

Title: Treatment of effluents from Food Services Establishment (FSEs) by physico-chemical processes: a case study for Trinidad & Tobago

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Abstract:

Background: Effluents from Food Services Establishments (FSEs) contain primarily Fats, Oil and Grease (FOG) which severely impact on sewers and the environment when released in high concentrations. In Trinidad & Tobago, it is estimated that approximately 231,304 kg/day of unaccounted for FOG bearing wastewaters from FSEs, are released into the environment with no viable treatment in the country. This research explored the optimization of physico-chemical processes for the treatment of FOGs for subsequent release into sewers.

Results: Bench-scale studies analysed the characteristics of FSE's effluents from three popular sources, conducted the treatment of these effluents using Jar Tests, and subsequently confirm results via a pilot plant study. Characterization showed the mean concentration of the parameters examined to be; FOG ($511 \text{ mg/l} \pm 116 \text{ mg/l}$), Suspended Solids ($446 \text{ mg/l} \pm 146 \text{ mg/l}$), Chemical Oxygen Demand ($2229 \text{ mg/l} \pm 963 \text{ mg/l}$) and pH (6 ± 0.3). Jar Tests were conducted using Poly-aluminium Chloride (PACl) as coagulant, anionic and cationic polyelectrolytes as flocculant aids with suitable pH adjustments of samples to determine the isoelectric point for the coagulant. Effluent results showed FOG removal levels of 99.9% and final effluent concentration of 0.17 mg/l. This was attained using PACl concentration of 250 mg/l, a 0.1% low cationic polyelectrolyte (CP 1154) at 4 mg/l with the pH of sample adjusted to 8. The pilot plant achieved a 97.4% removal of FOG (residual of 16.8 mg/l) using the same coagulant dosing, and pH value, but increasing the strength of the flocculant aid to 0.1% medium cationic (CP1156) at 5 mg/l.

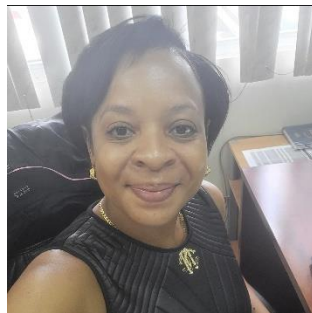
Conclusion: Experimentation showed high concentrations of emulsified FOG can be efficiently removed to levels below the permissible requirements (20 mg/l) for entry into sewer systems in Trinidad and Tobago using coagulation, flocculation and sedimentation techniques. Pilot scale study also revealed that a higher strength and/or dose of the cationic polyelectrolyte and increased times in primary and final tanks were required to attain the desired results as in the bench level study, where equipment limitations in the flocculation tank were faced. This is in alignment with theory where factors critical for agglomeration is equipment type and density charge. It is, concluded that the optimum combination of chemicals and the respective dosages attained at the bench level study should prove effective should the right equipment be made available.

Keywords: Characterization, Fats, Oils and Grease (FOG), Food Services Establishments (FSEs), Coagulationflocculation, Poly-aluminium Chloride (PAC), Poly-electrolytes.

Biography:

My name is Shamika Cudjoe, born and raised in the beautiful island of Trinidad and Tobago that lies in the Caribbean Sea. I have always had a passion for science and hence my academic life would have eventually led to research in the field of science and engineering. During that lifetime, I would have attained a BSc. in Physics (Honors) and then I went on to the engineering field, where I completed the MSc. in Environmental Engineering followed by the MPhil in Civil Engineering at UWI. I went on to work as the Operations Manager at the Water and Wastewater Utility of Trinidad and Tobago, where a problem within my field was realized. As such, I explored the problem with the University, to bring resolve to this issue my country faced. It is this topic I would discuss.

I also enjoy teaching where I currently conduct training for wastewater process plant operations, under the National Training Agency for Caricom States (CANTA). In the past I would have tutored and demonstrated labs at the Physics Department at UWI and taught Physics and Mathematics at a renowned High School. My hobbies include fitness and showing dogs.



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