شبكة المعلومات الجامعية

التوثيق الإلكتروني والميكروفيلم

بسم الله الرحمن الرحيم

HANAA ALY

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جامعة عين شمس

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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

HANAA ALY

Wastewater Treatment in Small Communities Using Some Natural and Synthetic Materials

A thesis submitted to Faculty of Science, Ain Shams University for the degree of Ph.D. Sc. in Zoology

By

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

B.Sc. in Zoology and Chemistry

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M. Sc. in Zoology

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2020

Approval sheet

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وَأَنزَلْنَا مِنَ السَّمَاءِ مَاءً فَأَنبَتْنَا فِيهَا مِن كُلِّ زَوْجٍ كَرِيمٍ (١٠)

صدق الله العظيم

"سوره لقمان- أيه (١٠)"

Abstract

The aim of the present study is the development and testing of an integrated low cost technology associated with an engineering package for domestic wastewater treatment that can be applied in small communities. Design, construction and operation of an integrated anaerobic- aerobic pilot–plant system hybrid with non–woven fabric spiral sheets for domestic wastewater treatment were carried out. The treatment system consists of UASB (up flow anaerobic sludge blanket) (primary treatment unit) packed with non-woven fabric sheets, followed by DHNW (down flow hanging non-woven fabric unit) (secondary treatment unit) packed with non-woven fabric sheets as post treatment. Complete physicochemical and biological examinations (bacteriological) in raw and treated effluent from different treatment steps were regularly monitored during the study period.

One hydraulic retention times namely (HRT); 6h was examined. The results indicated that the integrated treatment system operated at 6 h HRT at the UASB- DHNW produced sustainable and satisfactory results for the removal of organic pollutants. The use of the system produced a quality of effluent complying with the Egyptian code of practice (2015), regarding effluent reuse in unrestricted irrigation. The quality of treated effluent in terms of COD, BOD, Turbidity, and TSS removal rates were 71%, 79%, 94% and 66% respectively. Also the removal of fecal coliform bacteria was 79%.

Study on removal of heavy metals from synthetic water (Cu^{2+}, Zn^{2+}, Mn^{2+}, Ni^{2+} and Fe^{3+}) carried out by using banded iron formations (BIF_s) at different conc. (0.5, 0.75 and 1g) and different pH (5, 7 and 9). The results showed that the best removal for Cu was 99.8% at (pH 5 and 1g). For Zn, the best removal was 99.5% at (pH9 and 1g). For Fe^{3+} the removal was 94.7% at (pH5 and 1g).

The best removal for Ni^{2+} was 95.5% at (pH5 and 1g). For Mn^{2+} the best removal was 97.7% at (pH5 and 1g).

In the present study, it was observed that the average count of *E.coli* bacteria in raw wastewater in different samples from the system was 132×10^4 MPN/100ml. After the wastewater passes to the UASB unit, the count of *E.coli* decreased to average 105×10^4 MPN/100ml, whereas the average count of *E.coli* after the DHNW was 95×10^4 MPN/100ml, By using different conc. of chitosan (0.09, 0.2, 0.4, 0.6 and 0.8g) the percentage of removal were 95.3%, 99.9%, 99.9%, < 99.9%, < 99.9% respectively.

Bacteriological examination on different types of bacterial strains using chitosan which derived from *Procambarus clarkii* was studied. The effect of chitosan was studied by different conc. (0.09, 0.2, 0.4, 0.6 and 0*.8g) on different types of bacterial strains (*Enterococcus faecalis*, *E.coli, Bacillus subtilis*, *Enterobacter aerogenes Staphylococcus aureus aureus*) and at different times (10, 20 and 30min). The results showed that the first optimum concentration which gave high quality of removal (99.98%) for *Enterococcus faecalis* was at 0.4g and time 20min, for *E.coli* bacteria the maximum removal of bacteria was started at conc. of 0.4g of chitosan and 20min by % of removal 99.98%, The *Bacillus subtilis* showed removal 99.98% which started at concentration 0.6g and 10min. The removal for *Enterobacter aerogenes* was 99.98% started at 0.4g and 30min. for *Staphylococcus aureus,* the removal was 99.98% and started at 0.2g and time 30min. In addition the chitosan was used in two conc. (0.6 and 0.8 g) as an anti-bacterial to *Escherichia coli* in comparison with the amoxicillin antibiotic, which has a strong effect on bacteria *Escherichia coli* using the spread method. It was found that the conc. of 0.6 g of chitosan gave 8 mm inhibition zone, while the

conc. of 0.8g of chitosan gave 11 mm inhibition zone, while the amoxicillin disc gave inhibition zone of 6 mm.

Key words: Anaerobic treatment, aerobic treatment, domestic wastewater, up flow anaerobic sludge blanket unit, down flow non-woven fabric units, small communities, banded iron formations, heavy metals, chitosan, bacteria.

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Signature

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