شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

شبكة المعلومات الجامعية

شبكة المعلومات الجامعية

التوثيق الالكتروني والميكروفيلم

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات

يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار

بعض الوثائق الأصلية تالفة

بالرسالة صفحات لم ترد بالأصل

IMPROVING ANAEROBIC SLUDGE DIGESTER EFFICIENCY BY MIXING SEWAGE SLUDGE WITH AGRICULTURE RESIDUES

A thesis
Submitted to the Faculty of Engineering
Cairo University for the Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy
in
Public Work Engineering

by

AYMAN MOHAMED FOUAD IBRAHIM
M.sc. in civil Engineering

PUBLIC WORK DEPARTMENT
FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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DEDICATION

This work took a period of my life. I wish to dedicate it to who suffered to educate me, prepare and build my capacity and helped me to be as I am,

TO MY FATHER

I wish to dedicate it also to the person who strive to make my life comfortable and share in carrying the responsibility to help me

TO MY MOTHER

Last but not the least, I wish to dedicate this work

TO MY WIFE & CHILDREN

to be a guide in our life together in future.

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ABSTRACT

With the increasing concerns of environmental pollution control, level of wastewater treatment has been established for plant discharging to surrounding environment. Higher level of treatment generally means greater mass and volume of solids to be managed. Managing environmental pollution is on of the most problems which face the world today. So practice and procedures are being under deep investigation. Sludge treatment and management is a field of interest due to its adversely effect on environmental surrounding parameters. This study concerns with improving anaerobic sludge digester by co-digesting sewage sludge and agriculture residues. A bench and pilot scale were installed in El Berka wastewater treatment plant in El Sallam district, Cairo, Egypt. A bench scale was monitored over 70 days of operation to choose the most suitable agriculture residues could be mixed with sludge. The experimented sludge were primary sludge (PS), secondary sludge (SS), and thickened sludge, the agriculture residues were rice straw, maize stalk, grass clipping, and sugar cane refuse mixed with sludge with rates 1:20 and 1:10 (residue : sludge). The characteristics of digested sludge such as Temperature, pH, COD, TS, VSS, total alkalinity, and CBOD/NBOD ratio were monitored and evaluated. The results have showed that improving in COD destruction, VSS destruction, and total alkalinity were achieved. The most suitable residue was rice straw. Different rates 2% , 4%, 8%, 12% and 16% (of rice straw to sewage sludge) were applied in a bench scale and concluded that the 16% mixing rate was the most suitable ratio based on COD and VSS destruction percentage. Two pilots scale digester work in parallel, one for sewage sludge and the other for sludge mixed with rice straw. The rice straw was applied with rates of 5 %, 10%,16% and 20% to sewage sludge. The pilots unit were monitored over 386 days of continuous operation. The pilot unit was $2m^3$ tank reactor with net effective volume of 1.5 m^3. The reactors were fed daily and operated under routine operating condition such as sun light, and sludge characteristics changes. The characteristics of digested sludge such as temperature, pH, COD, TS, VSS total

alkalinity, bacterial count, total coli-form, fecal coli-form, and shegella were monitored and evaluated.

The results have showed that a reduction of COD, and VSS up to 94, and 97.7% respectively were achieved. Improving in effluent COD and VSS (compared with digesting sludge without mixing) were 65% and 71.5% and increasing in bio-gas production from 30 % to 117 % was achieved. Mathematical representation for results are introduced.

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