
ABSTRACT

Determining optimum operating parameter levels in a methanol plant: A simulation model approach.

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The purpose of attempting these simulations was to provide useful models for plant troubleshooting and equipment performance evaluation. The use of design of experiments was extremely helpful in determining the optimum operating levels of the chosen variables.

In this thesis, HYSYS has been utilized to develop a general simulation of the TTMC Plant which is divided into three sections:

1. The Front End, which consists of the Feed Preparation, Reforming and Heat Recovery areas.
2. The Synthesis Loop Section, which consists of the Synthesis Reactors and the Recycle Loop.
3. The Distillation Section, which consists of the Topping and Refining Columns.

Due to the limits of the simulation package in modeling the CMD Reactor, a predictive model of the Reactor had to be developed. This was done using associated theory and a Fortran code written to determine optimum yield and hence optimum operating parameters by using a simple set of experiment designs. This model predicts outlet temperature, pressure, composition and flow conditions based on developed equations for active reaction dynamics down the reactor bed via concise integration of Material and Energy balances, Kinetic data and pressure drop analyses.

It was therefore possible to simulate the entire plant given all input data, including design criteria, which was incorporated into the simulation design.

This thesis employed a simple design of experiments which used a full factorial design incorporating three variables; Temperature, Pressure and Composition at two levels of testing. These experiments indicated the optimum levels of operation for the variables of temperature, composition and pressure to be high, high and low, respectively. The defined values of these levels are contained within section 3.5 of the thesis.

The results of this project confirmed all the simulated models as a success and to be practical and feasible for plant use.