สำนักงานวิทยทรัพยากร จุฬาลงกรณ์มหาวิทยาลัย

CHAPTER I
INTRODUCTION

Nowadays, the petroleum refinery business is very competitive due to slow economic and more stringent environmental regulations resulting in low economic margin. Furthermore, uncertainties from rapidly changing supply, demand, and highly fluctuating crude price patterns signal an era of increasing complexity in working out the business. To ensure future profitability in this situation, refinery planning and scheduling has become a very important tool as they can bring all potential opportunities to push the economic margins to the maximum limit.

According to Shah (1996), scheduling is important for two reasons: the economic penalties of poor scheduling are severe, and efficient scheduling techniques will enable the exploitation of opportunities. The planning can be used to manage crude oil inventory that involves the optimal operation of crude oil unloading from pipelines, transfer to storage tanks and charging schedule for each oil distillation unit. Moreover, it is also used to schedule a set of operation that includes: product receiving from processing units, storage and inventory management in intermediate tanks, blending in order to attend oil specifications and demands, and transport sequencing in oil pipelines (Pinto *et al.*, 2000).

The scheduling problem in the chemical industry has been extensively studied and alternative methodologies and problem statements with different considerations have been proposed in literatures to address the combinatorial character of this problem (Shah, 1998). However, 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.*, 2003). In reality, the deterministic schedule obtained may become unfeasible. Traditional deterministic optimization is not suitable for capturing the truly dynamic behavior of most real-world applications. The main reason is that such applications involve data uncertainties which arise because information that will be needed in subsequent decision stages is not available to the decision maker when the decision must be made. Moreover, financial risk is not properly controlled.

Planning under uncertainty is a common class of problems found in process systems engineering (Barbaro and Bagajewicz, 2003). Some examples widely found in literatures are capacity expansion, scheduling, supply chain management, resource allocation, transportation, unit commitment and product design problems. This effort has been mainly driven by increasing competition and the need for developing new markets. Moreover, the inherent level of uncertainty in forecasted demands, availabilities, prices, technology, capital, markets and competition make these decisions very challenging and complex.

In this thesis, a model was developed, as a case study, for the production planning in the Bangchak Petroleum Public Company Limited in Bangkok, Thailand. Uncertainty of product demand and price was incorporated into the deterministic version of this model. The stochastic model was used to handle the uncertainty. The model was implemented by GAMS (General Algebraic Modeling System).