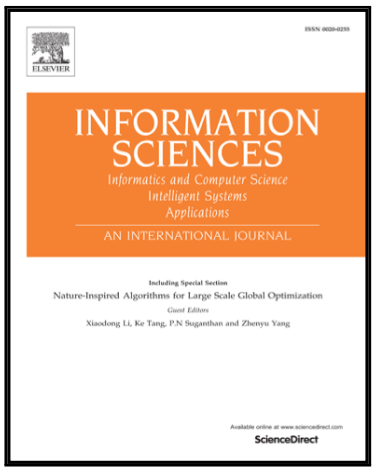


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# Petri Net-based Approach to Short-term Scheduling of Crude Oil Operations with Less Tank Requirement

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*Abstract* – With the interaction of discrete-event and continuous processes, the short-term scheduling problem of crude oil operations is essentially combinatorial. Thus, it is preferred to develop computationally efficient techniques for a satisfactory solution other than an exactly optimal one. Based on this idea, such a scheduling issue is studied in the viewpoint of control theory. To do so, as charging tanks are a type of critical resources, it is crucial to determine how many charging tanks are required to obtain a feasible schedule. By using a hybrid Petri net to describe behavior of crude oil operations, we show that a feasible schedule can be found for a system with two or more than two distillers if there are two charging tanks for each distiller, which is the least number of charging tanks for finding a feasible solution to reach the maximal productivity. Also, the requirements of the initial state for obtaining a feasible schedule are given and scheduling method is proposed. The scheduling method is simple and computationally efficient. An industrial case study is used to show how the proposed can be applied.

*Keywords* – oil refinery, Petri net (PN), short-term scheduling, crude oil operations.

## I. Introduction

With oil being one of the main energy resources, oil refinery plays a more and more important role in our society. It is known that a well operated plant can increase the profit by $10 for every ton of products produced [23]. A plant is operated hierarchically with three levels: production planning at the higher level, production scheduling at the middle level, and process control at the lower level. For production planning at the higher level, an optimal plan can be pursued for the whole refinery by using commercial software tools that are developed based on linear programming techniques [8]. It is believed that the technology of planning has been well