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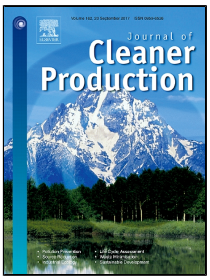

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PII:	S0959-6526(17)31678-5
DOI:	10.1016/j.jclepro.2017.07.222
Reference:	JCLP 10225
To appear in:	*Journal of Cleaner Production*
Received Date:	13 September 2016
Revised Date:	10 March 2017
Accepted Date:	29 July 2017

Please cite this article as: Naiqi Wu, Zhiwu Li, Ting Qu, Energy Efficiency Optimization in Scheduling Crude Oil Operations of Refinery Based on Linear Programming, *Journal of Cleaner Production* (2017), doi: 10.1016/j.jclepro.2017.07.222

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Energy Efficiency Optimization in Scheduling Crude Oil Operations of Refinery Based on Linear Programming

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Abstract: For sustainable development, a refinery is required to save energy as much as possible so as to reduce the emission of greenhouse gas. In crude oil operations, oil transportation from storage tanks to charging tanks via a pipeline consumes a large portion of energy. It is vitally important to minimize energy consumption for this process. Since the oil flow resistance is proportional to the square of oil flow rate, the relation between energy efficiency and flow rate is nonlinear, which makes the problem complicated. This work addresses this important issue by formulating a linear programming model for the considered problem such that it can be efficiently solved. A real-world industrial case study is used to demonstrate the applications and significance of the proposed method.

Keywords: Oil refinery, crude oil operations, scheduling, energy efficiency

I. Introduction

Facing with global and increasingly intensive market competition, great attention is paid to the scheduling operations and control of discrete manufacturing systems [Bai *et al*., 2016; Chen *et al*., 2017a and 2017b; Qiao *et al*., 2015; and Wu *et al*., 2012b, 2012c, and 2013] to name a few of studies made in recent years. Also, a plant in the process industry has to be well operated such that it is competitive. It is known that, with advanced information technology applied to modify the operations, a process plant can be made more profitable [Moro, 2003]. During the last two decades, extensive attention from both academia and industry community has been paid to the optimization of the operations in refineries, a type of most important process industries. A refinery can be operated in a hierarchical way with three layers: production planning, short-term scheduling, and unit control at the upper, middle, and lower layers, respectively. With linear programming-based commercial

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