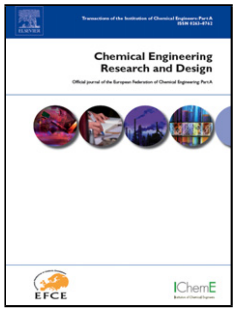

Title: An MILP approach for detailed scheduling of multi-product pipeline in pressure control mode

Authors: Qi Liao, Yongtu Liang, Ning Xu, Haoran Zhang, Junao Wang, Xingyuan Zhou

PII: S0263-8762(18)30302-2
DOI: https://doi.org/10.1016/j.cherd.2018.06.016
Reference: CHERD 3225

To appear in:

Received date: 27-3-2018
Revised date: 23-5-2018
Accepted date: 12-6-2018

Please cite this article as: Liao, Qi, Liang, Yongtu, Xu, Ning, Zhang, Haoran, Wang, Junao, Zhou, Xingyuan, An MILP approach for detailed scheduling of multi-product pipeline in pressure control mode.Chemical Engineering Research and Design https://doi.org/10.1016/j.cherd.2018.06.016

An MILP approach for detailed scheduling of multi-product pipeline in pressure control mode

Qi Liao[1] Yongtu Liang*[1] Ning Xu[1] Haoran Zhang*[1,2] Junao Wang[1] Xingyuan Zhou[1]

1. China University of Petroleum-Beijing,Beijing Key Laboratory of Urban oil and Gas Distribution Technology , Fuxue Road No.18, Changping District, Beijing, P.R.CHINA 102249
2. Center for Spatial Information Science, The University of Tokyo 5-1-5 Kashiwanoha, Kashiwa-shi, Chiba, JAPAN, 277-8568

**Corresponding authors:liangyt21st@163.com (Yongtu Liang); zhanghroper@gmail.com (Haoran Zhang)*

Highlights

- A discrete-time MILP model is developed for multi-product pipelines in pressure control mode.
- Pipeline scheduling and pump scheduling are optimized simultaneously by the model.
- Hydraulic constraints associated with flowrate are linearized by piecewise linear approximation.
- Two cases are given to illustrate the model's superiority.

Abstract

ABSTRACT: Scheduling with hydraulic constraints is one of the crucial aspects to guarantee multi-product pipeline safety. This paper develops a discrete-time mixed-integer linear programming (MILP) model for a single-source multi-product pipeline in pressure control mode, minimizing the pump cost as well as the labor cost of pump stoppage/restart. Instead of limiting pressure through flowrate constraints, this paper adopts piecewise linear approximation to deal with pump characteristic curves and frictional loss associated to flowrate and establish corresponding pressure constraints. The pressure at all key points along the pipeline should be within the allowable range to ensure transport safety. In this way, the proposed model can attain the integrated optimization of the pipeline scheduling and pump scheduling, thereby avoiding the possible mismatch between pressure and flowrate obtained by two-step solving strategy. Finally, the proposed method is compared with another discrete-time MILP model(Chen et al., 2017) which sets the minimum pump rate variation as objective function for the operating economy. Two cases tested on a Chinese real-world pipeline are given to demonstrate that the optimal detailed schedules obtained by the proposed model perform better in both economy and the convenience of pump operations.