

Chapter V

CONCLUSION

The results of the study are concluded as following:-

1. From in - plant study, it has been concluded that the main sources of waste water are coagulating and cake making parts and washed water from the processing line. The waste waters from coagulating and cake making parts are concentrated but washed water from the processing line is diluted. Water use is about 190 to 210 l per 10 kg of soya - bean used and waste water generation is about 180 to 200 l per 10 kg of soya - bean used.

2. The raw characteristics of waste water vary all the time. The average COD is about 6000 mg/l at 60 per cent certainty, and average BOD₅ to COD ratio is about 0.82. Suspended solids, settleable solids, and total solids are 312 - 760 mg/l, 12 - 350 mg/l and 0.215 - 2.331 per cent, respectively. Nutrients, nitrogen and phosphorus are high enough for biological waste treatment process. The average COD : N and COD : P ratios are 1000 : 28.1 and 100.5.06, respectively. The pH of waste varies from 3.8 to 6.05.

3. From waste characteristics, due to the high suspended solids, settleable solids, high variation of properties of waste and low pH; sedimentation, equalization and neutralization are necessary.

4. From plain sedimentation study, 30 min. sedimentation time is suitable and the suspended solids, total solids, BOD_5 , COD and organic nitrogen removals are, approximately, 79.87, 18.69, 24.28, 27.04 and 44.3 per cent, respectively. The average COD : N and COD : P ratios of settled waste are 100 : 21.55 and 100 : 5.28, respectively.

5. From biological treatability study, the treatability of settled waste is high indicating that biological waste treatment method is suitable for secondary treatment.

6. From batch - fed activated sludge process study, the COD of influent is removed very rapidly in the first 2 hr. of aeration and the COD removal at 4 hr. detention time is 86.7 - 95.0 per cent. The COD removal is increased while the MLVSS of the system increases. The average ratio of MLVSS and MLSS of the system is 0.76. The average substrate removal rate, k (COD basis), mass yield rate, a and endogenous respiration rate, b are 0.0322 day^{-1} , 0.85 and 2.6832 day^{-1} , respectively.

7. From continuous - fed activated sludge process study, the COD and suspended solids removal efficiency of 0.22 - 1.67 gm COD per gm MLSS - day loading are 95.27 - 96.92 and 80.0 - 96.5 per cent, respectively. Suitable loading rate should be 0.75 gm COD/mg MLSS per day; for higher loading rate, difficulties of foaming accrued. The SVI is low indicating the sludge is well - settled. The sludge produced is

relatively high and has to be disposed of every day.

The treatment process of soya - bean cake waste water should be composed of plain sedimentation, equalization, neutralization and biological treatment method. Activated sludge process gives high efficiency removal and can be used but high operating cost and less simple operation are required. The advantages of activated sludge process are small space requirement for installation, and free from flies, worm and odors.

RECOMMENDATIONS FOR FURTHER WORK

Because the study of soy^a - bean cake waste water has never been performed before in Thailand , many aspects should be recommended for future work. Some of the points which should be studied in greater detail are as follow:-

1. Settling column studies on raw waste water to enable conclusive design criteria for sedimentation tank should be performed
2. The study of oxygen requirement on biological waste treatment should be carried out.
3. The study of nutrient requirement on biological waste treatment should be carried out.
4. More investigation to evaluate the design parameters for activated sludge process.
5. Aerated pond should be studied to determine the design criteria and operating conditions.
6. The study of antifoamers on high rate activated sludge process.