بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

FEASIBLE TECHNIQUE FOR IN STREAM AGRICULTURAL DRAINAGE WASTEWATER TREATMENT

A Thesis
Submitted To The Faculty Of Engineering
Ain Shams University For The Fulfillment
Of The Requirement Of Ph. Degree
In Civil Engineering

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2022

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DEDICATION

It Took From Me A Portion Of My Life To Finish This Work, And I Return The Credit Of Finishing This Work To God.

I Wish To Dedicate This Work To Who Suffered To Educate, Prepare, Build Capacity And Help Myself To Be As I Am,

TO

MY MOTHER

AND

MY FATHER

AND I LIKE TO DEDICATE THE WORK TO MY LOVELY CHILDREN AND

MY HUSPEND

STATEMENT

This Dissertation Is Submitted To Ain Shams University, Faculty Of Engineering For The Degree Of Phd In Civil Engineering.

The Work Included In This Thesis Was Carried Out By The Author In The Department Of Irrigation And Hydraulics, Faculty Of Engineering, Ain Shams University, From October 2019 To March 2022.

No Part Of The Thesis Has Been Submitted For A Degree Or A Qualification At Any Other University Or Institution.

The Candidate Confirms That The Work Submitted Is His Own And That Appropriate Credit Has Been Given Where Reference Has Been Made To The Work Of Others

Date: - **--- /-- /2022**

Signature: - **----------** **Name: -** **Zainab Abdelaziz Mohamed Mahmoud El Hefny**

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ABSTRACT

Name : **Zainab Abdelaziz Mohamed Mahmoud El Hefny**
Title: Feasible Technique For In Stream Agricultural Drainage Wastewater Treatment
Faculty : Faculty Of Engineering, Ain Shams University
Specialty : Civil Eng., Irrigation And Hydraulic Department
Summary :

This Research Aims To Study Three Different Methods Used Instream For Drain Water Treatment. Application Of Agricultural Waste (Rice Husk), Plastic Material, And Rotating Paddles, To Improve The Self-Purification Process Through The Stream And Achieve The Possibility Of Its Water Reuse.

A Pilot Was Made At Faqous Wwtp, Sharkia Governorate, Near To Bahr Al-Baqar Drain Bank, Simulated Five Parallel Channels Built From Bricks Plastered By Epoxy Mortar. The First Channel Represents The Drain Water Without Treatment As Raw Water. The Second, Third, Fourth And Fifth Channels Used The Treated Media With Different Lengths From 50 Cm, 80 Cm, 110 Cm And 140 Cm. Samples Were Taken From Different Locations From Each Channel, The Channel Beginning, After The Treated Media By One Meter, Then 5 Meters And At 10 Meters From The Channel Beginning.

Three Methods Were Tested, The First Used Natural Material By Agricultural Wastes Of Rice Husk, The Second Used Artificial Media Of Overlapping Perforated Plastic Boxes, And The Third Using Rotating Paddles Rotated Due To The Water Velocity In The Stream. Experiments Were Conducted On 3 Operating Cycles One For Each Method, And In Each Cycle Water Samples Were Taken A Week After The Start Of Operation And For A Period Of Six Weeks To Measure The Different Elements.

Laboratory Experiments Showed That The Removal Ratio Using 140 Cm With All The Applied Methods Is The Higher In Removal Efficiency Than The Other Lengths, Where It Achieved Removal Ratios Of 20-87% With Rice Husk And From 34 – 87% With Plastic And From 47 – 85% With Rotating Paddles For All Measured Items, Which Are Bod, Cod. Tss, Hm And An Increase Ratio In Do Were Ranging From 20-80% For The Three Methods.

Technical, Financial And Environmental Comparisons Were Made Between The Three Methods Showed That Using Rice Husk Is The Best For Treating Agricultural Drain Water. So The Simulation Model Was Made For It.

The Mathematical Simulating Equations Were Deduced To Determine The Removal Ratio Of Each Element With Rice Husk Media Application Using The Data Of The First Four Weeks, And Its Verification Was Confirmed By Using The Results Of The Fifth And Sixth Weeks. The Produced Simulating Equations Are As Follows:

1- *For COD*With An Error Ratio Of -0.01 & +0.1%

$$E = -7e\text{-}16ci\ 2 + 0.034ci + 19.228 \qquad R2 = 1.0$$

2- *For BOD*, With An Error Ratio Of -0.96 & -1.23%

$$E = -9e\text{-}05ci2 + 0.1336ci + 36{,}655 \qquad R2 = 1$$

3- *For TSS* With An Error Ratio Of -13.52 & +12.29%

$$E = 87.418\ Lnci - 517.6 \qquad R2 = 0.1271$$

4- *For HM* With An Error Ratio Of -4.21 & +15.65%

E= 7.3429 Lnci + 26.451 R2 = 0.0311

5- *For DO* With An Error Ratio Of -0.23 & +5.62%

E= 7.3429 Lnci + 26.451 R2 = 0.0311

Supervisors:

Prof. Dr. Ghada Mahmoud Samy

Prof. Dr. Mohamed El Hosseiny El Nadi,

Dr. Nany Aly Hassan Nasr

Dr. Mona Abdel Hamid El Sayed Hagras

ABBREVIATIONS

Ann	**Artificial Neural Network**
Asb	**Aerated Stabilization Basin**
Baf	**Biological Aerated Filter**
Bod	**Biochemical Oxygen Demand**
Bod_5	**Biochemical Oxygen Demand At The Fifth Day Of The Experiment**
Cod	**Chemical Oxygen Demand**
Dbaf	**Dual Biological Aerated Filter**
Do	**Dissolved Oxygen**
Eb	**Eucalyptus Bark**

Fbr	**Fluidized Bed Reactor**
Gac	**Granular Activated Carbon**
Mbr	**Membrane Biological Reactor**
Mlp	**Multilayer Layer Perceptron**
Mse	**Mean Square Error**
Prh	**Phosphate Rice Husk**
Pvc	**Polyvinyl Chloride**
Rbc	**Rotating Biological Contactor**
Rbf	**Radial Basis Function**
S.P.	**Self Purification**
Ss	**Suspended Solids**
Ssfw	**Subsurface Flow Wetland**
Tb	**Tubular**
Tds	**Total Dissolved Solids**
Tf/Sc	**Trickling Filter / Solids Contact**
Tss	**Total Suspended Solids**
Ufbr	**Up Flow Fixed Bed Reactor**
Vf	**Vertical Flow**
Vfw	**Vertical Flow Wetland**
Vss	**Volatile Suspended Solids**
Xf	**Cross Flow**

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