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Treatment of Domestic Wastewater using modified Septic Tank

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كما اتقدم بخالص الشكر لكل اعضاء هيئة التدريس بكلية العلوم جامعة عين شمس وايضا اعضاء هيئه البحوث وكل العاملين بقسم بحوث تلوث المياه – المركز القومي للبحوث لتعاونهم ومساندتهم لي في اجراء هذه الرسالة

Abstract

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Title of the thesis: Treatment of domestic wastewater using modified septic tank.

The treatment of domestic wastewater using a conventional, single baffle, two baffles and packed type septic tanks were the main theme of the present study. The septic tanks were fed continuously with domestic wastewater at three hydraulic retention times (HRTs) ranging from 24h to 72h and corresponding to organic loading rates ranging from 0.32 to 0.88 kg COD/m3/day. The average characteristics of raw domestic sewage investigated in this study in terms of COD, BOD, TSS were 962, 450, 296 mg/l. This raw wastewater can be categorized of high strength as per world-recognized classification.

The treated domestic wastewater quality produced by the four types septic tanks in terms of physico-chemical and biological characteristics proved to be satisfactory. Comparison wise, better results were obtained using the packed type septic tank for primary treatment. Further processing by a post treatment system, however, has to be applied to meet environmental standards. The average removal of pollutants for each type of septic tank in terms of COD, BOD and TSS improves in direct proportion to HRT.

The maximum removal of nitrogen and phosphorous; 34% and 36%, respectively are small values due to the anaerobic digestion which takes place in the septic tank. The fecal coliform removal values were observed to

be affected by type of the septic tank and the HRT, however the highest percentage removal reached only one log.

At each HRT it was observed that the type of the tank affects the percentage removal of the pollutants such that the packed type returns best results and the conventional type is the least.

Operating the four types septic tanks at HRT of 24h and 48h, each type gave close results at the two HRT, an indication of feasible selection of the 24h HRT for optimum performance /operation based on economic advantage. The accumulated sludge volume and weight depend on the septic tank type and HRT. The average percentage of sludge volatile organic matters is almost equal. The due time for desludging is directly proportional to the HRT. At each HRT the due time for desludging tank is in the order of conventional > single baffle > packed type > two baffles septic tank

Based on achieved results, either the two baffles or the packed septic tank is considered a viable solution for the on-site decentralized treatment of high strength domestic wastewater especially at rural communities.

Keywords: domestic, wastewater, treatment, conventional, baffled, packed, septic, desludging.

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CONTENTS

Page

CHAPTER (1): LITERATURE REVIEW

1. INTRODUCTION 1

1.1 Background 1

1.2 Water supply and sanitation in Egypt 3

1.3Wastewater treatment plants in Egypt 4

1.4 Wastewater treatment approaches 7

1.4.1 Centralized vs. decentralized wastewater treatment 8

1.5 Septic tanks 11

1.5.1 History of septic tank 14

1.5.2 Conventional septic tank 16

1.5.3 Baffled septic tank 17

1.5.4 Packed septic tank 22

1.5.5 Septic tank Volume 24

1.5.6. Septic tank Geometry 25

1.5.7. Septic tank pumping 25

1.5.8 Septic Tank Maintenance 27

1.5.9 Safe Use of Septic System 28

1.5.10 Septic tank treatment mechanism 28

1.5.11 Factors affecting the treatment efficiency 30

1.5.11.1 Impact of temperature on treatment process 30

1.5.11.2 Impact of hydraulic retention time (HRT) on treatment efficiency 31

1.5.11.3 Impact of number of chambers / baffles on treatment efficiency 32

1.6 Objective of the thesis 32

CHAPTER (2): MATERIALS AND METHODS

2.1 septic tanks 34

2.1.1 Conventional septic tank 34

2.1.2 Single baffle septic tank 34
2.1.3 Two baffles septic tank 35
2.1.4 Two baffles septic tank with packing material 35
2.2 sampling and analytical methods 35
2.2.1. Calculation of flow rate (Q) and hydraulic retention time (HRT) 37
2.2.2. Calculation of organic loading rate (OLR) 37
2.2.3. Calculation of hydraulic loading rate(HLR) 37
CHAPTER (3): RESULTS AND DISCUSSION
3.1. Raw Wastewater Characteristics 40
3.2. Performance of the conventional septic tank 47
3.2.1 Sludge accumulation in the conventional septic tank 64
3.3. Performance of the single baffle septic tank 67
3.3.1 Sludge accumulation in the single baffle septic tank 82
3.4. Performance of the two baffles septic tank 84
3.4.1 Sludge accumulation in the two baffles septic tank 99
3.5. Performance of the packed septic tank 101
3.5.1 Sludge accumulation in the packed septic tank 117
3.6 performances of the investigated septic tanks 120
CHAPTER (4): SUMMARY AND CONCLUSION
4.1 Introduction 125
4.2 Objective 127
4.3 materials and methods 127
4.4 Raw wastewater characteristics 127
4.5 performances of the investigated septic tanks 128
4.6 Conclusion 130
REFERENCES 132
ARABIC SUMMARY

