

Mixed-Integer Nonlinear Programming Models for Optimal Design of Multi-product Batch Plant

Fengqi You* and Ignacio E. Grossmann**, Department of Chemical Engineering,
Carnegie Mellon University, Pittsburgh, PA 15213

*e-mail: yfq@cmu.edu, **e-mail: grossmann@cmu.edu

Problem Statement

In the optimal design of multiproduct batch plants problem, we are given a plant consisting of a number of processing stages j , $j \in J$, for the production of a number of products i , $i \in I$. Each product i has a fixed production target Q_i that should be manufactured. We are also given and the size factor S_{ij} and processing time t_{ij} for each product i at stage j , as well as a fixed production horizon time H . The cost coefficient α_j and cost exponent coefficient β_j for processing unit j are also given. The objective is to minimize the total investment cost by choosing the number N_j and sizes V_j of processing units for each stage j , and the batch sizes B_i and cycle times TL_i for each product i .

Reference

1. Ignacio E. Grossmann, Roger W. H. Sargent, "Optimum Design of Multipurpose Chemical Plants," Ind. Eng. Chem. Process Des. Dev., 1979, 18(2), 343-348
2. Gary R. Kocis, Ignacio E. Grossmann, "Global Optimization of Nonconvex Mixed-Integer Nonlinear Programming (MINLP) Problems in Process Synthesis", Ind. Eng. Chem. Res., 1988, 27, 1407-1421