

# SUPPLY CHAIN OPTIMIZATION OF PETROLEUM REFINERY COMPLEXES

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Production planning is a valuable tool to help inventory level management in order to decrease production costs and attend demand requirements. For petroleum refineries, although, there is still lack of development concerning production planning. Most of the literature and commercial tools treating such a problem presented simplified linear models that are far away from reality. Pinto et al. (*Comp. & Chem. Eng.* 24, 2259-2276, 2000), presented a superstructure that represents a general refinery topology and allows the implementation of nonlinear process models as well as blending relations. The main idea is to model each unit of a refinery as an entity and the complete topology of the refinery by connecting production units, product streams and their physical properties. Given a set of petroleum types and a typical planning period, the nonlinear programming model determines optimal operation conditions for the entire refinery. The main objective of the present work is to extend the single refinery model to a corporate planning model that contains multiple refineries, which can be connected by supply pipelines in common or interconnected. The model is optimized along a planning horizon spanning multiple periods and decides the choice of petroleum types for each refinery, resulting in a very large scale MINLP. The objective function maximizes net present value under raw material and product inventory level constraints as well as mass balance and operating constraints in each refinery. Finally, detailed analysis for different crude oil and product demand scenarios is incorporated in the model. A real-world application is developed for a refinery network composed of four refineries in São Paulo (Brazil). Different petroleum types are supplied to the refineries from a single oil terminal. Optimization of the supply chain reveals the advantages of corporate planning with respect to multiple one-site refinery production planning.