

Accepted Manuscript

Title: On improving the online performance of Production Scheduling: Application to Air Separation Units

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PII: S0098-1354(17)30385-X
DOI: <https://doi.org/10.1016/j.compchemeng.2017.10.030>
Reference: CACE 5936

To appear in: *Computers and Chemical Engineering*

Received date: 7-6-2017
Revised date: 19-10-2017
Accepted date: 26-10-2017

Please cite this article as: Lotero, Irene., Gopalakrishnan, Ajit., & Roba, Thierry., On improving the online performance of Production Scheduling: Application to Air Separation Units. *Computers and Chemical Engineering* <https://doi.org/10.1016/j.compchemeng.2017.10.030>

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FOCAPO/CPC 2017

On improving the online performance of Production Scheduling: Application to Air Separation Units

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Abstract

In the operation of power-intensive Air Separation Units (ASUs) that produce storable liquid products, optimization opportunities exist at two time scales - week-ahead production scheduling to leverage fluctuations in electricity prices, and real-time decisions that optimize the entire plant operation and capture spot opportunities. In our previous work, we proposed a methodology based on flexibility analysis and robust optimization to ensure feasibility of real-time operational decisions at ASUs for future time periods within a scheduling horizon. In this paper, we build upon the methodology to propose approaches to improve the online performance of a production schedule for ASUs by using the real-time optimization layer. We compare several policies for real-time optimization and our studies on real plant data show interesting trade-offs between week-ahead scheduling and real-time optimization.

Keywords: online scheduling, real-time optimization, decisions under uncertainty, industrial challenges

Nomenclature

Indices

i	Products
t	time periods
k	a specific time period
j	constraints defining the production space

Sets

I	Products
T	time periods in scheduling horizon, $T = \{1, 2, \dots, t^{fin}\}$
\bar{T}	time periods before the scheduling horizon, $\bar{T} = \{-\theta + 1, -\theta + 2, \dots, 0\}$
J	constraints defining the production space

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