CHAPTER I
INTRODUCTION

The refinery industry is one of the most important components of the national industry. It is an asset-intensive, operationally complex, low-margin, and extremely competitive industry. Especially in very competitive economics situation now, refiners are challenged to survive their businesses and accomplish their objectives. So, they have resorted to advanced decision-making technologies to respond quickly to problems and opportunities and make decisions with a high level of confidence. Planning and scheduling has become a very important tool as they can push the objective to the maximum limit.

Many planning and scheduling problems in chemical industry have been studied. Alternative methodologies and problem statements with different considerations have been proposed in literatures (Shah, 1998). A high effort to develop different strategies and tools of modeling, simulation and optimization for planning and scheduling, especially to response the dynamic environment, is underway. Many models have been proposed for scheduling but few are devoted to include uncertainty (Guillén *et al.*, 2005). Most of the formulations presented are based on nominal parameter values without considering the uncertain requirements after the operations are planned and scheduled (Bonfill *et al.*, 2004).

To overcome these problems, some forms of stochastic programming has been studied and proposed for planning and scheduling under uncertainty. Anyway, even though the stochastic models can optimize the total expected performance measure, they usually do not provide any control on its variability over the different scenarios. Therefore, related to this, some problems are related to financial risk management have been studied. Bonfill et al. (2004) presented some techniques to manage risk in scheduling problems similarly to what was done by Barbaro et al.(200 for planning problems. In addition, Guillén et al. (2005) also used some of these techniques to manipulate the financial risk in a given supply chain under uncertainty

Furthermore, there is another important aspect for planning in a highly dynamic environment, which is price-decision making. Pricing strategies consist of selecting the most appropriate price for a particular economic environment of market

situation. Traditionally, pricing decisions were the responsibility of the marketing manager who sets a price within the context of his overall market strategy (Hirshleifer, 1987), but an effort to integrate pricing strategies with different decision making process is now underway (Guillén *et al.*, 2005).

Another concern is that in the past the model was developed case-to-case for a specific refinery and it is uncomfortable that the model users need to have knowledge of computer programming to input the data and use the developed model. It might be better if the developed model is applicable for any typical refinery and has the simple input interfaces.

This work is focused on the approaches of optimization models for refinery production planning with integrated pricing decisions. The starting point was the development of the planning model. The relationship between product prices and demand was modeled and forecasted. Then it was integrated into a mathematical planning model in order to simultaneously determine the prices and the optimal schedule which maximizes the objective. The model was implemented in General Algebraic Modeling System (GAMS) and was generalized. The model input/output interfaces were created by applying the GAMS Data Exchange (GDX) facilities. The consideration of the uncertainty and financial risk management were introduced. The model was tested by applying the data from the Bangchak Petroleum Public Company Limited.