Assessment of the current and suggested treatment processes of sludge in some wastewater plants in Egypt

A thesis submitted to Faculty of science, Ain shams University

for the degree of PhD. Sc. in Zoology

By

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Sanitary & Environmental Engineering Institute -Housing & Building Research Center (HBRC)

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Examiners	***signature***

بِسْمِ اللَّهِ الرَّحْمَٰنِ الرَّحِيمِ

وَأَنزَلْنَا مِنَ السَّمَاءِ مَاءً بِقَدَرٍ فَأَسْكَنَّاهُ فِي الْأَرْضِ ۖ وَإِنَّا عَلَىٰ ذَهَابٍ بِهِ لَقَادِرُونَ ﴿١٨﴾

صدق الله العظيم

" سورة المؤمنون– أية (18)"

Abstract

Sewage sludge production in Egypt is continuously increasing. Therefore, the pressing needs are to find/develop more efficient, economic and sustainable technologies for sludge treatment. Recently, there is an increasing interest in the sewage sludge treatment.

The aim of the present study is assessment of the current treatment of sewage sludge in some wastewater treatment plants (WWTPs) in Egypt, develops an integrated low cost decentralized technology for watery sewage sludge treatment that can be applied in WWTPs in small communities.

Biological examinations (bacteriological) as well as some physico-chemical characteristics of raw sewage sludge and treated sludge with anolyte water, catholyte water and zeolite were carried out. The optimum conditions for treatment were investigated by changing of some parameters such as pH, temperature, concentrations and the incubation periods of anolyte water, catholyte water and zeolite. The results showed that the total coliform and fecal coliform was zero at concentration 5ml of using anolyte water after 20 min incubation period.

The removal percent of Fe, Cu, Cr, Pb and Zn was 90%, 71%, 46%, 91% and 85%, respectively after 24h incubation period.

The removal percent by applying zeolite was 52% for Cr with size of 2-5 mm and weight of 5g for 15 min, 97% for Pb after 15 min with 1g zeolite size of 2-5 mm, 95.3% for Zn with1g of size 600 µm – 1 mm after 60 min, 95% for Cu after 15min with 1g of

size 2-5 mm and 93 % for Fe after 15 min with1 g of size 600µm-1 mm.

The optimum conditions for using catholyte water and zeolite were at pH10 and Temp 40 °C.

The results of the present study indicated that using anolyte water for 20 minutes followed by catholyte water for 24 hours then zeolite for 15 minutes can treat the sewage sludge and make it suitable to be reused as fertilizer in agriculture.

Key words: Sewage sludge, anolyte water, catholyte water, zeolite, treatment, reuse, heavy metals, pathogens.

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With all admiration, appreciated and respect

Who earned this degree as well as my self for their endless support, patience, love and understanding

Signature

Enas Mortada

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