List of abbreviations

%R	*Percentage Removal*
ABR	*Anaerobic Baffled Reactor*
AF	*Anaerobic filter*
AIT	*Asian Institute of Technology*
APHA	*American Public Health Association*
AsiBR	*Anaerobic single baffled reactor*
BAST	*Baffled anaerobic septic tank*
BASTAF	*Baffled anaerobic septic tank with anaerobic filter*
BOD	*Biochemical Oxygen Demand*
^{o}C	*Celsius*
Cm	*Centimeter*
CNES	*Citizen Network on Essential Services*
COD	*Chemical Oxygen Demand*
d	*Day*
EIB	*European Investment Bank*
FC	*Fecal coliform*
g	*Gram*
h	*Hour*
HLR	*Hydraulic Loading Rate*
HRT	*Hydraulic Retention Time*
ICC	*International Code Council*
max	*Maximum*
min	*Minimum*
OLR	*Organic Loading Rate*

SWIS	*Subsurface wastewater infiltration system*
TKN	*Total Kjeldahl Nitrogen*
TP	*Total Phosphorus*
TSS	*Total Suspended Solids*
UASB	*Up-Flow Anaerobic Sludge Blanket*
USEPA	*United State Environmental Protection Agency*
VSS	*Volatile Suspended Solids*
WHO	*World Health Organization*

List of Figures

Figure	Page
Figure (1.1) the ranking of annual incidences of certain diseases due to the lack of sanitation	3
Figure (1.2) Wastewater service developments in Egypt	6
Figure (1.3) Wastewater service coverage in Egypt	7
Figure (1.4) Conventional septic tank	17
Figure (1.5) Single baffle (two compartments) septic tank	18
Figure (1.6) Two baffles (three compartments) septic tank	18
Figure (2.1) Schematic diagram of the Conventional septic tank	38
Figure (2.2) Schematic diagram of Single baffle septic tank	38
Figure (2.3) Schematic diagram of the two baffles septic tank.	39
Figure (2.4) Schematic diagram of the packed septic tank.	39
Figure (3.1) Variation of total COD in raw wastewater	44
Figure (3.2) Variation of total BOD in raw wastewater	44
Figure (3.3) Variation of total suspended solids in raw wastewater	45
Figure (3.4) Variation of total solids in raw wastewater	45
Figure (3.5) Variation of total Kjeldhal nitrogen in raw wastewater	46
Figure (3.6) Variation of ammonia in raw wastewater	46
Figure (3.7) Variation of total phosphorus in raw wastewater	46
Figure (3.8) Variation of total alkalinity in raw wastewater	47
Figure (3.9) Variation of COD in conventional septic tank effluent at 72, 48 and 24 h	49
Figure (3.10) Average COD in raw wastewater and conventional septic tank effluent at 72, 48 and 24	49
Figure (3.11) Variation of BOD in conventional septic tank effluent at 72, 48 and 24 h	52

Figure (3.12) Average BOD in raw wastewater and conventional septic tank effluent at 72, 48 and 24 h 52

Figure (3.13) Variation of TSS in conventional septic tank effluent at 72, 48 and 24 h 54

Figure (3.14) Average TSS in raw wastewater and conventional septic tank effluent at 72, 48 and 24 h 54

Figure (3.15) Average COD, BOD and TSS in conventional septic tank effluent at 72, 48 and 24 h 55

Figure (3.16) Variation of total solids in conventional septic tank effluent at 72, 48 and 24 h 56

Figure (3.17) Average total solids in raw wastewater and conventional septic tank effluent at 72, 48 and 24 h 56

Figure (3.18) Variation of TKN in conventional septic tank effluent at 72, 48 and 24 h 57

Figure (3.19) Average TKN in raw wastewater and conventional septic tank effluent at 72, 48 and 24 h 57

Figure (3.20) Variation of ammonia in conventional septic tank effluent at 72, 48 and 24 h 58

Figure (3.21) Average ammonia in raw wastewater and conventional septic tank effluent at 72, 48 and 24 h 59

Figure (3.22) Average TKN and ammonia in conventional septic tank effluent at 72, 48 and 24 h 59

Figure (3.23) Variation of total phosphorus in conventional septic tank effluent at 72, 48 and 24 h 61

Figure (3.24) Average total phosphorus in raw wastewater and conventional septic tank effluent at 72, 48 and 24 h 61

Figure (3.25) Variation of alkalinity in conventional septic tank effluent at 72, 48 and 24 h 62

Figure (3.26) Average alkalinity in raw wastewater and conventional septic tank effluent at 72, 48 and 24 h 62

Figure (3.27) Variation of Fecal Coliform in conventional septic tank effluent at 72, 48 and 24 h 63

Figure (3.28) Average Fecal Coliform in raw wastewater and conventional septic tank effluent at 72, 48 and 24 h 64

Figure (3.29) Accumulation rate of sludge (cm^3) over time in conventional septic tank 65