Development of a MINLP Model for Naphtha Feeding Scheduling of Naphtha Cracking Centers

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Petrochemical companies face the challenge of the decreases of net profit margins due to the sharp increases of feedstock petroleum prices. Considering the distinguished feature that feedstock cost constitutes more than 50 % of the total production cost, feedstock management is a key issue in need of further attention.

This work addresses the scheduling problem for naphtha delivery and storage tank management in NCCs (Naphtha Cracking Centers) which transform naphtha into ethylene. Particularly, in this work, selections of naphtha types and their delivery times are simultaneously considered. Thus, by solving this problem, the opportunities of purchasing lower-price naphtha can be found while meeting the operational condition of naphtha crackers through storage tank management. The proposed model is formulated as a MINLP problem because of the nonlinear feature in naphtha pooling. To avoid computational difficulties of MINLP, this formulation is converted into a MILP problem by adapting a relaxation method. A number of examples are presented to illustrate the applicability of the proposed model.