sphaerotilus natans in the sludge was regarded as the cause of bulking. Heukelekian (1940) reported that it can utilize sugar preferentially to the Zooglea under aerobic conditions, while under anaerobic conditions Zooglea cannot utilize the sugar. This was why Sphaerotilus was predominate in this soft drink sludge. Because it is a slime filamentous bacteria which increases the bouyancy of the flocs and it can grow well in both aerobic and anaerobic conditions, aeration cannot improve settleability.

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