ESTIMATING OF CO$_2$ CONVERSION IN FALLING FILM REACTOR USING ARTIFICIAL NEURAL NETWORK

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ABSTRACT - This paper presents the development of Artificial Neural Network (ANN) model for absorption process of CO$_2$ gas using monoethanolamine (MEA) as a solvent in a falling film reactor. Although studies on ANN applications in chemical engineering in the literature are more concentrated on utilizing dynamic models, there has been an increasing trend for diverse application of ANN to model steady state systems. The feed-forward artificial neural network was adopted and trained by back-propagation algorithm. In this paper 216 sets of data are used to train and test the network. This study shows that ANN model with one hidden layer and nine neurons in the hidden layer gives a very close estimation of the CO$_2$ conversion and there is high potential for absorption application of ANN model.

Key Words: Artificial Neural Network, Back-propagation algorithm, falling film reactor.

1- INTRODUCTION

Falling film reactors are generally used in processes where it is essential that temperature is maintained below certain limits – for example, removal of carbon dioxide, sulfonation, and concentration of syrups or the manufacture of cosmetics. Removal of carbon dioxide has been practiced industrially for several decades$^{(1)}$. CO$_2$ capture is typically done by absorption with alkanolamine-water solution. The alkanolamines are bases, and they react with the acid species CO$_2$ to form different reaction products$^{(2)}$. In the heart of successful process analysis is the step of mathematical modeling. The objective of modeling is to construct, from theoretical and empirical knowledge of a process, a mathematical formulation which can be used to predict CO$_2$ conversion of this process$^{(3)}$. A simulation model for the