DEVELOPMENT OF A HIGH RATE BIOLOGICAL SYSTEM FOR THE COMPLETE TREATMENT OF LOW STRENGTH WASTEWATERS

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OCTOBER 2011

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Submitted

in fulfillment of the requirements of the degree of

DOCTOR OF PHILOSOPHY

to the

INDIAN INSTITUTE OF TECHNOLOGY DELHI
NEW DELHI – 110016, INDIA

OCTOBER 2011

Certificate

This is to certify that the thesis entitled "**Development of a High Rate Biological System for the Complete Treatment of Low Strength Wastewaters**" being submitted by Mr. Motipalli Ramesh is worthy of consideration for the award of the degree of Doctor of Philosophy. The thesis has been prepared under my supervision and guidance in conformity with the rules and regulations of Indian Institute of Technology Delhi and is a record of the original bonafide research work. The results presented in this thesis have not been submitted in part or full to any other universities or institutes for the award of any other degree or diploma.

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Acknowledgements

I am extremely grateful to my supervisor **Prof. T. R. Sreekrishnan** for his expert guidance and constant encouragement throughout my project. It would not have been possible at all to complete my thesis successfully, without his continuous support and motivation. I am indebted to him for his patience and devoting his valuable time throughout my work.

I am very thankful to Prof. G. P. Agarwal, Prof. James Gomes and Prof. A.K. Mittal for their valuable suggestions and encouragement. I also thank all the faculty members who taught and encouraged me.

I am fortunate to have a lab mate and friend, Dr. Sk. Ziauddin Ahammad to whom I ever remain indebted. My special thanks to Dr. Russell Davenport, Mrs. Fiona Read and Dr. Cesar Mota of CEG, Newcastle University for their expert guidance and teaching, which helped me to learn molecular biology techniques applied in Environmental Engineering.

I am grateful to my department friends Dr. Saravanan, Dr. Mukesh and Dr. Smita for all their support and encouragement. I am thankful to Mr. Khan and all the department staff for their technical support and cooperation. My heartfelt thanks to all my lab mates and friends for their wholehearted support and encouragement. Due thanks to my present and previous office colleagues for all their cooperation.

It is not possible to express in words the support and love I received from my family and all the well wishers.

Motipalli Ramesh

ABSTRACT

Low Strength Wastewaters (LSW) are those that have a COD<1000mg/l. Nitrogen and phosphorus are the major nutrients present in LSW in addition to the organic carbon.

The present study was undertaken to develop an optimal combined treatment system for removing organic carbon, nitrogen and phosphorus from LSW at high hydraulic loading rates as there are hardly any reports on the same. The biological removal of carbon in LSW has been studied in detail earlier (M.Ramesh, 2004) using the anaerobic Hybrid Reactor (HR) and Activated Sludge Process (ASP). The biological nitrogen removal was studied through the conventional route of nitrification & denitrification and also using a recent process of anaerobic ammonium oxidation (Anammox) process. Effect of different operational parameters was studied to optimize the nitrification in RBC and aerobic HR. RBC showed better nitrification rate over aerobic HR. Denitrification was studied in a high rate anoxic HR which yielded NO_3^--N removal in the range of 92-100% till a Hydraulic Retention Time (HRT) of 0.3 d and 79% at 0.24 d respectively for an inlet NO_3^--N concentration of 500 ppm. TKN removal of 91%, 77%, 69% and 61% were obtained in the HR containing Anammox and denitrifying granules at a HRT of 2.14 d, 0.94 d, 0.56 d and 0.4 d respectively for an inlet TKN concentration of 500 ppm. Phosphorus removal of 100%, 83% and 72 % was obtained for an inlet PO_4^{3-}- P concentration of 50 ppm, 75 ppm and 100 ppm respectively at an optimum anaerobic HRT of 0.06 d (1.5 h) and aerobic HRT of 0.94 d. Based on the experimental results, four different schemes were proposed for complete treatment of LSW. These schemes were mathematically modeled to predict the performance of the complete treatment systems for LSW having varied C: N: P.

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