

AN OPTIMIZATION MODEL FOR GUIDING THE PETROCHEMICAL INDUSTRY DEVELOPMENT IN SAUDI ARABIA

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A mixed integer linear programming model is formulated for determining the optimum plan for the expansion of the Saudi Arabian petrochemical industry. The products selected for consideration fall into four categories: propylene derivatives, ethylene derivatives, synthesis gas derivatives, and aromatic derivatives. The model incorporates new variables and constraints, and realistic estimates of production costs, which are calculated based on local conditions in Saudi Arabia. For each production process, the unit production cost is assumed to be a function of production capacity. The input data for each product includes relevant production technologies, capacities, local production costs, and selling price. The solution of the model gives the recommended products under different scenarios of available capital investment and feedstock. The results are reported and analyzed.

Keywords: Optimization; Integer programming models; Petrochemical industry; Industrial development; Investment models

1 INTRODUCTION

Saudi Arabia has a small domestic petrochemical market and a large raw materials resource base, and hence the Kingdom's development of the petrochemical industry is a logical consequence of this situation. The industry is export-oriented, with emphasis on higher value-added products to maximize the economic benefits of industrialization. Saudi Arabian Basic Industries Corporation (SABIC) was established in 1976 to undertake and lead the development of the petrochemical industry. In recent years, there has been a lot of interest from local companies and investors in diversifying petrochemical production as the industry is competing for new and attractive projects. Therefore, this paper presents a model for the optimum planning of the future development of the Saudi petrochemical industry.

For the production of many petrochemicals, there may be more than one process technology involving different combinations of feed stocks and co-products. Several alternative derivatives (with different capacities) can be derived from a certain petrochemical feedstock. Since the available capital and feedstock quantity are limited, it is very important to formulate

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