***Chapter Five***

***Conclusions and Recommendations***

 **5.1 Conclusions**

Simulating of sewer system by constructing synthetic sewer system via pipes and tanks had been conducted. The constructed structure had been used to simulate the transition of wastewater via gravity as an approach to real sewer system that connecting [Adhamiya](https://twitter.com/adhamiyahnews?lang=ar) district and Al-Wazireya neighborhood. The system had been used for testing different operation parameters to investigate the objectives declared in the current research the following conclusions had been extracted:

1. A comparison of simulated between no-air desecrate aeration and two points of aeration in a pilot scale system with raw domestic wastewater demonstrated that aerobic conditions in-sewers, could results in significantly good removal of soluble organic matter.
2. Maximum RSCOD values of 12.19 % and 14.28 % were recorded for temperature of 20 OC and 30 OC, respectively under aerobic condition.
3. The degradation process had been improved as activated sludge added to the influent stream of wastewater, RSCOD values of 27.69 % and 29.62 % were recorded at 20 OC and 30 OC temperatures respectively, under 50/50 (v/v) mixing ratio.
4. The results obtained in term of RSCOD for seeded experiment showed more impact rather than aerated one.
5. The RSCOD of wastewater was found to be significantly influent by VSSO over a retention period of 8 hours.
6. Kinetics model of first order was adopted to represent the experimental data. Mathematical approach of least square method was adopted successfully to fit the experimental data to the proposed model as indicated by calculated R2 values for the predicted results. Investigating the results of the estimated k values reveled that no specific pattern can be recognized for experimentation under ambient temperature of 10 OC due to low operation temperature. While, the estimated k values for temperatures of 20 and 30 OC showed a harmony with VSSO values for all investigated samples.
7. Dissolved oxygen measurements were conducted for all operation temperature and least square method had been conducted as mathematical approach in fitting the experimental data to oxygen transfer model. The results revealed that as temperature increased, the amount of oxygen transferred to sewage water increased providing more activation for biomass to degrade the organic materials.

**5.2. Recommendations for future work**

A few recommendations can be made for future research work in the research area based on the current research findings:

1. Investigating the performance of the simulated system under higher ambient temperatures for the summer season (July and August) to show performance of partial degradation and the effect of higher temperatures on the living microorganisms.
2. A comparative study should be undertaken to investigate the influence of many parameters which include:
3. Effect of changes in velocity and flow variations.
4. Effect of the type of the sewer i.e. pressure vs. gravity and linear vs. branched.
5. Use of chemical instead of air.
6. Delivering pure oxygen to the system instead of air to investigate its performance by eliminating the negative effect of nitrogen presence in air.
7. Optimizing the residence time of sewage water in the system is an important parameter to be investigated as longer residence times were recommended to investigate the degradation of particulate slowly biodegradable COD in sewage water.
8. Adopting other parameters in expressing the organic degradation as BOD5, SS, and VSS presented in the treated sewage water to identify more accurate diagnostic character for the degradation process.
9. The economics of in-sewer treatment comparison with the costs of extension of existing overloaded WWTP.