CHAPTER 5

SUMMARY AND CONCLUSION

5.1 GENERAL

The experimental results of the laboratory model, the interpretation of observations for process parameters and validation of results from a conclusion that Upflow anaerobic sludge blanket reactor is a viable technical option to remove COD upto 90-95% while treating industrial waste streams of Sugar and Dairy and 80-90% while treating industrial waste streams of Brewery & Tannery.

The results of the experiment may be used to enhance the performance of UASBR for treating the respective effluent streams, by constructing Mathematical models in future.

5.2 CONCLUSION

The present research work using a laboratory scale experimental model of UASBR for treating four different industrial waste streams viz., sugar, dairy, brewery and tannery can be concluded with the following observations.

1. The reactor startup required 60 days with domestic waste water and stabilized sludge.
2. UASB methods of treatments of industrial waste seems to be an attractive choice for removal of organic content like sugar, dairy & brewery and does not prove to be so effective in color removal, hence it is suggested for Advanced aerobic process as post treatment for high strength waste water like tannery.

3. UASBR is more versatile and effective in offering anaerobic treatment to high COD industrial waste streams. It is observed that dairy effluent can be treated for COD removal upto 94.7% and 91.86%, 91.22% and 82.6% for sugar, brewery and tannery effluents respectively.

4. The UASB reactor achieved the optimum % removal efficiency of BOD, TSS, TDS, N & P was observed only at mesophilic range and for sugar; 96.4, 86.91, 41 & 50 for dairy; 95.8, 87.5, 88.6, 56 &55 for brewery; 93.45, 85, 86 ,48 & 49 and for tannery; 84.8, 76 ,79.5, 35 & 55 respectively.

5. The Volumetric Loading Rate for laboratory scale experimental model of 25 litres of volume was observed for a maximum of 8.28 kg COD/m³d.

6. The maximum Organic Loading Rate was observed for a value of 0.658kgCOD/kgVSSd. This value corresponded to the sludge blanket volume of 7.7 litres in the model for tannery waste water.

7. There was a significant difference in COD removal with respect to influent pH, ambient temperatures, HRT and OLR.

8. It was found to yield better results or meet the disposal standards, the combined UASB with pre and post treatment by
physical or chemical methods of aerobic treatments to treat high strength waste water.

9. The performance observed for high strength wastewater is better only at suitable influent COD and overall performance only below the influent COD of 6000 mg/L.

10. The volumetric biogas production rate increased from 0.21 to 0.32 m$^3$/kgCOD removed all four waste streams which further strengthen the view of UASBR as full fledged effluent treatment plant for treating biodegradable industrial waste streams.

11. The response of the model shows that the major concentration of substrate is degraded at lower part of the reactor where the major concentration of biomass presents. Better removal of COD occurred due to longest time of contact between the substrate and the microorganisms only at the lowest upward velocity.

12. The maximum upward velocity of the flow is observed as 0.031 m/h. This velocity condition is also adjusted as an important contribution for high values of VSS in the Blanket.

13. The acclimatization process reaches in the reactor was observed for every successive waste stream only at maximum of 40 to 50 days.

14. It may be concluded that the maximum decrease in removal of BOD, COD, TSS, TDS, N & P was observed at colder period were 6%, 10%, 6.5%, 3.5%, 5%, & 4% than warmer period. Hence requires an increase of biomass in the reactor or to
operate at higher SRT and HRT in order to achieve the same performance of reactor as warmer period.

15. At a particular HRT, as the OLR increases % COD removal also increases upto the influent COD of 3500 to 4000 mg/L, beyond which the % COD removal decreases with increasing OLR.

16. At a particular HRT, as the VLR increases % COD removal also increases upto the influent COD of 4000 mg/L, beyond which the % COD removal decreases.

17. As the HRT decreases from 5.21 days to 1.04 days VLR increases and the corresponding % COD removal decreases.