BUSITEMA UNIVERSITY
Pursuing Excellence

FACULTY OF ENGINEERING

DEPARTMENT OF AGRO-PROCESSING ENGINEERING

FINAL YEAR PROJECT REPORT

DESIGN AND CONSTRUCTION OF A HOMOGENIZER FOR OIL BASED WASTEWATER

BY:

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BU/UG/2014/151

Final year project report submitted to the faculty of engineering, department of agro-processing engineering in partial fulfillment for the award of a bachelor of sciences in agro processing engineering

Abstract

Demand for food products and petroleum has been steadily increasing which has led to an need for increased productivity in such industries, thus increase in the number of dairies, slaughterhouses, meat processing plants and oil refineries in many countries of the world. These generate large volumes of post-production and processing effluent. In most of the slaughterhouses, the consumption of water per slaughtered animal varies according to the animal and the industry-specific process employed, ranging from 1.0 to 8.3 m^3. Most of this is discarded as wastewater, with 0.4–3.1 m^3 of water per slaughtered animal being reported (Caixeta et al., 2002). Milk industries also generate a relatively high volume of post-production processing effluent (about 77-100% of the total production). Therefore, the objective of the study was to design, construct, test a homogenizing system for the oil based wastewater generated by such plants, which will result into a more effective means and cheaper way of handling this type of water during the treatment process.

The design of the various machine parts was carried out by analyzing forces acting on them. Force analysis led to selection of proper materials to withstand the forces to avoid failure. Mild steels of various grades were the main materials recommended to be used because they are strong, cost effective and durable. Engineering drawings of the various components were drawn before the various components were constructed and then machine parts fabricated. A fully functional prototype resulted after all the above operations. Testing of the prototype was carried out and the figures revealed that the machine was 35% efficient.

Declaration

I, WETAKA DAVID, do hereby declare that this final report was compiled is my original work and to the best of my knowledge, it has never been published or submitted for the award of any academic qualification in any higher institution of learning.

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Approval

This is to certify that WETAKA DAVID is the original author of this final year project report to be submitted for examination for partial fulfillment for the award of a Bachelor of Science in Agro-Processing engineering, Busitema University under the approval of my supervisors.

Supervisor

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Acknowledgement

Special thanks go to the department of Agro-Processing Engineering, the head of department, and all the lectures of Agro-Processing department Busitema University.

I thank my supervisors for all their support during this report writing. Thanks also go to my fellow colleagues.

And finally, my sincere appreciation goes to my family and friends for the financial support extended to me throughout the report writing, may the Almighty reward you abundantly.

Dedication

I dedicate this report to my dear family and friends for the unsparing support that made this proposal writing possible. Love you, God bless u all.

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of biological nature, have been employed in the past (Water Research Commission, 1989). New technologies which include electrochemical treatment, adsorption and treatment using ultrasound-dispersed nanoscale zero-valent iron particles, titanium dioxide, vacuum ultraviolet and natural minerals, and hybrid technologies, among others have also been employed (Jamaly et al., 2015). However most of these methods are of very high cost, yet the removal efficiency of the dissolved or emulsified oils, fats and grease is low and extremely problematic sludge is produced.

In this study, I plan to develop a homogenization system to help improve on the management of this wastewater, will be more efficient and cost effective.

1.2 Problem statement

Grease traps, tilted plate separators, physical-chemical treatment, oil skimmers, lagoons, electrochemical treatment, adsorption, treatment using ultrasound-dispersed non-scale zero-valent iron particles, titanium dioxide, vacuum ultraviolet and natural minerals, and hybrid technologies are some of the methods being used in the oil based wastewater treatment process to remove the oil from the wastewater (Hickenbottom et al., 2013). However, these methods are ineffective in most of the plants and some of them like lagoons are very expensive to establish and require large space to be constructed.

Once the greases and oils/fats are not effectively removed from the wastewater they may led to reduction of the cell-aqueous phase transfer rates (substrates, products and oxygen) through the formation of a lipid coat around the biological floc (Sustarsic, 2012). In addition, filamentous microorganism blooms (bulking) and floating sludge with undesirable physical characteristics may develop (O'Brian, n.d.). These detrimental effects are further associated with clogging and the emergence of unpleasant odors, and are frequently associated with a reduction in the efficiency of treatment stations.

Therefore, this study seeks to develop an oil homogenizing system which will help reduce on these adverse effects of the oils and greases in the wastewater leading to cheaper and easier means of management of the wastewater

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