

CURRENT RESEARCH AND DEVELOPMENT IN BIOTECHNOLOGY ENGINEERING AT IIUM

VOLUME IV

Editors:

Ma'an Alkhatib
Abdullah Al Mamun
Faridah Yusof



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(VOLUME IV)

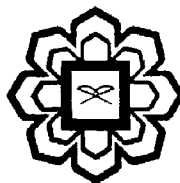
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POTENTIAL OF ARTIFICIAL NEURAL NETWORKS IN THE PREDICTION OF WASTEWATER TREATMENT PLANT PERFORMANCE

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ABSTRACT

This paper provides a solution on how to unveil the complicated interrelationships of wastewater parameters using artificial neural network (ANN) which is available in MATLAB software. ANNs give precise prediction thus capable of optimizing the performance of the plant. Using real data provided by Indah Water Konsortium Sdn Bhd (IWK), the ANN models developed will train, test, and validate the data to come up with various results that could be used in analyzing how wastewater parameters such as Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), and Suspended Solids (SS), are affecting each other, also, the networks could be used to gather predicted values of any of the parameters when fresh values of any of the parameters are inserted. These make ANNs valid as a tool to study biological processes.

Keywords: wastewater treatment plant, artificial neural network, biological oxygen demand, chemical oxygen demand, suspended solids.

INTRODUCTION

ANNs resemble the central nervous system. They are networks of highly interconnected neural computing elements that have the ability to respond to input stimuli and learn to adapt to the environment. They cannot be programmed to perform a specific task, instead, like the human brain, they learn from examples. Basically, ANNs consist of three layers; input, hidden, and output. These layers contain nodes, akin to the neurons in the human brain, and each connecting node has weight, representing the degree of influence of that particular node.

The process of learning includes pattern training. During pattern training the network is trained to associate outputs with input patterns. Later on, when the network is assessed with fresh information, it will identify the input pattern and try to generate output associated with the output pattern. Back-propagation neural networks learning algorithm is used mostly in forecasting problem for adjusting the weights of each neuron repeatedly until the error between the desired output and the actual output is at the least.

Neural networks (NNs) are systems that are deliberately constructed to make use of some organizational principles resembling those of the human brain. Such a model resembles the brain in two aspects: (1) knowledge is “acquired” by the neurons through a learning