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## Simulation of Low TDS and Biological Units of Fajr Industrial Wastewater Treatment Plant Using Artificial Neural Network and Principal Component Analysis Hybrid Method

PDF (Size: 528KB) PP. 370-376 DOI : 10.4236/jwarp.2012.46042

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### ABSTRACT

Being familiar with characteristics of industrial town effluents from various wastewater treatment units, which have high qualitative and quantitative variations and more uncertainties compared to urban wastewaters, plays very effective role in governing them. With regard to environmental issues, proper operation of wastewater treatment plants is of particular importance that in the case of inappropriate utilization, they will cause serious problems. Processes that exist in environmental systems mostly have two major characteristics: they are dependent on many variables; and there are complex relationships between its components which make them very difficult to analyze. In order to achieve a better and efficient control over the operation of an industrial wastewater treatment plant (WWTP), powerful mathematical tool can be used that is based on recorded data from some basic parameters of wastewater during a period of treatment plant operation. In this study, the treatment plant was divided into two main subsystems including: Low TDS (Total Dissolved Solids) treatment unit and Biological unit (extended aeration). The multilayer perceptron feed forward neural network with a hidden layer and stop training method was used to predict quality parameters of the industrial effluent. Data of this study are related to the Fajr Industrial Wastewater Treatment Plant, located in Mahshahr—Iran that qualitative and quantitative characteristics of its units were used for training, calibration and validation of the neural model. Also, Principal Component Analysis (PCA) technique was applied to improve performance of generated models of neural networks. The results of L-TDS unit showed good accuracy of the models in estimating qualitative profile of wastewater but results of biological unit did not have sufficient accuracy to being used. This model facilitates evaluating the performance of each treatment plant units through comparing the results of prediction model with the standard amount of outputs.

### KEYWORDS

Fajr Industrial Wastewater Treatment Plant; Simulation; Artificial Neural Network; PCA; Low TDS; Biological Unit

### Cite this paper

N. Mehrdadi, H. Hasanlou, M. Taghi Jafarzadeh, H. Hasanlou and H. Abdolabadi, "Simulation of Low TDS and Biological Units of Fajr Industrial Wastewater Treatment Plant Using Artificial Neural Network and Principal Component Analysis Hybrid Method," *Journal of Water Resource and Protection*, Vol. 4 No. 6, 2012, pp. 370-376. doi: 10.4236/jwarp.2012.46042.

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