CHAPTER I

INTRODUCTION

Several examples of industrial process dynamic simulation modeling have been reported in the literature. But so far, a study involving a small refinery dynamic simulation has yet to be reported. Therefore a study of this nature, which involves experimental data collection and dynamic modeling simulation, will be presented herein.

The refinery in question is a small refinery that is a duplicate of a major Thai refinery. A simple configuration of the plant is shown in Figure 1. In a normal operation of the process, the feedstock (condensate) is heated to a temperature of 140^{o}C. The heated feedstock is then fed to the first of five distillation columns, where gases comprised of butanes and pentanes are separated from the liquid. Butanes and pentanes are further separated in the process by the debutanizer and depentanizer units. The gases are one of the two products obtained from the first column. The other product, obtained from the bottom part of overhead drum of the first column, is rubber solvent, whose specification is shown in Table 1.1.

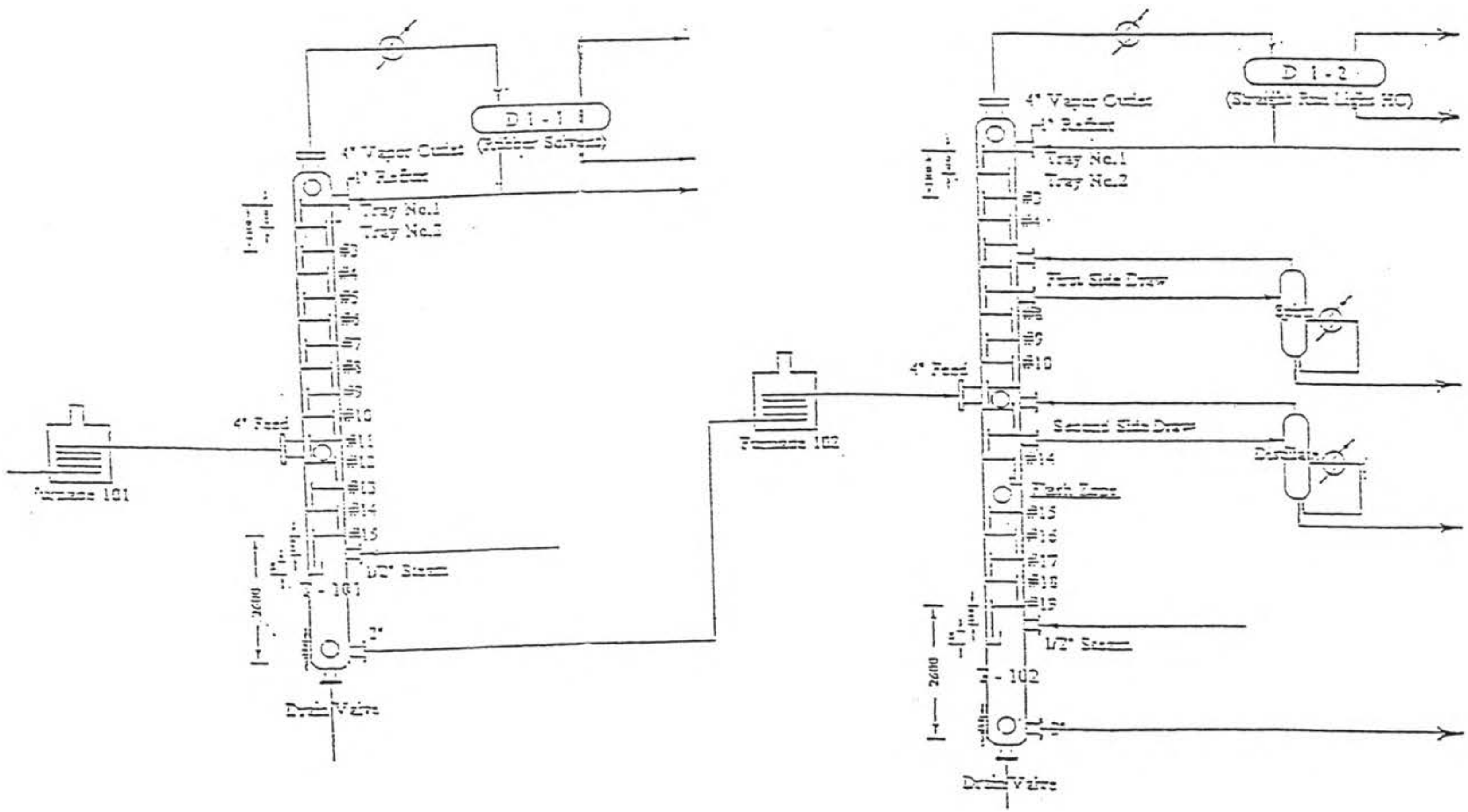

Figure 1.1 Configuration of the plant

Table 1.1 Product Specification

Product	API @ 60°F	Sp.Gr. @ 60/60°F	IBP	10 %	30 %	50 %	70 %	90 %	95 %	EP
Rubber Solvent	59.8	0.7397	70	79	83	87	91	98	103	105
Straight Run Light HC	54.7	0.7599	83	98	104	109	115	126	135	141
Spirit	47.3	0.7914	132	138	141	143	147	153	158	171
Distillate	45.6	0.7990	143	157	167	176	188	212	229	249

The degassed liquid is then sent to the second distillation column where three products with different boiling ranges are separated. These products are straight run light hydrocarbon (C5-C9), spirit and distillates (see Table 1 for product specifications). The heavy end from the second distillation column is then sent to the third (vacuum) distillation column where waxy residue and light distillate are separated.

Using the above mentioned process as a model for the study, its efficiencies will be determined. This involved data collection from the refinery, where data pertaining to each of the products yields were collected by varying different parameters such as feedstock temperatures, feed flowrates and reflux ratios. In order to determine the efficiencies of the process, enthalpy values of the process were determined to yield calculated and actual enthalpy values. Based on the differences of these values, efficiencies could be determined. To determine the efficiencies of the process, a programme based on the Excel and Mathcad program were developed. Therefore the objectives of this study are as follows:

- Determination of the effects of feedstock temperature, reflux ratio and feed flow-rate on the product yields.
- Determination of the enthalpy values of the refining process.
- Determination of the efficiency coefficients, heat loss and yield loss based on modeling simulation and enthalpy values using Excel program.
- Development a dynamic model to represent the distillation column.